CONTENTS

Preface xiii
Introduction xvii

PART 1: FARMER INNOVATION

Introduction 3

1.1 The role of farmers in the creation of agricultural technology 3
ROBERT RHOADES
A legacy of farmer innovation 3
Diffused light technology: a farmer idea 5
The great germ-plasm issue 6
Creating a new farming system: the pioneers of Tupac Amaru 7
Conclusions 8

1.2 The innovative approach of Indian farmers 9
D M MAURYA
Selection of crop varieties 9
Machines, pest control and fertilizer 12
Farmers as partners in varietal selection 13

1.3 Local knowledge for agroforestry and native plants 14
DIANNE ROCHELEAU, KAMOJI WACHIRA, LUIS MALARET, BERNARD MUCHIRI WANJOHI
Local knowledge and research processes in Africa 14
Rapid Rural Appraisal (RRA) and ecological methods for community-based AF research 16
An example from Kenya: trials, errors and hindsight 17
Plant domestication: local knowledge and 'chain of interviews'
Lessons and follow-up questions
1.4 Scientists' views of farmers' practices in India: barriers to effective interaction
ANIL K GUPTA
Researchers' attitudes
Extensionists' attitudes
Attitudes toward homestead gardens
Issues arising
1.5 Farmers' knowledge, innovations and relation to science
IDS WORKSHOP
Classification systems and their functions
Complexity of knowledge: the example of plant domestication in Kenya
Cropping patterns and innovations in Bangladesh
Facts or superstitions: recognizing values and limitations
Scientized packages or cultural integrity?
1.6 Agriculture as a performance
PAUL RICHARDS
Is R&D directed at the wrong target?
Thinking about performance
Implications for research methods
1.7 Interactions for local innovation
IDS WORKSHOP
Scientists and farmers
Extensionists and farmers
Local women, men and specialists
Local knowledge and new technology interactions: costs and benefits
PART 2: FARMERS' AGENDAS FIRST
Introduction
2.1 Encouraging farmers' experiments
ROLAND BUNCH
Agricultural development goals and farmers' innovations
Why promote and teach small-scale experimentation?
How to teach small-scale experimentation
2.2 Virgilio's theorem: a method for adaptive agricultural research
LOUK BOX
Building interfaces
Early steps in the research
Biographical analysis for problem identification
Problem verification and adaptive trials
Discussion and conclusion
2.3 Appraisal by group trek
S B MATHEMA AND D L GALT
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4</td>
<td>Community appraisal among upland farmers</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>CORAZON B LAMUG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upland forest agriculture in the Philippines</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Walking tours for rapid appraisal</td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>Comprehensive appraisal</td>
<td>76</td>
</tr>
<tr>
<td>2.5</td>
<td>Diagrams for farmers</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>GORDON R CONWAY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diagrams for communication</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Diagrams to aid analysis</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>Conclusion</td>
<td>86</td>
</tr>
<tr>
<td>2.6</td>
<td>Maps drawn by farmers and extensionists</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>ANIL K GUPTA AND IDS WORKSHOP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Different views of reality</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Topographical maps by pastoralists</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>Other mapping concepts</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Environmental mapping</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Mapping for agronomic monitoring</td>
<td>92</td>
</tr>
<tr>
<td>2.7</td>
<td>Systems diagrams to help farmers decide in on-farm research</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>C LIGHWOOT, O DE GUIA JR, A ALIMAN AND F OCADO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Farmer-researcher interaction</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td>Systems diagramming</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>Screening potential solutions</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>Conclusions</td>
<td>100</td>
</tr>
<tr>
<td>2.8</td>
<td>Interactive research</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>IDS WORKSHOP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interdisciplinary team interaction</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>The diagnostic stage in research</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>Respect for farmers</td>
<td>104</td>
</tr>
</tbody>
</table>

**PART 3: PRACTICAL PARTICIPATION**

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1</td>
<td>Farmers, on-farm research, and new technology</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>J SUMBERG AND C OKALI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approaches to on-farm research</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>Parameters, variables, and constraints</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>Research on alley farming</td>
<td>112</td>
</tr>
<tr>
<td></td>
<td>On-farm trials or on-farm research</td>
<td>114</td>
</tr>
<tr>
<td>3.2</td>
<td>Farmer participation in technology development: work with crop varieties</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>JACQUELINE A ASHBY, CARLOS A QUIROS AND YOLANDA M RIVERS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Farmers at first hand</td>
<td>115</td>
</tr>
</tbody>
</table>
Pre-screening varietal materials by farmers 116
Trial establishment 118
Evaluating varietal trials with farmer participation 118
Concluding remarks 122

3.3 Farmers groups and workshops 122
IDS WORKSHOP
Overview of group methods: types, purposes and features 122
Groups in field hearings 123
Farmers’ groups and field days 125

3.4 Experience with group techniques in Colombia 127
J ASHBY WITH C QUIROS AND Y RIVERS
Group techniques for crop variety selection: snap beans 127
Group meetings for bush bean and cassava evaluations 128
Review of experience in Colombia 131

3.5 Innovator workshops in Bangladesh 132
ZAINUL ABEDIN AND FAZLUL HAQUE
First experiences with farmer-led workshops 132
Mustard, wheat and watermelon 133
Two further workshops and influence on research 134
Conclusions 135

3.6 Farmer groups for technology development: experience in Botswana 136
D NORMAN, D BAKER, G HEINRICH, C JONAS, S MASKIARA AND F WORMAN
The group development setting 136
Group formation and administration 137
Experience of groups in two areas 138
Typology of groups in Botswana 139
Advantages of farmer groups 142
Disadvantages of farmer groups 143
Outstanding issues 145
Conclusions 146

3.7 Participatory technology validation in highland communities of Peru 146
MARIA E FERNANDEZ AND HUGO SALVATIERRA
Labour bottlenecks and livestock 146
Farmers’ reactions to plans for experiments 148
Redesign of experiments in response to farmers’ objections 149

3.8 Two complementary approaches to farmer involvement: an experience from Indonesia 151
CAROL J PIERCE COLFER WITH FAHMUDDIN AGUS, DAN GILL, M SUDJADI, GORO UEHARA AND M K WADE
The site and its problems 151
Starting the experiment 152
Research directions and a parallel study 154
Methodological comparisons and conclusions 156

3.9 Final reflections about on-farm research methods 157
IDS WORKSHOP
Complementary methods 157
On-farm experiments: scope, methods, and the systems approach 158
A learning process: lessons from the Philippines 159

PART 4: INSTITUTIONS AND PRACTICAL CHANGE

Introduction 165

4.1 Context and change 165

4.2 Scientists’ training and interactions with farmers in India 169
K V RAMAN
Problem identification as a gap in scientific training 169
Pre-service training for ARS scientists 171
The National Agricultural Research Project 173

4.3 Changes in the organization of research on dryland agriculture 175
N K SANGHI
Research-extension linkages 175
Lessons learned from operational research projects 177
Farmers as co-researchers 178
Issues for consideration 180

4.4 Reversals, institutions and change 181
ROBERT CHAMBERS
Farmer first and TOT 181
Farmer-first activities and roles 183
Analysis 183
Choice 184
Experimenting 185
Institutional change 186
Decentralization and resources 186
Search and supply 187
Incentives 188
Methods and interactions 189
A pluralist strategy 190
Practical action: starting and sustaining change 193

Appendix 196
Abbreviations 198
References and sources 200
Index 213

List of figures

Figure 1.1 States within India mentioned in Section 1.2, illustrating by arrows the spread of paddy variety Mahsuri by ‘farmer-to-farmer’ extension 11
Figure 1.2  Four-row seed drill as used in South India in the eighteenth century  26
Figure 1.3  The *chitemene* system in north-east Zambia, including new practices observed near Misamfu  48
Figure 2.1  Transect of a village in northern Pakistan  79
Figure 2.2  Seasonal calendar for a village in northern Pakistan  80
Figure 2.3  Production cycle for seed potatoes  82
Figure 2.4  Seasonal calendar for the Lake Buhi Project  85
Figure 2.5  Transect of land in the area around Gandara, Philippines  96
Figure 2.6  Causal relationships drawn by farmers for cogon problem  97
Figure 2.7  Systems diagram of the percentage distribution of socioeconomic constraints and biophysical causes for the cogon problem of twenty households in Gandara, Samara  98
Figure 3.1  The method of separating blocks and treatments for on-farm experiments with potatoes in the Mantaro Valley, Peru  150
Figure 4.1  A combined formal and informal agricultural R&D system  166
Figure 4.2  Linkages between resource-poor farming systems and informal and formal R&D  168

List of tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.1</td>
<td>Some typical responses of scientists regarding farmers' innovation and practice</td>
<td>25</td>
</tr>
<tr>
<td>Table 1.2</td>
<td>Farmers' beliefs and practices reported but not tested by staff at the Department of Agricultural Extension, Tangail, Bangladesh</td>
<td>27</td>
</tr>
<tr>
<td>Table 1.3</td>
<td>Classification of soil from sorghum sample plots in the Pelotshetla area of south-east Botswana by farmers and by laboratory analysis</td>
<td>32</td>
</tr>
<tr>
<td>Table 1.4</td>
<td>Per cent area occupied by different crops in Kanhar irrigated site, Mymensingh District, Bangladesh</td>
<td>35</td>
</tr>
<tr>
<td>Table 2.1</td>
<td>Guide topics used in the informal survey of 24 farmers in Gandara, Samar, The Philippines</td>
<td>94</td>
</tr>
<tr>
<td>Table 3.1</td>
<td>Pre-screening seed according to grain quality</td>
<td>117</td>
</tr>
<tr>
<td>Table 3.2</td>
<td>Excerpt from a farmer's evaluation of the standing bean crop, Pescador, Cauca, 1985</td>
<td>120</td>
</tr>
<tr>
<td>Table 3.3</td>
<td>Farmer evaluations of the standing crop</td>
<td>121</td>
</tr>
<tr>
<td>Table 3.4</td>
<td>Results of innovator workshop on snap beans, farmers' criteria for selecting acceptable snap bean varieties</td>
<td>128</td>
</tr>
<tr>
<td>Table 3.5</td>
<td>Group evaluation: farmers' characterization of preferred type of bean variety</td>
<td>129</td>
</tr>
<tr>
<td>Table 3.6</td>
<td>Typology of farmer groups</td>
<td>140</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>Sources of ideas for technology and development given by scientists in research stations</td>
<td>173</td>
</tr>
</tbody>
</table>
Table 4.2  Details of projects conducted by five research stations during 1985 and 1986  174

Table 4.3  Alternative methods for fertiliser placement in red soils of Hyderabad developed by farmers, compared with the Fespo plough developed by researchers  179

Table 4.4  Transfer-of-technology and farmer first compared  182

PREFACE

This book is addressed to all who are concerned with agricultural research, extension and development, regardless of discipline, profession or organization. It is for physical, biological and social scientists — agricultural engineers, agronomists, animal scientists, economists, entomologists, foresters, social anthropologists, sociologists, soils scientists, and many others; for researchers, extension workers, teachers and trainers; for those who work in International Agricultural Research Centres, in National Agricultural Research Systems, in Departments of Agricultural Extension, in Agricultural Universities, Faculties and Institutes, and in farmers' and other non-government organizations; for students who seek careers in agriculture; and for all — administrators, planners, staff of aid agencies, and NGO workers wherever they are, who are responsible for policy, management, teaching and training for agricultural research and extension.

The audience is wide because the topic is basic and the content challenging. Resource-poor farming in the Third World presents intractable problems. Probably well over a billion people depend for their livelihoods on the complex, diverse and risky forms of agriculture which have been poorly served by agricultural research. This failure has been met with two responses: 'more of the same' through the conventional generation and transfer of technology; and the development of new approaches and methods in which farmers participate.

In July 1987 some 50 people, with natural and social scientists in roughly equal numbers, met for five days at the Institute of Development Studies at the University of Sussex, UK, for a workshop on 'Farmers and Agricultural Research: Complementary Methods'. Many of those who took part had been developing new participatory research methods, some of them in isolation. We found that new and similar modes of agricultural research and development were being evolved in parallel in different parts of the world, but that most of the professional pioneers were in a minority and marginal in their institutions.

The term 'complementary methods' was used to avoid the impression that the new approach was an alternative or complete substitute for traditional on-station and in-laboratory agricultural research. The importance of commodity research and of farming systems research was acknowledged. There was concern, too, about the dangers of a new instant orthodoxy. At the same time, the new research methods appeared powerful and accurate in meeting farmers' priorities. The evidence presented indicated that these new approaches and methods could serve the complex, diverse and risk-prone agriculture which supports perhaps a quarter of humankind, with lessons also for all agriculture. We found we were dealing with a new paradigm, in the sense of mutually supporting concepts, values, methods and action. To this the term 'farmer first' has been applied, distinguishing it from the conventional paradigm of 'transfer of technology'.

The nature of the subject has demanded that we make this book more than a compilation of papers. In doing this, we have been helped by the preparatory research and analysis for the workshop carried out by John Farrington and Adrienne Martin and their paper 'Farmer Participatory Research: A Review of Concepts and Practices', which was revised and republished in 1988 as ODI Agricultural Administration Unit Occasional Paper 9. We are grateful to John Farrington, Janice Jiggins and others who have made comments on the text, and to the authors of the 42 workshop papers for their tolerance and understanding. We owe much to those who participated in the workshop discussions, some of whose verbal contributions we have tried to capture in the sections by 'IDS Workshop', which also include some of our own comments.

The brief summary preceding each of the four parts of the book is intended to help the reader gain a quick overview in a matter of minutes.

The workshop and the editing of this book were made possible through grants from the Ford Foundation, the Rockefeller Foundation, and SAREC. In addition, ISNAR enabled some participants to take part. A further grant from the Ford Foundation to the IDS has supported follow-up workshops in Peru and the Philippines, and other research and dissemination, especially by the Overseas Development Institute, London. The grants have helped this book to be published at a sustainably low price which we hope will make it accessible to all who
can use it, especially those who work on low salaries and in countries with foreign exchange and recurrent budget constraints. The papers of a further follow-up workshop, convened by the Information Centre for Low External Input Agriculture, Leusden, Netherlands, are available (see appendix) as Proceedings of the ILEIA Workshop Participatory Technology Development in Sustainable Agriculture, April 1988.

We wish to thank Rhona Adams and Helen McLaren who organized the workshop. We are grateful to all those in many institutions who typed papers for the workshop and this book, and especially Helen McLaren in IDS who has throughout been the central point, calmly and competently handling the tasks of typing and managing a complex, diverse and risk-prone manuscript.

Permission from Cambridge University Press is acknowledged to include parts of six papers (by Baker et al, Kean, Lightfoot et al, Maurya et al, Norman et al, and Sumberg and Okali) which were published in a special issue of Experimental Agriculture, vol. 24 part 3, 1987, edited by John Farrington. Also, the papers by Ashby et al, by Box, and by Rhoades, were distributed in December 1987 as Discussion Papers of the ODI Agricultural Administration (Research and Extension) Network. All these sources are listed in the references.

In the book we use the term ‘farmer’ as in the title. This is shorthand for the farm family, with special stress on the poorer and those with few resources, and on women, who are often and so easily neglected or left out. Many farmers are women. Often both women and men farm. The importance of eliciting women's views, and of their playing a full part in the activities described in this book was a major theme in the IDS workshop and deserves repeated emphasis.

This book is not a final statement, but part of a process. It presents an outline of approaches, with evidence and examples. We have edited and written it to be convenient for teachers as a textbook for universities and institutes. We hope it will stimulate and encourage readers, of whatever profession or discipline, to learn from farmers’ innovations, to put farmers’ agendas first, and to support practical participation by farmers. Above all, we hope it will encourage many more to join in pioneering and writing, adding to and sharing experience and methods. For it is through hands-on experience and efforts to communicate that the practical potentials of farmer-first approaches and methods will spread and be realized.

The editors

Introduction

The 1980s have seen shifts of thinking and priority in agriculture in much of the Third World. It has been increasingly recognized that questions about who produces food, who runs command it, and where production takes place, often matter more than how much is produced. It has become clear that resource-poor families and conditions have been less well served by agricultural research than have resource-rich farmers. For reasons of both production and equity, rainfed agriculture has risen in importance compared with irrigated agriculture. Sustainability of output now also has a high place on the agricultural agenda because of widespread deforestation and environmental degradation. At the same time, population projections indicate that in many countries rural areas will have to support much larger populations, with many more people living in fragile and difficult environments. The priority has become not just sustainable agriculture, but sustainable livelihoods based on agriculture, not only for present populations but for hundreds of millions more people.

The thesis underlying this book is that these changes present a new challenge not just to agricultural policy, but also to agricultural professions. It is true that for adequate and decent livelihoods that are sustainable, much depends on policies which affect agriculture. An agricultural price policy based on paying good prices to producers is vital for a good or better living for rural people. Security of tenure and rights regarding land, water, livestock and trees are also preconditions for farmers to take the long view and invest in good husbandry, in trees, terracing and other physical works. Service infrastructure in roads, credit and input supply are also often important. But beyond these more familiar challenges, lies one that is deeper and less obvious. This concerns what can be termed normal professionalism — the thinking, values, methods and behaviour dominant in a profession. The thesis is that for the new priorities in agriculture, normal agricultural professionalism is part of the problem.

This can be understood in terms of the three types of agriculture identified by the Brundtland Commission (WCED 1987: 120-2) (see table below). These were industrial agriculture, green revolution agriculture, and the third, resource-poor agriculture. The first or industrial agriculture is found mainly in the industrialized, rich world,
but also in specialized enclaves in the Third World. It has large farming units, is highly capitalized, and relies on high inputs and often on subsidies. The second or green revolution agriculture is found in agricultural heartlands in well-endowed areas in the Third World, either irrigated or with good and reliable rainfall. These include the large irrigated plains and deltas of South, South-East and East Asia, and parts of Latin America and North Africa. It includes large and small farms, and exploits high-yielding varieties with complementary inputs.

Three types of agriculture summarized

<table>
<thead>
<tr>
<th></th>
<th>Industrial</th>
<th>Green Revolution</th>
<th>Third/CDR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main locations</td>
<td>Industrialized countries and specialized enclaves in the Third World</td>
<td>Irrigated and stable rainfall, high potential areas in the Third World</td>
<td>Rainfed areas, hinterlands, most of sub-Saharan Africa, etc</td>
</tr>
<tr>
<td>Main climatic zone</td>
<td>Temperate</td>
<td>Tropical</td>
<td>Tropical</td>
</tr>
<tr>
<td>Major type of farmer</td>
<td>Highly capitalized family farms and plantations</td>
<td>Large and small farmers households</td>
<td>Small and poor farm</td>
</tr>
<tr>
<td>Use of purchased inputs</td>
<td>Very high</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Farming system, relatively</td>
<td>Simple</td>
<td>Simple</td>
<td>Complex</td>
</tr>
<tr>
<td>Environmental diversity, relatively</td>
<td>Uniform</td>
<td>Uniform</td>
<td>Diverse</td>
</tr>
<tr>
<td>Production stability</td>
<td>Moderate risk</td>
<td>Moderate risk</td>
<td>High risk</td>
</tr>
<tr>
<td>Current production as percentage of sustainable production</td>
<td>Far too high</td>
<td>Near the limit</td>
<td>Low</td>
</tr>
<tr>
<td>Priority for production</td>
<td>Reduce production</td>
<td>Maintain production</td>
<td>Raise production</td>
</tr>
</tbody>
</table>

CDR: complex, diverse and risk-prone

The third type of agriculture has been variously described as 'low-resource', 'resource-poor' or 'undervalued-resource', and is identified with unfavourable or difficult areas. These are mainly rain-fed, and often undulating and with fragile or problem soils. They include farming lands of many types — in hinterlands, high lands, drylands, and wetlands, and in forests, mountains and hills, savannas, near-deserts, and swamps. Examples are the Deccan Plateau in India, the uplands of many countries in Southeast Asia and Latin America, and most of sub-Saharan Africa. According to one estimate (Wolf 1986), some 1.4 billion people, or over a quarter of the human race, are dependent on this form of agriculture for their livelihoods, comprising approximately 1 billion in Asia, 300 million in sub-Saharan Africa, and 100 million in Latin America.

The new challenge to agricultural research can be understood in terms of these three types of agriculture. Industrial and green revolution agriculture are both relatively simple in their farming systems, often with large fields and monocropping, uniform in their environments, and low-risk. In contrast, the third agriculture can be characterized as complex in its farming systems, diverse in its environments, and risk-prone.

Several factors have contributed to the success of normal agricultural research with industrial and green revolution agriculture. One is that conditions on research stations, with controlled environments and easy access to inputs, have usually been close to those of resource-rich farmers: what does well on the research station can therefore do well, other things being equal, with the farmer. Another is that the standard methods of agronomic research have generated high input packages which are simple and amenable to widespread adoption in uniform and relatively low-risk environments. Yet another factor is that the sorts of farms and farm families best able to benefit — those which are resource-rich, with good farming conditions and good access to capital, inputs and markets — have been well represented in the main industrial and green revolution agricultural areas; and in green revolution areas, many smaller and poorer farm families have also gradually managed to make some gains from the new technologies.

In contrast, the resource-poor farm families of the third — complex, diverse and risk-prone — agriculture have not benefitted or have not benefited as much. In contrast with industrial and green revolution agriculture, the
physical, social and economic conditions of this resource-poor agriculture differ more from those of research stations. Simple and high-input packages do not fit well with the small scale, complexity and diversity of their farming systems, nor with their poor access and risk-prone environments. For them, as Paul Richards (pp 39-42) describes, each season demands its own adaptive performance, depending on unpredictable weather, and the interplay over time of farming activities with the household's resources. Farm families often lack reliable access to purchased inputs, and need to use them sparingly, if at all, in the face of risks. In these conditions, there are limits to the extent their needs can be met by conventional research.

One consequence has been that resource-poor farmers have been slow or unable to adopt many of the recommendations flowing from agricultural research. In the 1950s and 1960s, non-adoption was often attributed to ignorance, and extension education was prescribed. In the 1970s and the earlier 1980s, non-adoption was more often attributed to farm-level constraints; gaps in yield between research station and farm were analysed; and the prescription was to try to make the farm more like the research station. In the 1980s, however, a new interpretation, more challenging to the agricultural professions and to science, has gathered support. It is that the problem is neither the farmer nor the farm, but the technology; and that the faults of the technology can be traced to the priorities and processes which generate it.

This insight has many sources: world-wide, indigenous technical knowledge has been more and more recognized as valid and useful; in agriculture, social and biological scientists have increasingly gone to farmers to understand reasons for non-adoption; farming systems research has made a huge contribution by revealing the complexity of farming systems and of the decisions which face resource-poor farmers, and the limitations of multi-disciplinary statistical analysis; farmers have increasingly been recognized as themselves innovators and experimenters (Johnson 1972; Richards 1985; Rhoades and Bebbington 1988); and perhaps most decisively, farmers have again and again been found to be rational and right in behaviour which at first seemed irrational and wrong to outside professional observers. New changes have been gathering momentum, a small minority of social and biological scientists, and of fieldworkers in non-government organizations (NGOs), have been collaborating in new ways with farm families, and showing that besides normal agricultural research, there are other ways to identify priorities and to develop and test technologies.

As so often happens in the early stages of a new movement, many flowers have bloomed and many labels have been used. 'Farmer-back-to-farmer' (Rhoades and Booth 1982), 'farmer-first-and-last' (Chambers and Ghildyal 1985), 'farmer participatory research' (Farrington and Martin 1987), and 'Approach Development' (Scheuermeier 1988) have been added to their precursor known sometimes as 'downstream' farming systems research (Gilbert et al 1980). The later forms of these approaches all use reversals to complement conventional research. The conventional approach has been 'transfer-of-technology'. In this mode, priorities are determined by scientists, who generate technology on research stations and in laboratories, to be transferred through extension services to farmers. In the new, complementary mode, this process is stood on its head. Instead of starting with the knowledge, problems, analysis and priorities of scientists, it starts with the knowledge, problems, analysis and priorities of farmers and farm families. Instead of the research station as the main locus of action, it is now the farm. Instead of the scientist as the central experimenter, it is now the farmer, whether woman or man, and other members of the farm family. The label that is given to these practices does not matter. But as contributions to this book show, farmers' participation and priorities are recurrent themes, and reversals too are central. Together, these elements can be described as 'farmer-first'.

Farmer-first approaches and methods constitute a complementary paradigm. 'Complementary' is used, since the transfer-of-technology approach, including commodity research, on-station and in-laboratory basic investigations, and so on, will always be needed. 'Paradigm' is used since it carries the sense of a mutually supporting pattern of concepts, analysis, methods and behaviour. The contributors to this book include biological and social scientists who have been leading in the exploration and development of this paradigm. Within their own organizations they have often been a minority, evolving views and methods which some still consider heresy. With their contributions brought together here, it is evident that they are working on similar lines and with similar good results. In the paradigm they explore and describe, farmers are primary: it is they who come first and who identify their own priorities; and it is they who are the key actors, choosing, experimenting, and adapting in order to survive and do better.

The ideas and evidence in this book are not finished and final. They are a stage in a process of pioneering and learning. They do, though, point towards solutions to the intractable problems with which we started: the need for the third agriculture and for resource-poor farmers to produce more and to generate, many more sustainable livelihoods. They raise the question whether the Potential of the third agriculture has been underestimated. For the low potential may be partly only apparent, an artefact of inappropriate technologies which do not fit. The issue now, and for the 1990s, is whether with farmer-first approaches, major gains in production, incomes and livelihoods can be achieved; and if so, how these approaches can be widely and rapidly developed, diffused and adopted in the agricultural professions.
Each of the four parts of the book concentrates on a main theme. The first concerns farmer innovation, with evidence of the capacity of farmers, especially resource-poor farmers, to experiment, adapt and innovate. The second part concerns methods to enable farmers' agendas to be put first. The third deals with practical participation by farmers. Finally, the fourth part considers the implications for institutions and action, and what is needed for the future.