Chapter Six

Conclusions and Policy Implications

Introduction

On the basis of the discussion and literature review, certain conclusions and policy implications can be made with reference to the agricultural research and delivery systems of SG 2000 as observed in the case study area and, by implication, in the rural areas of Ethiopia and in many Third World countries. It would help place the conclusions and policy implications in perspective by reiterating the basic problems of this study. The study examined technical change and agricultural research and delivery system in rural areas with a focus on poor farmers using the SG-2000 approach in the case study area presently emulated by the National Extensions System. The study aims to contribute to an understanding of technical change and the process of technology transfer and the underlying factors which affect technical change in the peasant sector. Technical change is generally perceived in terms of a moving production possibilities curve, in terms of the increasing number of production of goods and services or decreasing costs per unit of outputs. The SG-2000 approach emphasises the Extension Management Training Plots and EMTP participating farmer at the centre of the orbit of the diffusion process, where the EMTP participating farmer will be a source of inspiration for the surrounding farmers and thus induce them to jump on the wagon and move around the orbit. The central assumption of the approach is that 10 other farmers could emulate each EMTP participating farmer through the trickle-down effect. In theory, this is a brilliant assumption. However, the study demonstrates the contrary.

Using the case study, an attempt is made to draw certain policy issues in agriculture research and extension activities to bring about technical change in rural areas. An attempt is also made to demonstrate that peasants know their own problems of development and can help responsive policy makers and scientists in research and development institutions know them, provided they are willing to know. An attempt is also made to demonstrate the perceived problems of the peasants in the case study area, the level of interaction with the extension and research and development system, and the extent of cultivators' knowledge, familiarity with the improved agricultural practices generated by the research and development system. Thus, in general, it

is demonstrated that extension activities in the area have been oriented towards intensification of plant husbandry – exclusively aiming at increasing production of wheat – ignoring the solutions to other problems identified by the farmers in the area. The task of distribution of farm inputs and collection of credit is resented by the extension agents themselves. Thus, the following conclusion and policy implications derived from the study provide the overall findings of the study.

The Need to Develop a Workable Methodology for Identification of Technological Needs and Problems

The perceptions of farmers to the general and operational problems and constraints have already been presented. Generally, a workable methodology for identification of the technological needs, constraints and the economic forces affecting farmers use of technology should help in the designing of future technology better adapted to farmers conditions. The conceptual model used in the formulation of packages is defective in that the high yield technology developed at research station does not yield or produce as much yield under farmers' conditions. This is partly caused by biological constraints and the socio-economic conditions. It is clear that the farmer in the study area does not apply all the recommended inputs but some elements of the package. It is demonstrated that the conditions that impede development varied relatively widely even within the restricted case study area. This demonstrates the diversification of the conditions and problems of production even within the study area let alone with the same agro-ecological region or in the extremely varied agro-ecological conditions in Ethiopia as a whole. Different management packages have to be developed for the farmers set of practices and different input combinations which represent different yield levels and production costs, rather than develop one package for all areas. This allows a meaningful look at the question of cost and returns of different management packages. This also gives an opportunity to demonstrate one or more packages which could be good candidates for recommendation to farmers. The key thrust in this concept which differs significantly from the work of experimental stations, is to find out what improvements can be made to farmers practices rather than formulate new practices recommended for maximum yields for all farms.

The Need to Focus on Agricultural Science and Technology Policy Research

Little attention has been given to the identification of the major issues in agricultural science and technology policy that might be used as guideposts to policy-makers seeking to improve performance of the agricultural sector. What one sees instead is research and development being discussed in general, with divergent views. Furthermore, few efforts have been geared to reviewing the approaches and policies followed by the formal agricultural research and extension agents at the farm level. Based on the farmers perceived roles of the extension system, there is a definite need to undertake further study with focus on policy research for generation and dissemination of technologies to enhance agricultural production and non-farm activity.

The Need for a Drastic Change in the Orientation of the Extension Activity

It is to be recalled that during the 1974-1991 period, the extension service was mainly preoccupied with promotion of collective agriculture, organisation of peasant associations, reallocation and distribution of land and involvement in many political activities which made farmers view extension agents with distrust and suspicion, thus reducing their contribution to influencing adoption behaviour of farmers. This concern was raised by the extension agents interviewed and by farmers expressing views on the role of the extension service as with regard to the supply of farm inputs and collection of credit. These activities should be left to private firms; extension services should focus on developing the innovative capacities of farmers, strengthening the farmers institutional base and the necessary infrastructure of the peasant organization – building the innovative capacity of farmers rather than the distribution of inputs and collection of credit.

The Danger of Centralists, Linear Model Vision in Agricultural Research and Extension System

The problems of research in Third World countries are characterised by complexity, diversity of the farming conditions, and the large number of producers compared to those in industrialised countries who have become increasingly specialised. The present vision of agricultural research and extension is full of gaps. There is now widespread recognition that the model is problematic, as demonstrated by the growing literature in technical change in rural areas of the Third World countries. As discussed earlier, some parallel approaches have been designed and introduced to deal with some of these problems. However, all the approaches aim at the production of packages which are introduced in a top down fashion. The packages are designed and provided by scientists to extension agents. It is interesting to note that in most cases, farmers do not apply all the elements of the packages designed but use only elements of the package.

The Need for more Specific and Relevant Research Methodology

In order to cope with the ecological variations and the attendant problems, even within the same peasant association area, more attention should be given to the development of an appropriate methodology for problem identification, characterisation of technology, field trials, establishing the balance between what has to be done at the research station and at the farm level, monitoring and feed-back mechanisms.

The conceptual model used in the formulation of packages is defective in that the high yield package developed at research stations does not yield as much under farmers' conditions. This is partly because of biological conditions, skill and socio-economic constraints. This suggests the need to understand the reasons for the yield gap between the experiment station yield, the potential farm yield and the actual farm yield over farms, season and years.

Different management packages have to be developed designed to represent the farmers'

set of practices and different input combinations representing different yield levels and production costs, and returns of the different management packages. This will give an opportunity to demonstrate more management packages, which could be good candidates for recommendation to farmers.

It is important to find out what improvements can be made to the farmers' practice rather than formulate packages for maximum yield in all farms. Farmers' practices vary from one field to another even on the same farm, let alone within different farms. The problem gets more complicated at a regional level and much more complicated at a given environment. Furthermore, innovative efforts should be undertaken whereby farmers are encouraged to be the major source of improved practices.

The Need to Establish Closer Functional Linkages between Research and Extension

It is widely recognised that the weak linkage between research and extension is a problem in many developing countries. This concern is well reflected in the response of the extension agents in the study area. The extension agents' response to the statements made clearly demonstrate the weak linkages between research and extension in the study area. We argue for a functional linkage between research and extension. For those who see the problem from a structural angle, the solution becomes one of creating a structure which brings the two institutions under one administration. However, this line of thinking mixes the role of institutional structures with that of the informal research and development activities of the farmers themselves. To this end, there is need to fuse the extention, research and peasant activity to create a nucleus for setting research problems, priorities and demonstrations. The conception of the dichotomy of research and extension activities should be viewed as a division of labour rather than of function. After all, the research agenda should be partially determined by the user. The research process is not completed until its product has been adopted. After all, the users' problem or need is not static; it changes over time. It is essential, therefore, to have a drastic change in the orientation of researchers and extension agents to this approach as well as the training of extension agents in formal extension education and activity.

The Need for Training and Capacity Building fo the Extension Service

Extension agents are not well trained in agricultural extension education, except for a few months after completion of high school. There is a clear need to improve the number and quality of the extension personnel by providing them with adequate training on innovations and appropriate methods of demonstration and communication that allows them to reach the small-holders. Furthermore, to improve their effectiveness, the problems identified by the extension agents have to be addressed. The extension service capacity to undertake extension activities and be an equal partner with researchers requires the capacity building of the extension service at all levels.

The Need to Promote Improved Seed Production as an Activity by Selected Farmers

The farmer sows mainly the seed that he has produced. As an individual, he is usually incapable of providing the high standards of skill and care that improved seed production requires. Seed is thus often inferior. It is also clear that the seed enterprise of the government will not be in a position to produce all the seed requirements of the farmers in the country. The solution to this problem is to avoid power-vested interests and develop the capacity of farmers to multiply the seed in the community.

The Need for a Breeding Policy

The study underscores the need for a thorough understanding of the varied rural environments, the existing conditions of the different categories of farmers, especially the resource poor farmer before designing a technical change approach. It also calls for a research policy that is directed towards decentralisation, catering for ecological and social diversity.

Thus agricultural research should be location-specific. This calls for an understanding of the characteristics of the different cultivators growing under a definite agroecological environment which should be taken into accounts in breeding work. The strategy for breeding should focus on the collection, characterization, and selection of the indigenous genetic materials rather than on exotic cultivars. Furthermore efforts should be made to carry out the breeding work under sub-optimal conditions rather than the conventional practice of breeding under optimal conditions that do not exist in the farmers' environment.

The Need for Local Agricultural Science and Engineering Capacity Building

In the study area, a number of farm implements and facilities requiring improvement have been identified. This underscores the need for mechanical innovation that meets the needs of he farmers. Although an attempt has been made in CADU to design certain farm implements such as improved plough, harrow and oxen cart, many of these were not adopted by the peasants. For example, the plough was found to be too heavy, both for the farmer to carry and for the oxen to pull. Obviously, the farm implements did not meet the requirements of the farmers. Although these problems were realized, their solution was not found properly because of a lack of emphasis on research for mechanical innovations. From a policy point of view, it is important to note that the spread of new implements takes place slowly. This necessitates working out the solution with the peasants. Another feature is to focus on strengthening of both the biological and mechanical technological capabilities of the research and extension institutions which implement technical change and development in rural areas.

The Need for Land Tenure Policy

Although majority of those concerned realize the need for land tenure policy, most disagree on the question of issues of equity, economic efficiency, and landlessness. In the study area a number of respondents identified shortage and fragmentation of land as the major resource problems. The study also shows that fragmentation of land impedes development in the area. Evidence suggests the need for land tenure policy based on ownership, equity and the economic efficiency of farmers rather than on political interests.

References

Ascroft, J. and G. Gleason, 1981, "Breaking the Bottlenecks in Communication", *Ceres, FAO Review. on Agriculture and Development*, No. 80 (vol. 14, No. 2,) March-April, Rome.

Bell, M. 1985, "The Great Experiment: Harnessing Science and Technology to Third World Development", SPRU (Review Paper).

Benor, D. and J. Q. Harrison, 1977, " Agricultural Extension: The Training and Visit System", World Bank, Washington DC, May

Biggs, S. D. (1990) "Informal R & D: Farmer Resistance to New Technology is not always a Sign of Backwardness" *Ceres, FAO Review on Agriculture and Development*, No. 76 vol. 13, Rome

Biggs, S. D., 1981, "Institutions and Decision-Making in Agricultural Research, in F. Stewart and James (Eds), *The Economics of New Technology in Developing Countries,* Francis Printer (Publisher).

Biggs, S. D. and E. Clay, 1981, "Source of Innovation in Agricultural Technology", *World Development*, Vol. 9, No. 4.

Binswanger, H. P and V. W. Ruttan, 1978 *Induced Innovation: Technology, Institutions and Development*, Johns Hopkins Press, Baltimore.

Brown, L. R. (1972) *Seeds of Change: The Green Revolution and Development in the 1970s.* Praeger Publishers Inc.

Byerlee, D and M. Collinson, 1980, *Planning Technologies Appropriate to Farmers-Concepts and Procedures*, CIMMYT, Mexico.

Chambers, R. and J. Jiggins, 1985, "Agricultural Research for Resource-Poor Farmers: A Parsimonious Paradigm" IDS Paper for Discussion, Institute of Development Studies, University of Sussex, Brighton, November.

Chambers, R and B. P Ghildyal, 1985, *Agricultural Research for Resource - Poor Farmers: The Farmer-First and-Last Model*, Agricultural Administration, 20,1, pp.1-30.

Clark, N. 1980, "The Economic Behaviour of Research Institutions in Developing Countries: Some Methodological Points", *Social Studies of Science*, Vol. No. 1, 1980.

Cooper, C. 1973, *Science, Technology and Development* (ed.), Frank Cass London.

Ethiopian Economic Association, *1997 Economic Focus*, Issue No. 2 Volume 1, December. Addis Ababa.

Ethiopia Science and Technology Commission, 1989, *Proceedings of the First National Conference on Science and Technology Policy of Ethiopia*, Volume 1 Addis Ababa.

Ethiopia, *Statistical Abstract*, 1997, Ethiopia Statistical Authority, Addis Ababa.

Ethiopia, *Statistical Abstract*, 1998, Ethiopia Statistical Authority, Addis Ababa.

George, S., 1976, *How the Other Half Dies – the Reasons for World Hunger*, Penguin Books London.

Griffin, K., 1974, *The Political Economy of Agrarian Change*, Harvard University Press.

Herrera, A., 1982, "Research and Development Systems in Rural Settings: Background of the Project", The United Nations University Hayami, Y. and V. W. Ruttan, 1971, *Agricultural Development: An International Perspective*, Baltimore.

Hyden, G., 1980, *Beyond Ujamaa in Tanzania: Underdevelopment and a Captured Peasantry*, Hieneman, London.

Jorgeson, D. W., 1969, "The Role of Agriculture in Economic Development", in Wharton, G. R.(ed.), *Subsistence Agriculture and Economics Development*, Aldine,Chicago.

Lappe, F. M. and J. Collins, 1978, *Food First*, Institute for Food and Development Policy.

Mansfield, E., 1968, *The Economics of Technological Change*, Lowe and Brydone (Printers) Ltd., London.

Mellor, J., 1967, "Towards a Theory of Agricultural Development", in South Worth, H. M. and B. F. Johnston (eds.) *Agricultural Development in Economic Growth*, Corner University Press, Ithaca, New York.

Maxwell, S., 1984 "Farming Systems Research: Hitting a Moving Target" an IDS Discussion Paper 199, Institute of Development Studies, University of Success, Brighton November.

Ministry of Agriculture, (1988) *An Assessment of the Peasant Agricultural Development Policies, Plans and Strategies an their Implications for Science and Technology Development of the Sector,* Addis Ababa, March.

Ministry of Planning and Economic and Economic Development, (1994) *Survey of Current Economic Conditions in Ethiopia,* Vol. 11 No.4.

Nelson, H. D. and I Kaplan, 1981, *Ethiopia, A Country Study*, American University (Washington DC), Foreign Area Studies V Series.

Pearse, A., 1980, *Seed of Plenty, Seeds of Want: Social and Economic Implications of the Green Revolution*, Clarendon Press.

Reynolds, L.G., 1975, "Agriculture in Development Theory: An Overview" in Reynolds, L.G. (ed.), *Agriculture in Development Theory*, Yale University Press, New Haven and London, pp. 1-26.

Richards, P. 1985, *Indigenous Agricultural Revolution: Ecology and Food Production in West Africa*, Anchor Brendan Ltd., Tiptree, Essex.

Rodgers, E. M and F. F. Schoemaker, 1971 *Communication of Innovations: A Cross Cultural Approach.* The Free Press, Collier, Mac Millan Publishers (London).

Rosenberg, N., 1976, *Perspectives on Technology*, Cambridge University Press.

Ruttan, V. W., 1975, *Institutional Transfer in Agricultural Development Research Policy*, Vol. 4, pp.350-378.

Ruttan, V. W, 1975 "Technology Transfer, Institutional Transfer, and Induced Technical and Institutional Change in Agricultural Development", Chapter 7 in L.G. Reynolds (ed.), *Agriculture in Development Theory*, Yale University Press.

Schultz, T. W., 1964, *Transforming Traditional Agriculture*, Yale University Press, New Haven.

Schultz, T. W. (ed.), 1978, *Distortions of Agricultural Incentives*, Indiana University Press Bloomington, London.

Schumacher, E. F., 1973, *Small is Beautiful: A Study of Economics as if People Mattered,* Blond and Briggs, London.

Sen, A., 1981, *Poverty and Famines: An Essay on Entitlement and Deprivation*, Clarendon Press, Oxford.

Skorov, G. E. (ed.), 1978, *Science, Technology and Economic Growth in the Developing Countries*, Pergamon Press.

Stavenhagen, R., 1969, "Seven Erroneous Thesis about Latin American", in Horowitz, J. L. et al. (eds.), *Latin American Radicalism*, Random House, New York.

Tennassie, Nichola., 1985, *Agricultural Research and Extension in Ethiopia, The State of Art.* IDR Research Report No. 22. Institute of Development Research, Addis Ababa.

Thorner, D., Kerblay, B. and R. E. F. Smith (eds.) 1966, *A. V. Chayanov on the Theory of Peasant Economy*, Homewood, Illinois, Irwin.

WADU, 1981, *Wolaita Agricultural Development Project Phase Two: Evaluation Report.* Addis Ababa: WADU, MOA.

Watterhall, H. and L. Debelain, 1974, *A Case Study in Contemporary Changes in Agrairian Structure, Ethiopia: Chilalo Province*, Report to the Food and Agricultural Organization of the United Nations (FAO), Stockholm.

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