HOW TO LEARN FROM FARMERS

P H S Johnson
Chief of Crop Production
Department of Agricultural
Technical and Extension Services
P O Box 8117
Causeway
Harare
Zimbabwe

CONTENTS

The views and opinions expressed in this paper are not necessarily those of the Ministry of Lands, Agriculture and Rural Resettlement.

"Though this be madness, yet there is method in't"
Shakespeare: Hamlet, Act II, Scene 2

INTRODUCTION

Why do we want to learn from farmers? The short answer is that over the last decade or two research has been unable to provide extension services and therefore farmers, with technology that works reliably at grass roots levels of application. Despite this farmers have continued to produce, and in some instances to solve problems that have baffled research.

Chambers, D.R. and Jiggins, J. (2) have noted that the reductionist approach to research works well on farms and large estates where the number of variables controlled by the farmer is kept to manageable proportions partly through being resource rich and partly through having relatively simplified farming systems with but few enterprises. Where the resource poor are concerned, the researcher is faced with a much more diverse and closely woven system which presents both complex and dynamic difficulties. Not only is the system closely interlinked at several levels, but it is shifting and responding to multiple and frequent changes in the surrounding agricultural, economic and social environment. Making reliably accurate recommendations is complicated by the need to obtain reliable results from a system which is ever changing.

Peters, T.J. and Waterman, R.H. (12) in "In Search Of Excellence, Lessons From America's Best Run Companies", stated that key managerial processes are extremely complex ... drawing on the vaguest of information and using the least articulated of mental processes. These processes appear to be more relational and holistic than ordered and sequential and more intuitive than intellectual. They conclude that it is probably only the intuitive leap which allows us to solve problems in such complex systems at those in which land by which we live. While it would be dangerous to draw too close an analogy between a large corporation and small farmers in terms of the complexity of their systems, it does not seem inappropriate to take cognisance of the remarks by Peters and Waterman when considering future directions for research into the problems of the small farmers.

A major and widely fluctuating variable, particularly in the semiarid tropics, is the climate with which farmers have to contend which greatly adds to the risk element for farmers, extension staff and researchers alike. Researchers also have to contend with the paucity of the feedback obtained through extension. Rhoades, R.E. (14) notes that technologies introduced to farmers have been considered as inherently good and that, if they have been around long enough and thoroughly communicated, farmers should adopt them. Diffusion of innovations literature assumes that the offered technologies are superior to those presently in use and that factors such as the age, class, literacy, family size, etc. determine the rate of adoption.

Rhoades continues to state that there is an assumption that there is a stockpile of technology on the shelf waiting to be transferred. Even the much vaunted farming systems research made this assumption and just set out to fit the pieces of the technology into the jigsaw of the farming system.

Since time immemorial rural populations have been characterised as simple, conservative and tradition-bound. This paper will argue that farmers are a

source of remarkable achievements and innovations which should be capitalised upon both by research and extension services.

PAST EFFORTS OF FARMERS

In his excellent review, Rhoades, R.E. (14) suggests that farming as an activity stretches back for 10,000 years and that throughout this time, the farmer has been a proactive participant consciously observing, selecting, experimenting and manipulating the farming system as it related to plants, animals, tools and the agroecological environment.

He argues that, long before the existence of modern science, farmers had an 'evolutionary' effect on plants, animals and land and that, furthermore, their improvements embraced processing and storage as well as production aspects of any enterprise simultaneously.

I, personally, had the pleasure some thirty years ago of observing such an improved and integrated farming system in the Gwoza hills in what was then British North Cameroons, now a part of Nigeria. The farmers in this region had, over time, evolved a system which included the terracing of steep slopes, composting all varieties of waste and rotating crops through having a male and female year for crops. A ceremonial ox was fattened in a small house especially constructed to restrict the animal's movements to standing or lying with an input and output hatch at either end for food or faeces. Thus, the energy used by the animal was minimised, enhancing food utilisation, and manure could be captured for application to the land. In addition a system of food storage was practised and there was a form of clan organisation similar to that found in Scotland. While this complex set of agricultural systems existed before the advent of extension or research, with little scope for their subsequent improvement, the people on the lower plains did not use them, and tended to be generally wasteful of resources.

Let us now consider the resource rich end of the spectrum - the flue cured tobacco growers of Zimbabwe who have been responsible for a number of innovations. The work study handbook produced by the growers association (1961) cited some examples of these for instance the Ballance and Kurt reaping machines. In the curing phase, farmers helped to develop the tunnel method as well as methods of reducing costs and using available resources effectively.

To conclude this section let us recharacterise successful farmers as:

experimenters, risk takers, innovators,
intensifiers and diversifiers,
colonisers and pioneers,
addicted to information.
practitioners and developers of common sense,
socially and economically rational, in agreement with R.E. Rhoades.

INFORMATION FARMERS USE BEFORE ADOPTING A PRACTICE

If study could define the information which farmers actually use in deciding to adopt or reject a technology it would greatly assist extension and research in the promotion of innovations.

It is my contention that any advice must cover the following information bases:

biological
farm production economics
risk
work and ergonomics
social and economic systems.

Farm systems involve all these factors in a holistic way, acting and interacting continually. Thus, a successful extension officer must endeavour to empathise with farmers to the extent that he also takes all these factors automatically into account in giving advice and in feeding information back to research colleagues.

Let us briefly consider each factor in turn.

Biological

Agricultural research covers many forms of sciences - tillage, chemistry, pedology, irrigation, pesticides, nutrition, breeding, and vaccines to name a few - and must produce results that are, to be generally scientifically acceptable, of a coefficient of variance of 25 or less (for crop trials) and which report the standard error and mean of each treatment, as well as stating if the results are significant or not in terms of a positive cost benefit contribution to enterprise productivity. With this information on hand the farmer is now able to consider economics.

Farm production economics

Research and extension practioners could well, at this stage refer to some text such as, 'From Agronomic Data to Farmer Recommendations, an Economic Training Manual' (R.P. Perrin and J.R. Anderson, CIMMYT) which would enable them to predict monetary outcomes of practice adoption. Meanwhile the experienced farmer has already calculated the monetary and several other effects and decided to adopt or not to adopt intuitively, while the advisers are still reaching for the text. If we assume that the economic analysis says adopt, the next question is one of risk.

Risk

Risk touches a whole spectrum of factors which impinge on farming systems. For my purposes today we will only consider weather, and rainfall within weather, as it affects the farmer. Plainly farmers will not be interested in a research result if it requires rainfall conditions that occur only once in thirty years. Indeed they will very likely not be interested if it requires conditions which he is not reasonably certain of enjoying in nine years out of ten. Research and extension workers may be surprised to know that farmers have already arrived at their decisions on the basis of risk. Consider the Chivi area of Masvingo Province in Zimbabwe. There a research team headed by Dr C Jackson discovered that the ratio of area planted to crops of maize and millet varied in respect to the previous season's rainfall.

If there had been a good year previously the area planted to more water demanding and higher risk maize increased. The reason for this was found to be that farmers with stores full enough of grain to guarantee subsistence for a season could gamble on planting maize which is more risky, but higher yielding in good years, than millet.

Science would address this problem through looking at the probability function of season length (Hussein J. 1987) and would come up with the answer 27% for a crop requiring a season length of 120 days at Chivi. However we could postulate that the more apposite question is to enquire the probability of the farmer getting a successful maize crop at least once in three successive years? The intuitive farmer already has the answer, science tells us the probability of at least one year in three providing a suitable season is $(1-(.73)^3) = .61$. Loan managers of banks would do well to take note of such a seemingly crude approximation and to use it judiciously. A means of evaluating crop experiments for this form of risk is contained in the appendix.

Work and ergonomics

This subject includes any available means of easing the work, how the nature of the work affects the product and the limits to which human capability can undertake the required work. The use of a "Push hoe" having a wheel and a handle to act as a lever may serve as an example of how, in certain circumstances, the productivity of labour can be enhanced through use of simple, practical, mechanical aid. However, the circumstances, the soil type, the spacing of the crop and the nature of the weeds, must all suit.

There would also appear to be scope for using operations research and work study in the development of low technology to enhance the productivity of cropping. It must be remembered that the ease with which work is perceived and the apparent rewards from it are important motivators to getting it done. Recall here Turkish or oriental tobacco which is high yielding but requires a great deal of work of a very finnicky and time-extensive nature which makes it unattractive to the peasant farmer. Recall also the Hawthorn effect where the demonstration of interest by management through changing the work environment, both positively and negatively, yielded successive increments in productivity! There is an important perceptual difference between farmers and researchers, the former being interested in the return per man day while the latter are interested in return per area planted, or per dollar invested. As a result of this, while a researcher will consider an improvement of 10% per hectare worthwhile (and so would the farmer growing 200ha), to the farmer growing less than 1ha the labour needed to obtain the increased yield is not worth the return, especially if it increases his risk of losing the entire crop or requires him to increase his investments in its production.

Work usually impinges on the likelihood of adoption of a new practice through the timing of its requirements, which is especially important in the tightly woven farm systems of peasant farmers. It must be recalled that while the marginal returns to labour vary there is unlikely to be labour yielding zero marginal return at any point during the year and there is thereby, almost always, some opportunity cost to be borne. Thus interventions which can save labour without requiring additional capital investment are most likely to be adopted. Work study and operations research can yield such gains merely by reorganising the way in which work is done to reduce the labour required for its performance.

Socioeconomics

The fifth and last area of information which needs to be considered in proposing innovations is socioeconomics which are, here, concerned with markets, their location, accessibility and the infrastructure within which a farmer needs to be able to work effectively. We must also consider the alternative opportunities such as jobs in urban areas which result, on the one hand in less reliance on farming for subsistence, but on the other hand, results in more agricultural operations falling to the lot of women, in addition to their already existent household work. This trend of men working in towns can also cause delays and disruptions in farming operations if the decision-making function remains with the men who are only infrequently present on the farms. More directly, the money which men earn in towns may be a prerequisite to the procurement of farming inputs and may only be available when they are at home. For many this is often at Christmas which is, on the one hand late in the season and, on the other hand is not a socially usual time to be ploughing and planting. Reynolds N. (13) made an interesting study of the circulation of financial resources as a means of diagnosing poverty patterns in a typical Natural Region IV communal land area of Zimbabwe which others may well find instructive.

HOW FARMERS AUGMENT THEIR EXISTING KNOWLEDGE

Having looked at the types of information which farmers use in deciding to adopt or reject an innovation, it is now instructive to consider how they obtain the information.

Three sources will be considered: observation trials, watching over the fence, and the cocktail party method.

Farmer observational trials

We have already seen how farmers deliberately vary the treatment of different rows of crops from which they derive their preferred practices. What we know little about is how they decide which options to adopt. What is likely is that farmers using their methods can only see improvements when they exhibit returns of between 30 and 50% over the alternatives.

This means that they will select improvements that will give improvement with a margin for error and variation which will still be positive in their yield results. Such apparently crude measures offend the sensibilities of scientific researchers who have been at pains to apply the skills of their trade, particularly the powerful statistical tools largely introduced by Fisher in the 1930's which allow the identification of much smaller changes with confidence. The harsh truth is that farmers are only interested in innovations which yield between 40 and 50% on the additional investment which they require. Such returns can be obtained under the less variable conditions of research stations or monocropping commercial farms from innovations with lower yield responses. To obtain such returns on a peasant farm the yield responses need to be from 15-20% as minima. Use of some simpler analytical tools such as Fisher or Cochran tests and the sign test may be adequately robust to allow extension staff to utilise farmers trials to good effect.

Looking over the fence

It has long been known that prospective purchasers of farms are well advised to pursue judicious enquiries in the nearest hostelry over a series of visits. A similar approach can be used over the farm fence with your neighbours, not necessarily those in direct proximity, but certainly the nearest who is successful in the enterprises you are following, or anticipating to follow. Where extension coverage is sparse, farmers adapt and learn from each other. An experienced extension officer will both learn from farmers and set farmers learning amongst themselves to enhance his effectiveness. A multivariate analysis system using this approach is described by Johnson, P.H.S. (7,8).

The cocktail party method

The apparent value of a cocktail party is to meet people and to discuss trivia. However, C. Northcote Parkinson in his Parkinson's law, and experienced diplomats, would disagree. They have analysed the machinations and peregrinations of such events and demonstrate how they can be effectively used as means to pursue topics to great advantage, rapidly and cost effectively.

In the agricultural extension milieu similar advantages can be obtained through discussion groups. These are usually sponsored by an interested party which sets the theme, which must obviously be topical and significant to attract participants. Once the formal business is concluded the event then metamorphoses into a close analogy of a cocktail party. Now the farmer and the extension agent can really get down to business. The farmer can verify or enlarge on the information presented and the extension officer can justify and exemplify his advice. What is happening is a process of adjusting the advice to obtain a workable fit for the individual farmers. Many workers have fallen foul of the tendency to consider farmers, and particularly peasant farmers, as homogeneous. They are most certainly not. A discussion group, followed by a 'cocktail party' enables the extension worker to prime the participants to a suitable starting position and then to cut and fit the advice to tailor it to the specific requirements. Farmers can do this for one another and will continue to cut and fit as circumstances change during the life of the crop or other enterprises. There are skills to be learned by extension staff in priming and then facilitating such activities and their consequences. It is unusual for farmers to organise such a meeting themselves, perhaps for fear of being overtly seen as trying to direct their peer group.

LEARNING FROM FARMERS

Now that we know something of the information needs of farmers and something about how farmers set about filling those needs, we have the basis on which to design some tactics through which to learn from farmers. Maxwell (10) describes a case study method of understanding farm systems, which, if it is subject to critical review using the frame-work for on farm interviews devised by Carruthers (1), can be of use. Carruthers admits that his critical review procedure is merely a "thinly disguised mechanism for marginal analysis". Our Agritex Crop Production Branch has reduced this to an extension aide in the form of a plastic aide-memoire of pocket size fastened with a split ring to

make it more accessible to extension staff. Regular use of the questions and approaches therein should facilitate their internalisation.

The case study method quickly generates information and data on management strategies which can be recalled and used as comparison and contrast at later times. There are analogies possible here between agricultural case studies and those used in the medical and legal professions whereby similarities and variances are checked off against previous precedents as a guide to future action. The medical analogy is probably closer to the agriculture as diagnosis and prescription are needed quickly before the patient (crop or stock) expires. Thus, while formal written case studies may well have utility in getting new staff in the swing of such work, it must quickly be converted to an automatic, almost anecdotal approach, whereby complex systems can be quickly and reliably diagnosed.

CIMMYT (9) characterises diagnostic analysis as comprising of the following:

> Identifying the best technical opportunities for improving production in specific localities;
> Assessing the utility and acceptability of research results;

Four phases of the process are then defined:

> Describing the system of agriculture;
> Defining the target group or recommendation domain;
> Defining priority problem areas for each target group;
> Elucidating the causes of defined problems from an holistic view.

CIMMYT then propose three tools for use in this process:

> Informal surveys;
> Diagramming causal relationships for problems;
> Screening alternative recommendations for utility.

This approach was discussed and recommended from a workshop on cropping in the semi-arid areas of Zimbabwe in 1987 and has, subsequently, been included in a hand-book designed to assist extension in advising farmers in the semi-arid areas.

DISCUSSION

The view is often propounded that we could solve all agricultural problems if research were to be expanded and if extension were to grow to adequate size to be able to disseminate the research results to farmers. It is my belief that a great many of the problems faced by some farmers have been solved by other farmers and that catalysis of those results by extension (and their confirmation or denial by research) is an important missing element to the farmer, extension, research system.

How often has research set off to find answers to problems which are considerably less than immediate in their importance to farmers? More importantly why has this occurred? The answer lies in the failure to close the extension, research, farmer cycle. Research is unguided (if not misguided) because extension is not analysing the information needs of farmers adequately. This has led research organisations to start trying to short

circuit the system by doing farm systems research on farm trials with (despite millions of dollars which have been poured into such efforts) mixed results.

Can extension improve its performance in assessing research needs and can farmers practices', in all their variety, assist this? By sheer weight of numbers (there are many times the number of farmers than the numbers of researchers and extension staff) farmers are likely to be more innovating with their farm systems. Extension, considering the arguments which I started out with about the serendipitious, intuitive, leaps which are necessary to understand and improve on complex systems, should be able to pick out some juicy tit bits just in the course of their usual peregrinations around the countryside.

Without this approach it is difficult to see how large numbers of on farm trials will supply anything like the information required to be extended. The large Standard Error (S.E.) normally associated with such trials, together with the high frequency of drought, adds to the difficulty of interpretation of such trials. The method of analysing these trials as proposed by Hildebrand, (1984), although quoted by economists as a solution to such problems, is not widely accepted by agronomists. The biometricians' answer would be to increase still further the number of trials, however it should be borne in mind that the S.E. will only be reduced by the factor of 1/n. This in effect does not solve the problem either, bearing in mind that trials from reasonably homogeneous areas can only be compared. This problem is further compounded by the high failure rate of such trials, a figure of 50% is not uncommon. What span of years will need to elapse before tangible results can be obtained from this system?

More importantly what steps can be taken to improve the efficiency of extension (and research) staff in making the intuitive leaps and fostering the serendipity? Farm systems research and on farm trials are mechanistic and cumbersome means which bureaucracies have tried to develop to meet this need. Now, we all know the saying that the camel is a horse designed by a committee.! Neither mechanistic or bureaucratic solutions suit a non bureaucratic system - the farm. Both extension and research staff need to adjust their methods of thought, observation and analysis away from rigid reductionism towards greater development of their inductive capacity. This view may be considered fantastic or even madness but, "there is method in't."

CONCLUSION

In the body of this paper I have endeavoured to review the learning systems of farmers and the way and means whereby research and extension have endeavoured to match their work to the needs of farmers.

I have postulated that extension and research are well advised to continue learning with (as well as from) farmers but that the means by which they undertake this learning needs to be improved.

The essential and inescapable conclusion which I made is that extension and research staff need, like farmers already are, to become self actualising, proactive learners.

Approaches such as farm systems research and the CIMMYT method are useful ways for officers to learn these approaches but they must become internalised and

automatic to be capable of leading to the intuitive leaps with good advice that research requires.

To achieve this, a change is needed in preservice and inservice training, (at whatever level) to direct it away from pedagogy and towards self-learning. I am pleased to be able to report that the majority of inservice training in Agritex has already been converted to a Criterion Referenced Instruction basis, with good results once the trainees learn to cope with self-learning and can be weaned from the bottle of pedagogy. If such systems became the norm in the Colleges, Institutes and Universities where staff obtain their preservice training as well, then we could look to a considerable improvement in extension and research performance.

ACKNOWLEDGEMENT

I acknowledge editorial assistance and helpful comments from B Biscoe.

LITERATURE CITED

1. Carruthers, I. (1980-81) Mental construct for unstructured on-farm interviews for use in rapid rural appraisal. Agricultural Administration: 3, 271-278.

2. Chambers, R. and Jiggins, J. (1986). Agricultural Research for Resource Poor Farmers: A Parsimonious Paradigm. Institute of Development Studies, University of Sussex, Brighton, BN19 9RE, U.K.

3. Crop Production Branch (AGRITEX) (1987), Recommendations for cropping in the Semi-Arid areas of Zimbabwe. Edited from a workshop: Cropping in the Semi-Arid areas of Zimbabwe - Harare 24-28 August 1987.

4. Hildebrand, P.E. (1984). Modified stability analysis of farmer managed, on farm trials. Agron. J. 76: 271-274.

5. Hussein. J (1987). Agroclimatological Analysis of Growing Season in Natural Regions III, IV and V of Zimbabwe. Consultancy presented at the workshop on, "Cropping in the Semi-Arid areas of Zimbabwe" - Harare 24-28 August 1987.

6. Jackson, C. (and others) (1987). Farming Systems Dynamics and Risk in a Low Potential Area: Chivi South, Masvingo Provence, Zimbabwe. International Course for Development Orientated Research (I.C.R.A.) Wye College, London University, England.

7. Johnson, P.H.S. (1982). Use of Cluster Analysis in Flue Cured Tobacco Farm Management in Zimbabwe. Zimbabwe. Agric.J 79(6): 223-232.

8. Johnson, P.H.S. (1983). PUtting the Pieces Together. Z.Tob.Today. 6(6): 25-39.

9. Low, A. (1987). Application of CIMMYT Diagnostic Methodology in Extension. Paper presented at the workshop "Cropping in the Semi-Arid areas of Zimbabwe" Harare. 24-28 August 1986.

10. Maxwell, S. (1984). The Role of Case Studies in Farming System Research; In: IDS discussion paper 1987 Institute of Development Studies, University of Sussex, Brighton, England.

11. Perrin, R.K.; Winkelman, D.L.; Moscardi, E.R.; Anderson, J.R. (1976). From Agronomic Data to Farmer Recommendations. Information Bulletin 27. CIMMYT.

12. Peters, T.J. and Waterman, R.H. (1982). In Search of Excellence, Lessons from America's Best-Run Companies. Warner Books New York, U.S.A.

13. Reynolds, N. (1987). A Diagnostic Study of Poverty, Economic Security, Resource Management, Financial Flows and Development Administration in Chikore; A Ward in Natural Region IV, Manicaland. Consultancy presented at the workshop Cropping in the Semi-Arid areas of Zimbabwe - Harare. 24-28 August 1987.

14. Rhoades, R.E. (1987). Farmers and Experimentation. Discussion Paper 21. Agricultural Administration Unit, London.

15. Rhodesia Tobacco Association (1961). Manual of Work Study Observations R.T.A., P O Box 1781, Harare.