



RESEARCH GRANT STRATEGY

Asia and the Pacific

Enabling the rural poor to overcome poverty



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TABLE OF CONTENTS

Foreword	iv
Acknowledgements	vi
Abbreviations and acronyms	vii
Executive summary	viii
I. Asia: an overview	1
II. Understanding IFAD's focus on LFAs and the poor	7
III. Maximizing the impact of IFAD's investments in pro-poor research for Asia and the Pacific	15
IV. Thematic priorities for Asia	27
Theme 1: integrated natural resource management	27
Theme 2: strengthening social, institutional and policy dimensions	40
Theme 3: value-added processes along the post-harvest chain	49
V. Ecosystem priorities for Asia	55
Ecosystem 1: montane and hillside agriculture	55
Ecosystem 2: forest-related systems	61
Ecosystem 3: semi-dry and dry areas subject to degradation	66
Ecosystem 4: irrigated areas and systems under stress	71
Ecosystem 5: coastal and wetland systems	74
VI. Methodological implications of a shift towards pro-poor research	79
VII. A conceptual foundation for IFAD-supported pro-poor research: guiding principles	93
References and reading list	96
APPENDIXES	
I. Gender analysis: generic questions for researchers	107
II. Process for grant allocation and review	110
III. Guidelines for preparing technical advisory notes	111
IV. Relevant extracts from IFAD's lending policies and criteria	115
V. Fostering grant-loan linkages in IFAD-funded projects	122

FOREWORD

Since its establishment in 1978, IFAD has provided grant support to a number of international, regional and national agricultural research centres for the development of technologies for small and marginal farmers in the Asia and the Pacific region. Some of the Fund's grant-supported research initiatives have generated benefits to small-scale agriculture in the region. However, it must be acknowledged that most research work undertaken by international research centres with support from IFAD and other donors has benefited favourable production environments. New technologies have largely bypassed farmers in the uplands and in drylands that are unreliably watered, as well as crops such as sorghum, millet and barley on which poor farmers depend for their livelihoods.

Many loan-funded projects in the region have included agricultural research and extension components with the objective of developing and disseminating appropriate technologies for small and marginal farmers. As in the case of grant-funded projects, the focus in the past has mostly been on favourable production environments.

IFAD's recent rural poverty report shows that poverty in Asia is concentrated in less-favoured areas such as remote uplands and mountains, marginal coastal areas and unreliably watered drylands. Therefore, the Fund advocates more vigorous research in technologies that can revive the productivity growth of staples and other high-value commodities in marginal uplands and drylands. IFAD also argues that the poor in these areas need to be better informed in their judgements about new technical changes through more regular interaction with pro-poor scientists in the relevant topic areas. Such interaction should take place in a scientific environment open to public, democratic scrutiny.

Given the limitations of high-input agriculture and organic farming in the less-favoured areas of Asia, sustainable or regenerative agriculture holds enormous promise for yield increases and environmental protection. IFAD is keen to promote these technologies particularly in such areas.

Based on its experience in supporting agricultural technology development and dissemination in the region through its loan and grant-funded projects and the experience of other donors and organizations, IFAD has formulated an agricultural research strategy for the Asia and the Pacific region that focuses on small and marginal farmers in less-favoured areas. The strategy attempts to establish strategic research areas and criteria for the prioritization of research topics. It will guide IFAD's future investments in agricultural technology development and dissemination in the region through two instruments: technical assistance grants for regional programmes and loans for country investment projects. These two instruments need to be closely linked so as to foster synergy and complementarities.

The strategy formulation process was iterative and participatory and involved a range of different types of consultations. First, based on available secondary data and discussions with relevant IFAD staff, a review of IFAD's technical assistance grants for agricultural research was undertaken to assess the research prioritization process within IFAD, the implementation capacity of grantees, their partnership with the national agricultural research system, the commodity and geographic focus, linkages between loan and grant-funded projects, etc. This paper has been prepared based on that review and extensive consultations with IFAD staff and other stakeholders (consultative group centres, the national agricultural research system, civil society, other partners) through face-to-face meetings and e-discussions. The draft paper was examined at a workshop organized on 18-19 June 2003 and attended by participants from consultative group centres such as the World Agroforestry Centre and the International Plant Genetic Resources Institute, international organizations such as the Food and Agriculture Organization of the United Nations and the International Centre for Integrated Mountain Development, and staff of international non-governmental organizations and IFAD. The final paper incorporates the comments and suggestions made during this workshop.

The paper contains three main substantive sections: (a) Thematic Priorities for Asia, (b) Ecosystem Priorities for Asia, and (c) Methodological Implications of a Shift towards Pro-Poor Research. The first two are supposed to influence what kind of research is done, and the third how research is done. The sections "Understanding IFAD's Focus on Less-Favoured Areas and the Poor" and "Maximizing the Impact of IFAD's Investments in Pro-Poor Research for Asia" and the appendixes are meant to encourage the research community to favour pro-poor research in agriculture and natural resources; they are also meant to influence IFAD's priorities. Many research questions are embedded in the text of the paper, which, however, does not identify specific research questions for grantees. This should be done in consultation with local and regional stakeholders. Nonetheless, Section VII contains guiding principles for IFAD-supported pro-poor research that were discussed and finalized during the preparatory workshop. It is hoped that this paper will guide IFAD staff and potential grantees in developing grant and loan-funded agricultural research programmes for the benefit of the rural poor in marginal areas of the region.

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ABBREVIATIONS AND ACRONYMS

CGIAR	Consultative Group on International Agricultural Research
CPR	common property resource
FAO	Food and Agriculture Organization of the United Nations
IDRC	International Development Research Centre (Canada)
INRM	integrated natural resource management
LFA	less-favoured area
NARS	national agricultural research system
NRM	natural resource management
R&D	research and development
SAT	semi-arid tropics
TAG	technical assistance grant
TAN	technical advisory note

EXECUTIVE SUMMARY

IFAD has been unwavering in its emphasis on the poor and on less-favoured areas. It is a constant advocate of the strengthening and enhancement of the assets of poor peoples and, consequently, of the betterment of the livelihoods of the poor. Given a context in which the poor are increasingly marginalized, the commodity approach to agricultural research has come under sharp scrutiny, leading to an emphasis on improving the management of scarce, often degraded resources in rural and watershed areas.

Social, policy and institutional issues are being given greater recognition in research now than they were in the past because of new concerns for equity, land tenure rights and the role of collective action in regenerating rural environments. A fundamental change is required in the way agricultural research itself is conceptualized with a view to achieving better integration of the social and natural science perspectives. In future, better targeting and the development of approaches that are specially devised for each environment will be essential. In most cases, the approaches will have to be tailored to the asset base within each local community and build more firmly upon local knowledge.

This strategy paper has been put together for prospective applicants who are seeking grant funding for agricultural research through IFAD's grant programme. The first portion (Sections I through VII) is IFAD's strategy paper for the promotion of pro-poor agricultural research in the Asia and the Pacific Region; the second portion (the appendixes) provides relevant reference materials and guidelines to assist applicants in preparing funding proposals.

The strategy paper is based on a comprehensive analysis of secondary research materials and computer conferences and visits to research institutions in six countries, as well as a review of IFAD corporate documents. This work has permitted the identification of a number of priority areas for research that are consistent and complementary with the main thrust of IFAD lending operations. The strategy paper is not a blueprint since it identifies only themes and sub-themes and does not propose specific research questions.

The strategy paper examines critically important issues in poverty-oriented research in the context of less-favoured areas and reviews some of the implications of the shift towards this direction. Prospective applicants for grant funding from IFAD should look for a fit between the priority themes and ecosystems on the one hand and their own institutional priorities on the other, and they should consider the development and submission of a grant request only after identifying such a fit.

The following are IFAD's thematic priorities for pro-poor agricultural research in the Asia and the Pacific Region:

- integrated natural resource management;
- strengthening social, institutional and policy dimensions; and
- value-added processes along the post-harvest chain.

Considering that the poor predominate or are relatively more neglected in some areas than they are in others, the following are IFAD's priority ecosystems:

- montane and hillside agriculture;
- forest-related systems;
- semi-dry and dry areas subject to degradation;
- irrigated areas and irrigation systems under stress; and
- coastal and wetland systems.

Changes are needed not only in research topics but also in the ways in which research is carried out. Research organizations need to be transformed so that the research environments they offer become more enabling and supportive of diverse ways of doing research and ensure that staff are rewarded for performing meaningful poverty-oriented work. To assist prospective grant applicants and the IFAD staff in charge of reviewing the proposals of these applicants, the strategy paper contains a section in which the conceptual foundation and the guiding principles of IFAD-funded research are described. Another section explores some of the methodological implications of pro-poor research.

IFAD would like the research it sponsors to assign as much value to the development of methods and to capacity-strengthening as it does to the generation of technical solutions. As the greatest cause of food insecurity, poverty should be the prime determinant of the Fund's agricultural research agenda. Benefits and services through a regenerated ecosystem, the empowerment of local communities through collective action and improvements in ecosystems, human health, property and land tenure security, secure and sustainable livelihoods and effective market links are among the new principles that should be used to assess the validity of agricultural research findings. In the future, agricultural research will have to implement more holistic and process-oriented approaches in order to support both sustainable livelihood development and the regeneration of the resource base and the assets of poor people.

Fundamental changes in attitudes and approaches will have to occur if the challenge is to be taken up and the constraints experienced by the millions of poor people across Asia and the Pacific who have yet to benefit directly from agricultural research are to be addressed.



I. ASIA: AN OVERVIEW

1. Of the world's 1.2 billion poor, about 800 million people – equivalent to one sixth of the population of developing countries – do not have access to sufficient food to lead healthy, productive lives.¹ Furthermore, two thirds of the world's poor live in Asia, including 488 million in South Asia and 279 million in East Asia and the Pacific.² The extent and persistence of poverty in this region will determine the chances of achieving the Millennium Development Goal of reducing world poverty by half by the year 2015.
2. Rural dwellers represent over half the total population in two thirds of the countries of Asia, including the five largest ones: Bangladesh, China, India, Indonesia and Pakistan. Moreover, most of the poverty is concentrated in rural areas, especially in the marginal agro-ecological zones often referred to as less-favoured areas (LFAs). LFAs are home to some 40% of the world's rural poor, mainly dryland farmers, forest dwellers, hill and mountain dwellers and indigenous peoples. There are over 250 million indigenous peoples in the world, and 70% of these people are located in Asia, where their marginalization and poverty cause them to be “deprived of the ability to lead the kind of lives they value” (2002 IFAD Regional Strategy Paper for Asia and the Pacific). Strong gender inequalities prevail throughout the region, and women suffer continuing social and political, as well as economic deprivation.

South Asia

3. South Asia is a vast subregion, extending from the tropical, fertile plains of the Ganges to the temperate hills and mountains of the Himalayas and comprising such widely diverse countries as Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Agriculture has progressed substantially over the past 40 years, which have been marked by significant returns to the investments made in agricultural research, particularly in rice and wheat systems. Thanks to the green revolution, paddy outputs rose by nearly 2% per year between 1970 and 2000, and wheat output expanded at 2% per year, the strongest rate among the cereals. Outputs of fruits and vegetables also increased at 2% per annum.

1 Dixon, Gulliver and Gibbon (2001).

2 World Bank (2003a).

4. However, South Asia has a large and rapidly growing population, and it continues to have the greatest concentration of the world's poor: 41% of the 1.2 billion people living on less than a dollar a day ("dollar poverty") live in this subregion, mostly in rural areas. Landlessness or near landlessness, the limited voice of the poor and their fragile and quickly degrading resource base account for much of the subregion's rural poverty. Population pressures are high everywhere, and the degradation of agricultural lands, forests, grazing lands and bodies of water is widely reported. Over the next few decades, shortages of groundwater are expected to increase throughout the subregion (as well as in China in East Asia) slowing the advances in irrigation and depressing the productivity of existing irrigated areas. Climate change is expected to influence the frequency and intensity of storms in eastern India and Bangladesh.
5. In agro-ecological terms, 20% of the land in South Asia consists of steeply sloping hills and mountains, where 5% of the total population lives; 19% consists of densely populated, humid, or moist, sub-humid lowlands, with 43% of the population; and 29% consists of dry, sub-humid areas, with 33% of the population. The remaining 32% of the land area is composed of semi-dry and dry lowlands, with 19% of the subregion's population. Montane and hilly areas are found in all the countries, but predominate along the southern slopes of the Himalayan range, across Afghanistan, Bhutan, India, Nepal and Pakistan.

East and south-east Asia

6. Some 279 million people live in extreme poverty, i.e. on less than one dollar a day in this subregion. China alone has more than 200 million poor. About 240 million people, or 13% of the subregion's population, are undernourished. In rural areas, the poverty rates are two times higher than they are in urban areas.
7. Despite these realities, the subregion has experienced an unprecedented technological and economic transformation in recent decades that has been associated with dramatically improved food security, reduced poverty and higher incomes. Over the past 25 years, despite the 1997 Asian financial crisis, the most rapid rates of economic growth in the world have been recorded in the Asia and Pacific region as a whole, but especially in East and South-East Asia, where the increase has been essentially due to growth in primary sector production (accompanied by improved social service delivery). In fact, the vast majority of the working population in East and South-East Asia (about 70%) still relies on agriculture, fishing and forestry for its livelihood. These activities are, however, placing severe stress on natural resources, resulting in degradation that will eventually diminish the income-generating capacity of these people.

Agricultural research and the reduction of poverty and hunger³

8. Over the past three or four decades, impressive agricultural and rural growth has been recorded in Asia. This has been driven primarily by public-sector investment in agricultural research, rural infrastructure and education. This performance has demonstrated the importance of the role of government in establishing an enabling environment for market-based development. The strong agricultural growth in most Asian economies has been fuelled by rapid increases in the use of inputs, resulting in significant advances in productivity. The main motors of this productivity growth have been: (a) public-sector agricultural research and extension; (b) the expansion in irrigated areas; (c) improved rural infrastructure; and (d) improved human capital. Research has also facilitated the commercialization and diversification of agriculture and the rural economy.
9. In South Asia, cereal production rose by 92% during the three decades from 1969/71 to 1994/96, boosting daily per capita calorie availability from 2 060 to 2 380 cal. This was achieved using only 4% additional land. In East and South-East Asia, cereal production almost doubled during the same period, albeit using 22% more land, and daily per capita calorie availability increased from 2 063 to 2 662 cal. Across the region, annual incomes per capita also rose several times between 1970 and 1995. In 1975, six in ten Asians were living in poverty; by 1993, this was the case of only two in ten East Asians and of only four in ten South Asians.
10. However, the negative environmental effects of these achievements have been emerging rapidly, along with evidence of persistent and growing disparities between the poor and the less poor. Areas where crop production is rainfed have largely been ignored, resulting in the further impoverishment of already marginalized populations.
11. Recent experience has also shown that growth alone is not sufficient to reduce poverty. There is a need for policies that reach out directly to the poor, particularly through investments in human capital, health, nutrition and education, which, if deficient, can be major causes of poverty. The strong poverty-reducing impact of gender equity must be exploited, particularly in light of the ongoing process of the “feminization“ of poverty. Secure property rights are also important because they encourage farmers to invest in land improvements that will conserve resources and enhance long-term productivity growth.

3 Main source: Rosegrant and Hazell (2000a), (2000b), (2000c).

IFAD's regional priorities for Asia

12. Written in the context of IFAD's regional poverty assessments conducted in 2002, the report entitled "Assessment of Rural Poverty: Asia and the Pacific 2002" discusses in detail the specific nature, incidence and characteristics of poverty in Asia. It analyses ways to improve access by the poor to productive resources, to address the declining productivity of common property and private resources and to strengthen the local institutions and coalitions of the poor. Indeed, as a method to promote local accumulation, democracy and better governance, decentralization is perceived as critically important to effective poverty reduction. The social transformational role of women and the enhancement of women's role as agents of change are key elements in the regional strategy aimed at fostering societies that respect equity and social justice.
13. The above findings have allowed IFAD to prepare a *Regional Strategy Paper for Asia and the Pacific*. The paper argues that the Fund should play a catalytic role in the struggle against rural poverty by focusing especially on LFAs, where most of the rural poor are living. The following are proposed as fundamental elements of a poverty reduction strategy for Asia:
 - raise the productivity of staple food production in LFAs;
 - reform property and land tenure rights among various marginalized minorities and indigenous peoples;
 - expand the capabilities of the poor and the vulnerable by opening greater access to self-help, local accumulation, new skills and technologies; and
 - redress unequal gender relations so as to increase women's ownership and control of assets and their effective participation in the management of community affairs.
14. IFAD's broad experience in designing and implementing pro-poor development projects has shown that poverty is concentrated along two dimensions in Asia:
 - Socially, it is concentrated among women, indigenous peoples, the socially excluded, the internally displaced, victims of landmines, pastoralists, the landless and small and marginal farmers. In particular, IFAD has emphasized that special attention should be paid to eliminating the neglect of women and indigenous peoples because these categories are especially affected by endemic and intractable forms of poverty.
 - Geographically, poverty is concentrated in LFAs such as remote uplands and mountains, marginal coastal areas and drylands with limited or erratic availability of water. IFAD's strategy draws attention to and emphasizes the need to redress the past neglect of these marginal areas.



II. UNDERSTANDING IFAD'S FOCUS ON LFAs AND THE POOR

15. Ever since it was created in 1978, IFAD has focused exclusively on the reduction of rural poverty, working mainly in the more remote areas of the world and targeting some of the poorest and most deprived segments of rural populations. IFAD has long believed that poverty is a condition resulting from a lack of assets (or equitable access to them) and low income. Because vulnerability, powerlessness and exclusion characterize the majority of the world's poor, empowerment is often at the heart of the Fund's approach to overcoming poverty. This is the overall framework within which the Fund's projects are developed with a view to reducing hunger, poverty and malnutrition and thereby improving the quality of life of the poor and marginalized.

IFAD's strategic objectives

16. IFAD's mandate, which is aimed at enabling the rural poor to overcome their poverty, is detailed in a document entitled "Strategic Framework for IFAD, 2002-2006". This paper envisages a concentration on three strategic objectives: (a) strengthening the capacity of the rural poor and their organizations; (b) improving equitable access to productive natural resources and technology; and (c) improving access by the rural poor to financial services and markets.

- **Strengthening the capacity of the rural poor and their organizations.** IFAD believes that the lack of strong social organizations hampers the capacity of the rural poor to gain access to economic opportunities, basic social services and infrastructure. Opportunities therefore need to be created to allow the rural poor to build up their individual and collective capacities. Local and national governments also need to be strengthened so they can be more effective in responding to the needs of the rural poor. IFAD works with many different types of poor people's organizations and believes that building up their capacities is critically important. Otherwise, any investments made in social and economic infrastructure will fail to deliver self-sustaining benefits.

- **Improving equitable access to productive natural resources and technology.** Lack of access to natural resources on which the poor are especially dependent for their livelihoods (e.g. land, water and forests) is an important cause of debilitating poverty. Land and water tenure issues and rights of access to forests, forest products and other common property resources (CPRs) are a source of social conflict for the poor in search of a sustainable livelihood. On the other hand, the critical role that the poor are playing in managing and conserving the world's natural resources is becoming widely recognized.

- **Improving access to financial services and markets.** Assistance is essential for developing professional and responsive rural finance institutions focusing on the production-processing-marketing continuum. A strong emphasis is needed not only on providing credit, but also on encouraging savings. Efforts to increase agricultural productivity are most effective when market links are developed as well. Income diversification either by producing and selling non-traditional crops, or by exploiting non-farm income-generating opportunities is also important for cushioning against the risks of rapidly changing market conditions.

17. IFAD pursues the above strategic objectives through its lending programme, backed by grant-funded research, knowledge management, policy dialogue and advocacy.

IFAD's loan financing and grant funding

18. Loan financing for investment in development projects and grant funding for strategic and adaptive research are key elements of IFAD's strategy for favouring income opportunities, improving nutrition and fostering a healthier environment for the world's poor.

- **Country-specific loan-financed projects.** These are the Fund's main vehicle for having a direct impact on the poor, and they are generating lessons on approaches that work and those that do not work. These projects are implemented in partnership with local communities and institutions, national governments, the private sector and civil society organizations. IFAD believes that its projects must forge effective links at policy levels in order for its loans and grants to achieve the greatest impact. Project activities must address the obstacles to self-sustaining poverty reduction that are related, for example, to (lack of) access to assets, institutions and policies. The Fund's projects should become platforms for dialogue and participation in decision-making involving all concerned stakeholders.
- **Grants for agricultural research and training.** These are normally given to international centres of excellence and to national research institutions. Seen as a critical instrument for the pursuit of IFAD's corporate strategy, they focus on the development, through adaptive and strategic research, of new and more effective ways to eradicate rural poverty. While the term "agricultural research" embraces technical, policy and organizational issues, "training" focuses on the communication of promising findings and practices to the agencies and networks engaged in the design and implementation of development projects.

A catalytic role for IFAD

19. IFAD recognizes that it is only one of many sources of finance and that it can and should play primarily a catalytic role in boosting the share of national and international investment directed at improving the well-being and self-reliance of the poor. The IFAD document entitled "Lending Policies and Criteria" is unambiguous with regard to the Fund's role in influencing other players:

“IFAD’s investment priorities should be guided by the consideration of sharing know-how with other international financial institutions (IFIs), so as to stimulate them to invest in rural development with a view to alleviating mass poverty. IFAD’s sectoral/subsectoral focus should open the door for the development of modules that can be replicated and applied on a larger scale, if need be, by the recipients themselves or with support from other donors.”

20. This emphasis on a catalytic role implies that innovation must be valued and encouraged as part of the project design and implementation cycle. The promotion of replicable innovation is thus identified as an important feature of the Fund’s catalytic role in its strategic framework for 2002-2006.
21. The fact that IFAD puts a premium on partnerships further enhances the opportunities for development and the promotion of innovation. In 2002, a review of its capacity as a promoter of replicable innovation concluded that:
“Loan projects are excellent vehicles for promoting and replicating tested, reasonably ‘safe’ innovations, for the purpose of minimizing risks, both for the borrowing countries and for IFAD as a financial institution.”
22. The review also identified opportunities that are available at the design and implementation stages, for identifying areas needing innovations and, subsequently, for identifying promising and innovative approaches for testing and adaptation. It found that research grants are:
“...particularly useful for testing and adapting innovative, pro-poor farming technologies and approaches within specific contexts.”
23. To enhance its catalytic and advocacy role, IFAD emphasizes the importance of knowledge management and sharing as tools for capturing, distilling and disseminating information and lessons from its investment-based country-level operations and from its research activities. Monitoring systems are being put in place not only for improving performance and enhancing impact, but also for learning purposes.

Deliberately favouring LFAs and the poor

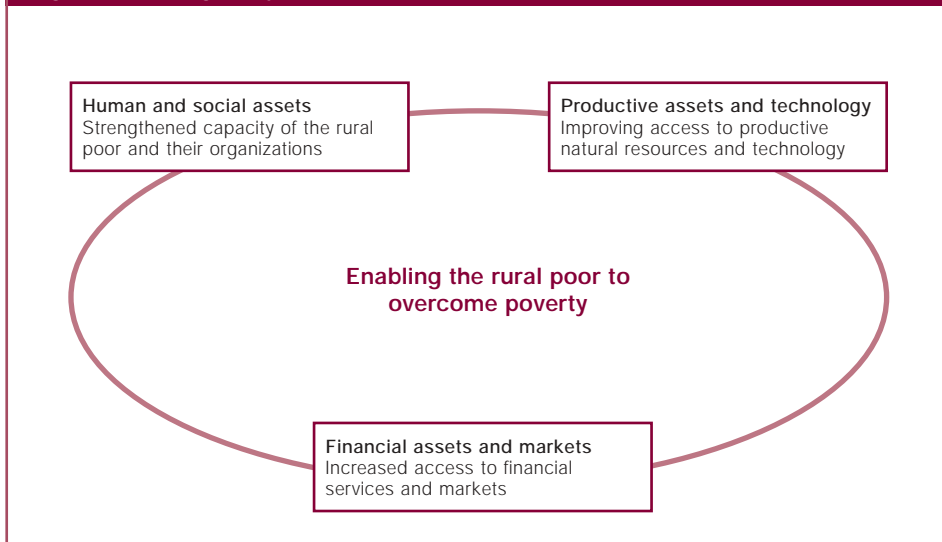
24. IFAD focuses on the poor living in areas where agricultural productivity is low. Typically, these areas have low natural potential and limited access to markets, and many have suffered from neglect by national governments and donors. In fact, most of the public investment made to date in rural infrastructure and in agricultural and social services has been in areas with high agricultural potential. The tendency to bypass areas with lower agricultural potential is being challenged for two reasons: (a) evidence of stagnation in growth and rapidly worsening environmental problems in the areas of high potential; and (b) growth in the more well targeted areas is not addressing the poverty, food insecurity and environmental problems elsewhere.

25. IFAD has lobbied in various international arenas for a stronger and more deliberate focus on the LFAs where poverty is widespread and deep. The Fund is aware that poverty is one of the important factors in environmental degradation in marginal areas. Due to their lack of access to resources and appropriate technologies, the poor in these areas are often trapped in a downwards spiral marked by deepening poverty and ever-worsening resource degradation.
26. IFAD's "Rural Poverty Report 2001" urges that the poor not be viewed as a "burden on society", but, rather, acknowledged as "hard-working microentrepreneurs", be they men or women, smallholder farmers, herders, artisanal fishers, craftswomen, or craftsmen. The report calls for the fostering of a "pro-poor policy environment" through the allocation of a greater volume of resources to development and by targeting these efforts more effectively at the poor. IFAD has a clear stance on the need for the development community to exercise a preferential option for LFAs and the poor who inhabit LFAs.

Addressing asset deprivation through institutional development

27. The key to sustainable rural development is the availability of legally secure entitlements to assets. Lack of assets is an effect, as well as a cause of poverty in terms of income opportunities, consumption and the capability of people and their own institutions. IFAD's "Rural Poverty Report 2001" states that "raising access to assets is crucial for broadbased growth and poverty reduction."
28. As seen in Figure 1, assets take many forms, and there are strong complementarities among the different kinds, e.g. strengthening farmers' groups and the building of roads also enhance the financial asset base; more secure land rights encourage farmers to invest in technologies that will boost their productivity and incomes. IFAD's strategic framework for 2002-2006 stresses that, because the reasons for rural poverty are so complex, the solutions need to be multifaceted and adapted to local contexts, taking gender, social and political issues into account. The rural poor need to enjoy greater access to a wider variety of assets if they are to reduce their vulnerability and overcome poverty.
29. Aware that access by the poor to essential assets can be enhanced by appropriate institutions, IFAD emphasizes the importance of institutional development (understood in the broader sense as comprising rules and policies, as well as organizations) as an instrument for mediating among the competing demands of different stakeholders and sectors of society. New institutional approaches aimed at promoting good governance, decentralization and micro-level lending are being developed and promoted through IFAD-financed projects. The functioning of representative and committed grass-roots organizations determines the nature, quality and relevance of the services that can be delivered to the poor. Without stable local institutions, the sustainability of most development efforts is a matter of doubt.

Figure 1: Strategic objectives



30. IFAD helps also to foster coalitions among the poor through capacity-building investments. According to the External Review of IFAD Operations (2002):
“IFAD has contributed to the formation of social capital in rural areas by promoting the development of local institutions that allow the rural poor to function more effectively. Networks have been established linking the rural poor among themselves and with institutions that can support them. Increasingly, non-governmental organizations and community-based organizations as partners have assisted in creating institutional structures and reduced dependency where government services could not perform alone.”
31. The review team concluded that IFAD’s capacity to impact positively on institutions, policies, rules and regulations has increased over the past decade.

Gender issues and women’s empowerment

32. IFAD’s strategic framework (2002-2006) states that:
“...poverty reduction – and indeed peace, stability and sustainable economic growth – can only be achieved by modifying the unequal power relations that contribute to generating poverty, and by making a conscious effort to enable historically excluded people to exercise their full potential.”
33. It therefore follows that attention to the differing opportunities and constraints experienced by women and men and to differences with regard to sources of vulnerability and ways of increasing resilience must always be a major overarching concern in the context of IFAD-supported operations. During IFAD’s 25 years of

existence, gender equality and the empowerment of women have gained importance both as objectives and as instruments for poverty reduction. The Fund's operations have increasingly focused on expanding women's access to and control over fundamental assets on the grounds that development initiatives should incorporate the priorities and needs of both men and women and ensure that they have equal opportunities to access benefits and services. In other words, any structural inequalities that prevent women from realizing their potential as human beings, producers and agents of change must be addressed. IFAD has recently adopted the Plan of Action 2003-2006 operationalizing the principles and objectives related to gender mainstreaming and women's empowerment in IFAD's strategic framework for 2002-2006.

34. Over the years, much progress has been achieved in the context of IFAD's loan-funded projects. Increasing attention is being given to the way in which gender issues and women's empowerment are factored into the project cycle, and the projects are becoming more gender-sensitive at all stages: design, planning, implementation, monitoring and evaluation, and impact assessment. Opportunities for including gender issues in policy dialogues at the different levels and stages of the project cycle are also being sought out and exploited.
35. There is, however, a need to improve the extent to which and the way in which gender issues are addressed in the context of the Fund's grant-supported research activities.



III. MAXIMIZING THE IMPACT OF IFAD'S INVESTMENTS IN PRO-POOR RESEARCH FOR ASIA AND THE PACIFIC

36. IFAD has, over the past 23 years, committed approximately USD 400 million in grants to fund research, training and the implementation of certain project components. The aim is to enhance the Fund's support for agricultural development and sustainable natural resource management (NRM). Given this emphasis on development impact, the Fund's grant portfolio is centred on enhancing partnerships in research, with a view to focusing simultaneously on policy and institutional, as well as technical dimensions. Recipients of IFAD's grants are expected to devote special attention to marginalized groups of people living in diverse, complex and challenging environments.
37. Wanting to draw the attention of the research and development (R&D) community to the role that agricultural research can play in improving the lives of the poor and the environments they inhabit, IFAD lobbies constantly for more collaborative work between the international agricultural research community and the vast and critically important network of national research centres collectively known as the national agricultural research system (NARS). Partnership being one of IFAD's core principles, IFAD grants should help nurture collaborative work.
38. IFAD provides strategic leadership within the Consultative Group on International Agricultural Research (CGIAR), and it helped establish the Global Forum on Agricultural Research, thereby bringing a wide range of key stakeholders in the global agricultural research system into a single forum. At the donor level, IFAD advocates for the need for pro-poor research, more collaborative research and networking, multi-stakeholder partnerships and better research governance.

Grants for agricultural research and training and new IFAD policy for grant financing

39. In December 2003 the IFAD Executive Board approved a new grant policy (EB 2003/80/R.5/Rev.1) that set forth the priorities for IFAD grant financing. New procedures and guidelines were put forward in July 2004 (Appendix II).
40. The revised policy draws on the IFAD Strategic Framework to shape the content and new directions of grant activities. The focus of the grant programme is twofold: (i) it should focus on interventions where grants have a significant comparative advantage over loans as a financing instrument; and (ii) it should complement the loan programme.

41. Two strategic objectives of the grant programme, representing priority areas for IFAD's regular grant resources, are proposed: 1) Promoting pro-poor research on innovative approaches and technological options to enhance field level impact; 2) Building pro-poor capacity of partner institutions including CBOs and NGOs
42. Grant proposals may be country-specific or international/regional, depending on the nature of the innovation and impact. The two windows created, global and regional and country-specific, supersede previous categories: agricultural research technical assistance grants (TAGs), non research and training TAGs and the NGO-ECP programme.
43. In the new grant policy, development of pro-poor technology (agricultural research) and rural innovation remain a significant component and are consistent with the great importance that the Strategic Framework places on IFAD's catalytic role and the promotion of replicable innovation. These objectives are the focus of the global or regional grant window. The regional window grants will remain an important source of technology and knowledge to be adapted locally. The innovation strategic objective operates at both process and output levels: in terms of demand-driven, participatory, institutional arrangements; and impact oriented and potential for mainstreaming.
44. Global or regional grant-financed instruments carry out strategic activities as they assist in the development and validation of pro-poor technologies (including agricultural research) and in pioneering rural innovation including institutional development (community based approaches). The regional grant window will also cover regional knowledge and information networks and emerging global challenges. Grants will continue to support international centers of excellence (CGIAR supported) and others (such as IFDC), and national research institutions. Support to these centres will continue to be project-specific (i.e. no core funding), generating clear pro-poor outputs. They operate in a broad R&D collaborative network that involves several countries in the region. This window is also suited to raise co- financing support for pro-poor activities.
45. The first grant objective will also support the development of outreach mechanisms and innovative institutional architectures; research on policies and institutions (Natural Resource Management); governance research mechanism devolution and decentralization of research, participatory research programme).
The second objective of the grant programme is covered by the country-specific grant window and is linked to the first objective of the strategic framework as its focus is mainly on strengthening institutional capacities of national and civil society organizations. Country specific grants will mainly fund national/local activities that address opportunities or constraints affecting the livelihood systems of beneficiaries located in ongoing IFAD project sites. Country based initiatives will cover partnership building and policy dialogue activities together with local capacity building. Activities under this strategic objective will address remoteness, lack of training, weak local research and extension institutions.

46. Details about IFAD's strategic framework for agricultural research and training grants, as well as the guidelines and procedures for obtaining and implementing these grants are provided in the appendixes.
47. A list of completed and ongoing agricultural research for Asia and the Pacific is shown in Table 1.

Enhancing linkages between loan-financed projects and grant-funded research

48. One of IFAD's main objectives in setting up its grant programme was to link the programme to the Fund's investment portfolio. As stated in its "Lending Policies and Criteria":
"...support to countries for research and extension activities, in particular the development of technology appropriate to small farmers, would be supported. Small scale but innovative projects with a strong exploratory element, leading to future larger scale investment decisions would receive special attention."
49. IFAD's new grant policy has enhanced the approach already adopted by IFAD to ensure complementarity and comparative advantage in the use of loans and grants and added the country specific grant to further enhance this approach. Under the revised policy, the selection process emphasises the need to establish a direct link between proposed grant programmes and specific loan projects.
50. While the objective/criterion of direct links to IFAD's on-going lending programme is being realised (explicit at design), it is recognised that there is a need to be realistic and pragmatic about the nature of the direct linkage between research (with longer term results) and ongoing projects (requiring inputs within the project period). IFAD is also concerned that a research grant may be driven by the priorities of the research institution rather than by the needs of the projects that have been or will be financed. Attempting to retrofit a proposal after it has been approved has serious limitations. Ongoing efforts to enhance appreciation for the value of grant-loan linkages both within IFAD and among grant recipients are, however, helping reduce such concerns.⁴
51. IFAD perceives the role of the CGIAR centres as one that is supportive of the NARS, i.e. that contributes actively to the strengthening of national entities and local institutions.
52. Poverty assessment reviews and critical analyses in the context of ongoing or completed loan-financed projects are often useful in deriving research questions for grant funding. The wider circulation of project reports (supervision missions, mid-term reviews, completion and thematic evaluations) and country portfolio evaluations could

⁴ The concerns expressed are actually not too different from those of many other lending agencies.

generate research questions. These reports are increasingly being shared with prospective candidates for research grants. Further, IFAD's Technical Advisory Division, which already undertakes technical reviews of the loan and grant portfolios, is helping a great deal in the development of linkages at various stages and levels and at appropriate times.

53. The time frames of the research and investment portfolios often do not match, with three years or less being the norm for the former and at least five years, generally more, being common for the latter. The review of the research grant programme indicated that longer time frames (up to five years) would allow for better situational assessments and permit more time for post-research impact evaluation. A better geographic and agro-ecological overlap between grant-funded research and loan-funded projects would also help IFAD and its partners in addressing the Fund's poverty-reduction goals more effectively.
54. Research grants are being explored as an instrument with a support role for loan-financed operations. Until recently, most research grants were primarily technical in scope. However, the inclusion of stronger social and institutional elements or dimensions is opening the way for a better fit between loans and grants. Thus, a research grant may either anticipate the information needs of a loan-financed project, or represent a source of innovative ideas, better technologies and managerial practices that could be tested or scaled up by a project. Specific short-term research grants could lay the groundwork or put in place the preconditions for launching a project or process.
55. Strategic research grants perceived as learning exercises could contribute significantly to the strategic thinking of IFAD as an institution. Indeed, one of the main thrusts of IFAD's catalytic role is to identify niches where it can develop and test social, technical and institutional innovations that may be attractive to other donors and thereby influence their operations on behalf of the poor. Research grants may be used to enable cross-project learning between IFAD-funded projects and projects funded by other agencies.
56. IFAD is adopting a pro-poor orientation in research by pre-identifying and prioritizing themes and ecosystems that are consistent with and complementary to the poverty-reduction priorities in its ongoing projects. This strategy paper lays down the Fund's research agenda for Asia as the first step towards inviting proposals from prospective research institutions. The aim is to encourage a better fit between grant proposals and the Fund's own research-derived, pre-identified priority themes and agro-ecosystems.

Enhancing the dissemination and use of research findings

57. The review of IFAD-sponsored research grants finds that almost all of them have generated lessons that are worth disseminating, but it suggests that the actual dissemination and, hence, the impact of the lessons on knowledge diffusion requires further strengthening. It also finds that the knowledge generated by research grants has been disseminated only to a small group of network-linked researchers, without reaching the wider development community or even a wider circle within IFAD.
58. Information and communication technologies, including web-based systems, are expected to feature prominently in future efforts to promote more intense exchanges among scientists and research institutions and networks and thereby reduce the knowledge gaps and enhance the utilization of research findings. The Electronic Networking for Rural Asia/Pacific Projects supported by IFAD and assisted by the International Development Research Centre (IDRC) is a step in this direction. IFAD is also discussing an organization-wide workplan on information management with a view to enhancing the role of information and communication technologies in the process of knowledge-building and information-sharing.
59. Technical advisory notes (TANs) are a mechanism specially developed by IFAD for sharing research grant-generated knowledge. TANs are a concise, somewhat simplified presentation of promising findings. Their main purpose is to help prospective users in identifying technologies that could be incorporated into development projects. Relevant technical information is presented in a simplified form to facilitate wider dissemination to an audience comprising project designers and development planners at national as well as international levels, and even prospective grant applicants.
60. TANs are primarily a way to disseminate awareness of the existence of new technologies developed through IFAD's research grant programme in order to enable the uptake of these technologies through investment projects. They are written by the lead grant recipient and emphasize technologies that have passed through several stages of adaptive research, farmer-level trials and peer review. The preparation of TANs is an integral part of IFAD's research grant-funded technology development and dissemination process. Their generation and sharing will continue to be a consistent feature of the TAG programme in future. Nearly 60 TANs have already been written, and some of them can be downloaded from the IFAD website. Details on how to prepare a TAN are presented in Appendix III.
61. Research grant reports. The same review stressed that the reports should be more relevant to IFAD's own projects and needs. In the past, grant recipients have tended to produce either "publicity documents", or "technical dissertations", and their reports rarely mentioned linkages with loan-funded projects: "...problems faced during implementation and solutions proposed are not sufficiently discussed and yet these are among the most informative parts of the report for IFAD and also for future TANs."

Table 1: grants for agricultural research implemented in Asia and the Pacific, 1980-2004

Grant No	Project/programme name
35	Research and Rice-Based Cropping Systems (six phases)
148	Development of Rainfed Rice Production Agricultural Research for the Years 1987, 1988 and 1989
162	Collaborative Research and Training Programme on Azolla Utilization in Rice Farming
167	Research Programme on the Impact of Fish Culture within the Farming System in Bangladesh
181	On-Farm Research on Groundnut, Pigeonpea, Chickpea and Transfer of Technology to Semi-Arid Tropics (SAT) Farmers of India
163	Research Programme in Farmer-Managed Irrigation Systems (two phases)
257	International Network for Bamboo and Rattan Research and Development Programme
263	Collaborative Research and Development of Sustainable Rice Farming Systems in Southern Asia Phase II
167	Research Programme on the Socio-Economic Impact of Fish Culture Extension on the Farming Systems in Bangladesh – Phase II
330	Development of an Integrated Pest Management Programme for the Management of Pulse-Pests in Southern Asia
332	Development and Transfer of Technologies for Smallholder Bamboo and Rattan-Based Producers (two phases)
350	Research Programme on Increasing and Sustaining the Productivity of Fish and Rice in the Flood-Prone Ecosystems in South and South-East Asia
361	Programme for the Sustainable Use of Coconut Genetic Resources to Enhance Incomes and Nutrition of Coconut Smallholders in the Asia-Pacific Region
363	Programme for the Adaptive Research on Improved Varieties of Jute and Allied Fibres and their Utilization for Enhanced Income-Generation
383	Programme for Action Research on Local Forest Management in Asia: Implications for Smallholder Livelihoods, Tenure and Governance and Related Impacts on Forest-Fringe Dwellers
399	Development Opportunities in the Non-Farm Sector: A Review of Issues and Options in Asia
411	Integrated Management of Potato Late Blight: Refining and Implementing Local Strategies through Farmers' Field Schools
424	Validation and Delivery of New Technologies for Increasing the Productivity of Flood-Prone Rice Lands in South and South-East Asia
425	Integrated Feed and Livestock Production in the Steppes of Central Asia

Approval year	Centre	Grant amount (USD '000)
1980	International Rice Research Institute	7,900
1986	International Rice Research Institute	1,306
1987	International Rice Research Institute	140
1987	WorldFish Center	202
1988	International Crops Research Institute for the Semi-Arid Tropics	1,068
1991	International Irrigation Management Institute	300
1993	Center for International Forestry Research	700
1993	International Rice Research Institute	1,380
1994	WorldFish Center	401
1996	International Crops Research Institute for the Semi-Arid Tropics	500
1996	International Network for Bamboo and Rattan	900
1996	WorldFish Center	585
1997	International Plant Genetic Resources Institute	907
1997	International Jute Organization	376
1997	Center for International Forestry Research	1,000
1998	International Food Policy Research Institute	232
1999	International Potato Center	1,050
1998	International Rice Research Institute	1,000
1998	International Center for Agricultural Research in the Dry Areas	1,500

Table 1: grants for agricultural research implemented in Asia and the Pacific, 1980-2004

Grant No	Project/programme name
443	Development and Testing of an Integrated Approach to the Control of Gastro-Intestinal Parasites in Small Ruminants in South and South-East Asia
444	Participatory Evaluation, Adaptation and Adoption of Environmentally Friendly Nutrient Management Technologies for Resource-Poor Farmers
484	Rising Demand for Maize and Intensification of Asian Upland Farming Systems: Policy Options for Productivity Enhancement, Environmental Protection and Food Security
486	Technical and Institutional Innovations and Implementation Support to IFAD Projects to Ensure Participatory Development of the Upland Poor in Asia
518	Development and Diffusion of Technologies for Smallholder Bamboo- and Rattan-Based Producers Phase II
490	Securing Livelihoods in the Uplands and Mountains of the Hindu-Kush Himalayas: Technical Innovations and Implementation Support to IFAD Projects
531	Community-Based Fisheries Management Programme in South and South-East Asia
534	Programme for Developing Mechanisms to Reward the Upland Poor of Asia for the Environmental Services they Provide
532	Programme for Farmer-Participatory Improvement of Grain Legumes in Rainfed Asia
634	Multi-Stakeholder Programme to Accelerate Technology Adoption to Improve Rural Livelihoods in the Rainfed Gangetic Plains
607	Programme for Integrated Upland Agricultural Development Using Participatory Approaches in China, Laos and Viet Nam
651	Programme for Improving Income Generation for Forest Communities through IFAD's Loan Portfolio in the Asia and the Pacific Region
654	Mitigating Poverty and Environmental degradation through nutrient management in South and South East Asia (ANMAT Programme Phase II)
655	Organic Production of Underutilized Medicinal, Aromatic and Natural Dye Plants (MADPs) Programme for Sustainable Rural Livelihoods in Southern Asia
706	Managing Rice Landscapes in the Marginal Uplands for Household food security & Environmental sustainability
731	Mainstreaming Rural Development Innovations Programme in the Pacific (MORDI)
705	Programme for Overcoming Poverty on Coconut-Growing Communities: Coconut Genetic Resources for Sustainable Livelihoods (II Phase)

Approval year	Centre	Grant amount (USD '000)
1999	International Livestock Research Institute	875
1999	International Fertilizer Development Centre	1,000
2000	International Maize and Wheat Improvement Center	750
2000	World Agroforestry Centre	1,100
2000	International Network for Bamboo and Rattan	1,295
2000	International Centre for Integrated Mountain Development	1,000
2001	WorldFish Center	650
2001	World Agroforestry Centre	1,400
2001	International Crops Research Institute for the Semi-Arid Tropics	1,300
2002	International Rice Research Institute	1,500
2002	International Center for Tropical Agriculture	1,450
2003	Center for International Forestry Research	900
2003	International Fertilizer Development Centre	1,000
2003	Food and Agriculture Organization of the United Nations	1,400
2004	International Rice Research Institute	1,190
2004	FPSPi	2,000
2004	International Plant Genetic Resources Institute	1,000

The reports should also discuss and document non-technical lessons, e.g. on institutional partnerships, participatory processes in research, impact-monitoring methodologies and technology adoption processes. Knowing that the knowledge value of grant-funded work is maximized by the quality of reporting, the distillation, synthesis and documentation of lessons learned both within IFAD and by grant recipients must be upgraded.

62. Research funded by IFAD is expected to address an advocacy and learning agenda, and grant recipients should be made fully aware of this in order to improve their reporting (and the quality of their proposals).

Implications of the external evaluation of the research grant programme

63. The external evaluation of the agricultural research and training grant programme conducted in 2002 commended IFAD for having played a strong advocacy role in redirecting the focus of the CGIAR system and that of other forums related to agricultural research. IFAD was also recognized for having taken the lead in opening up many new, pro-poor research areas. Its research grants have reflected an appropriate and growing concern for poverty, environmental sustainability and major production systems in the arid and semi-arid regions of the world. The evaluation noted that the goals and objectives of most of the grant proposals had a clear poverty relevance and that over half of the technological outputs were appropriate for addressing the needs of the rural poor.
64. The evaluation also noted a recent trend towards more multidisciplinary, multi-partner and participatory research that was very much in line with IFAD's strategic framework. The main research partners of the grant-funded operations of the recipient international centres belong to the NARS network, and, because of their persistent financial and capacity constraints, the importance of investing in the strengthening of these institutions is emphasized. Partnerships with NGOs also increased strongly, especially for facilitating farmer participatory research and technology dissemination. However, more should be done to boost the direct involvement of community-based organizations such as farmer groups and associations.
65. Although linking grant-funded research to the loan portfolio has always been important to IFAD, barely a third of the reviewed grants actually involved such a linkage. Greater attention must therefore be given to developing and strengthening the forward and backward linkages between grant-financed research and loan-financed projects. According to the evaluation, a time frame of four to five years is necessary to enhance these linkages, improve the quality of research and permit a realistic assessment of impact.



IV. THEMATIC PRIORITIES FOR ASIA

66. This section provides insights on the three research themes that IFAD has identified as priority areas for grant funding: (a) integrated natural resource management (INRM); (b) strengthening of social, institutional and policy dimensions; and (c) value-added processes along the post-harvest chain.⁵

THEME 1: integrated natural resource management

67. Five main aspects of this theme will be dealt with: (a) exerting a bias towards the poor and LFAs; (b) land degradation as a major factor influencing food security for the poor; (c) regenerating agriculture; (d) the strategic contribution of livestock in poverty alleviation; and (e) conservation and use of agricultural biodiversity.

Exerting a bias towards the poor and less-favoured areas

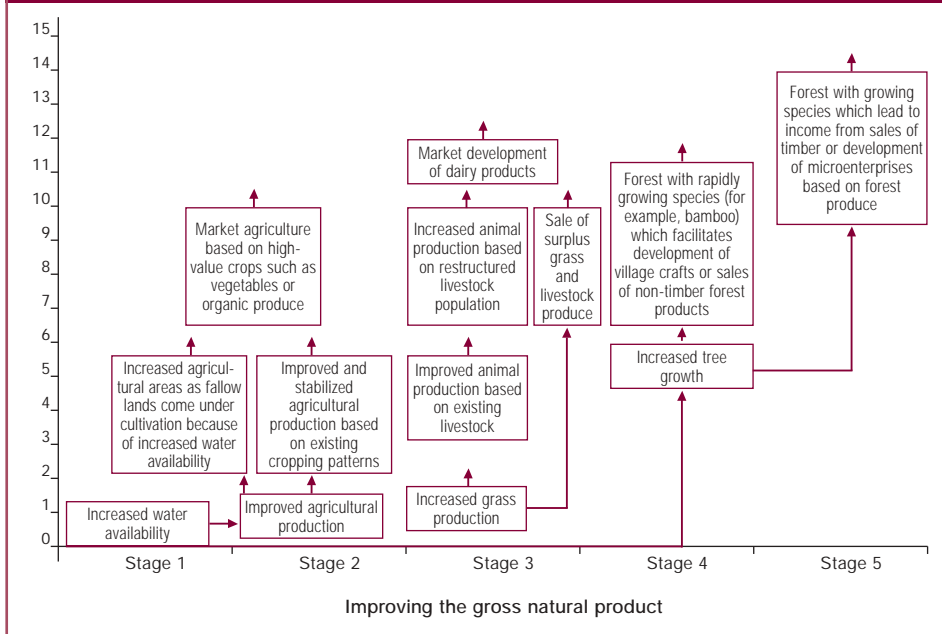
68. In the past three decades, the research establishment has focused primarily on higher potential irrigable areas to generate domestic food stocks. Both state-driven and market-driven agricultural investments have neglected dryland agriculture with its lower returns and higher risks, concentrating instead on agriculture in the more favoured areas. The result is that R&D funding on LFAs represents only 7 to 8% of total R&D funding.⁶
69. Much stress was laid in the past on the greater returns and higher overall productivity potential of investment in more favoured areas, and, in most Asian countries, the private sector has already moved into these areas to provide services. Furthermore, opportunities for achieving additional major increases in these areas are highly limited as the productivity of these areas has probably been maximized. There is no question of dropping them, but it is necessary in their case to shift the focus of R&D towards addressing the natural resource and environmental consequences of past production approaches and to promote diversification (e.g. via resource-conserving technologies).

5 IFAD has also identified several priority ecosystems (see Section V).

6 World Bank, *World Development Report 2003*.

70. While consumers have benefited from the lowering of food prices, many of the countries that now have large food reserves also have “hot spots” of malnutrition and seasonal hunger. A great majority of the world’s farmers are small-scale producers operating in complex, risk-prone and diverse farming systems and in LFAs, namely, in semi-arid zones, on hillsides, within forests or in montane and flood-prone areas. The millions of people living in such areas have not benefited from agricultural research.
71. LFAs are areas that are challenged by difficult agroclimatic conditions or that have poor infrastructure and service support. The deficiency in support is mainly due to neglect in government investment programmes not only because of a lack of political commitment or insufficient allocation of resources, but other causes include a shortage of site-specific information and a general gap in knowledge on the nature of poverty, its causes, effects and linkages. The neglect of property and tenure rights contributes further to widespread poverty in the LFAs.
72. The long-standing neglect of LFAs must be addressed by generating and improving the distribution of appropriate production opportunities. On environment, equity and poverty grounds alone, a public-sector focus on LFAs is easily justified. Such a choice also makes sense for a number of other reasons, including the fact that the research community has simply not yet tried sufficiently to bring agricultural science to bear on the problems of production, productivity and sustainability in the LFAs.
73. A fundamental hypothesis⁷ is that ecological poverty resulting from a degraded natural resource base is a widespread cause of rural impoverishment, especially in the world’s LFAs. This kind of poverty can be reduced through the (re)creation of natural wealth, i.e. by regenerating forests, replenishing groundwater supplies, rendering fodder grasses more abundant and improving coastal zones. Enhancing these natural assets contributes to building other assets (financial, human, social and cultural) and is also dependent on them. Asset-building as a poverty-alleviation strategy involves a mix of activities through which the poor are helped in acquiring individual or collective control or ownership. Access to significant levels of social capital is particularly important since the re-creation of natural wealth often calls for local collective action. Yet, research institutions rarely give much attention to the strengthening of social capital. Asset-building is a critically important dimension of the environment in which research institutions often work.
74. At the heart of a pro-LFA approach is the effort to regenerate or restore the ecological basis for village economies. Certain environmental scientists⁸ have made a strong case for village-specific ecosystem planning, keeping in mind a village’s natural resource base, its own particular mix of basic needs and its own social system. They emphasize that, without popular participation, environmental regeneration is impossible. With the regeneration of a village’s resources, the carrying capacities of the village improve; incomes rise, and new employment is generated. Ultimately, out-migration can be expected to slow down. This approach applied to a village in India is portrayed in

Figure 2: ecological regeneration and its impact on a biomass-based village economy



Source: Agrawal and Narain (2002)

Figure 2. The ecological poverty of people living in LFAs can be addressed fairly easily as there are enough useful models and principles to build upon. However, reaching the poor, most of whom live in highly diverse situations, calls for a tailoring of approaches. Germ plasms and external-input-driven approaches such as those that propelled the green revolution simply have not been relevant to the people living in LFAs, and there is now a better understanding of the reason why. Some scientists⁹ suggest that successful agricultural intensification in the LFAs requires new approaches, new partnerships and new information sets, as well as more time and flexibility. Research for such areas calls for longer time frames and more flexible plans (e.g. to cope with the vagaries of climate and other unpredictable factors). Research must address the problems in a variety of settings, as well as ecosystems at different stages of degradation. Priorities must be set because the research establishment, in the wake of sharply reduced support for public-sector agricultural research, cannot do everything.

7 Main source for this paragraph: Coward, Oliver and Conroy (1999).

8 Agarwal and Narain (2002).

9 Fan and Hazell (1999).

75. A recent study of CGIAR research priorities¹⁰ addressed the knowledge gaps, opportunities and challenges in future targeting of research in favour of LFAs. The findings emphasize the need for a geo-referenced database linking biophysical land conditions with poverty and the processes that cause poverty. This task raises major challenges with regard to the identification, development and organization of research topics; partnerships with NARS, NGOs and other civil society institutions are also essential.

Land degradation as a major factor influencing food security for the poor

76. The World Resources Institute estimates that 66% of the world's agricultural land area has been degraded to varying degrees by erosion, salinization, water logging, nutrient depletion, compaction, biological degradation and pollution over the past 50 years. Land degradation and desertification are major concerns in Asia. In South Asia, the annual loss in productivity is estimated to be equivalent to 36 million tonnes of cereals; and soil erosion is a continuing and major concern on the slopes of the Himalayas, in South China and in South-East Asia. The vegetative degradation of rangelands in the trans-Himalayas is expected to accelerate from now to 2020 due to overgrazing and overexploitation of vegetation for fuel. In South-East Asia, where soil erosion is already a major concern, the spread of *Imperata cylindrica* (cogon grass) in grassland areas poses a challenge to the enhancement of the productivity of upland rangelands. The middle hills of Nepal and Myanmar are subject to rising nutrient deficiencies, and densely populated irrigated lands are vulnerable to water logging and salinization.¹¹
77. Land degradation will remain high on the international agenda in the twenty-first century because of its impact on food security and the quality of the environment. A high population density is not always the main cause of land degradation. Rather, it is what a population does to its land that determines the extent of degradation. There are many – usually confounding – reasons land users permit their land to degrade; not least of these is that degradation is a slow process, and many people are simply not aware that it is occurring. Creating awareness and building up a sense of stewardship are therefore important steps in reducing degradation. People can be a major asset in reversing a trend towards degradation.¹²
78. Land degradation is the result of interrelated factors. A tool for understanding these factors is provided by a framework originally developed by the European Environmental Agency.¹³ Existing “driving forces” (D) produce “pressures” (P) that result in the current “state” (S) of land resources, with negative “impacts” (I) on society and the environment; this in turn stimulates “responses” (R). The indicators may be direct or indirect, ecological, technical, socio-economic, or cultural. Human activity may directly or indirectly influence the degradation or rehabilitation process at every stage. Figure 3 provides an illustration.

79. The classical concept of the downwards spiral according to which poverty drives a process of degradation (e.g. through overexploitation) that exacerbates poverty is now being challenged. The poor are no longer seen as the main perpetrators of land degradation; in reality, they are often perceived as the starting point for sustainable solutions.
80. Environment and agriculture are linked. R&D must therefore address both, together, given that land degradation is as much a socio-economic problem as it is a biophysical problem. The focus of agricultural research should shift from boosting productivity to enhancing sustainability, based on a recognition that land degradation caused by agriculture can be minimized and made compatible with the environment.¹⁴ The revival of collective management traditions and indigenous soil and water conservation techniques, the diversification of land-use systems and income enhancement strategies guided by sustainable livelihood frameworks and regenerative agriculture approaches: all these are valuable tools for reversing land degradation.
81. However, there is a serious and widespread lack of location-specific information on land and water degradation and on the state of the environment, including a knowledge and understanding of how environmental change is impacting crop production (particularly over time). There is a need to improve the research information base on land and water degradation and its impacts on agriculture, forestry and fisheries production.¹⁵ Better data collected over longer time frames are needed on the nature, extent and trends of degradation in the semi-arid tropics (SAT). The availability of new tools such as remote-sensing and geographic information systems opens up new opportunities for making more accurate assessments. Research is needed to identify, document and evaluate local solutions (both technical and institutional) and to help integrate them into broader and more participatory processes of technology development and diffusion.

Regenerating agriculture

82. The regeneration of agriculture involves a two-pronged approach focusing on: (a) strategic opportunities for addressing food security and livelihoods in smallholder agriculture; and (b) INRM as the broader context for future agricultural research.

10 TAC Secretariat/CGIAR and the Food and Agriculture Organization of the United Nations (FAO) (2000a).

11 For a good overview of the nature and seriousness of the problem of land degradation, see Bridges et al. (2001).

12 Eswaran, Lal and Reich (2001).

13 Bridges et al. (2001).

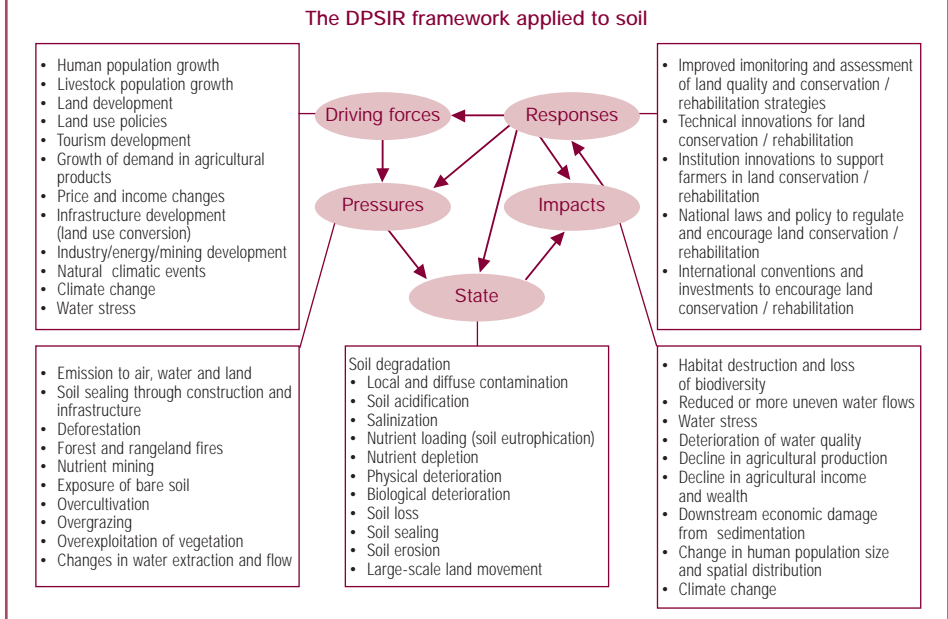
14 Eswaran and Dumanski (1994).

15 TAC Secretariat/CGIAR and FAO (2001).

Figure 3: using the soil “DPSIR” framework - driving forces, pressures, state, impacts and responses - for evaluating land degradation

The first key question is: What is the driving force behind the problem? The problem itself is then sub-divided in three stages: the pressure, deriving from the driving force, the state that the pressure creates, and the impact that results from the state. The second key question is how to respond so as to change the driving forces, in order to alleviate or to reverse the problem.

The diagram below shows the framework of driving force, pressure, state, impact, and response. It can be used by scientists, technicians, farmers, and others at the grass roots level to identify a problem. At the same time the approach may be used by politicians and decision-makers to respond to a situation, thus bringing together all persons concerned.



Source: Bridges et al. (2001)

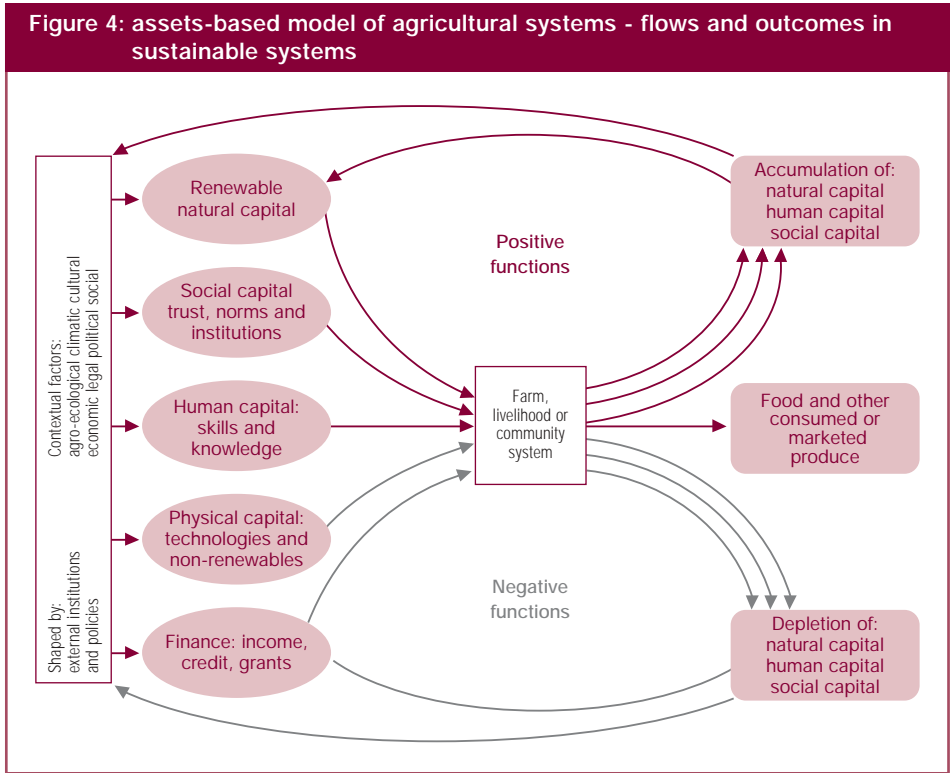
(a) Strategic opportunities for addressing food security and livelihoods in smallholder agriculture¹⁶

83. Modern agricultural successes such as those associated with the green revolution were not achieved without some negative impact on the environment and human health. It may even be wrong to assume that future food needs (great as they are) can be met in the same manner. Indeed, the capacities of existing farms and their natural resource base are already strained. Mountains of data already suggest a requirement for alternative approaches that can help regenerate the degraded resource base of millions of farmers in Asia. Policy does not yet fully account for the social and environmental costs associated with modern high-input agriculture, and subsidies continue to encourage the misuse and overuse of inputs. While science in its various modernized forms may still offer some promise for increases, the reality is that the majority of the world’s farmers simply cannot gain access to the necessary levels of knowledge and materials.

84. Fortunately, alternative approaches for regenerating small-scale agriculture exist and are already being used widely. A major study of 208 development projects commissioned by the University of Essex, the United Kingdom of Great Britain and Northern Ireland, (the SAFE World Study) to audit worldwide progress towards sustainable agriculture brought to light some very promising advances in the adoption and spread of sustainable agriculture, as well as clear evidence of increases in food production and consumption. The study concluded that sustainable agricultural approaches, if widely adopted, could have a significant impact on local and regional food security and on rural people's livelihoods. Being more diverse and multifunctional than modern systems, sustainable agricultural approaches are able to stimulate the emergence of more sustainable livelihoods.
85. Agricultural systems rely at all levels on the value of the services flowing from the total stock of assets controlled by small farmers. The five categories of assets envisaged by the sustainable livelihoods framework (natural, social, human, physical and financial capital) are transformed by policies, processes and institutions to give desirable outcomes that – when achieved – feed back to help build up the assets base. Undesirable effects such as pollution, deforestation, or social breakdown will, however, tend to reduce the asset base. While sustainable systems accumulate stocks of the five types of assets, thereby increasing the per capita endowment of all forms of capital over time, unsustainable systems deplete or “spend” assets, leaving less for future generations. The challenge is to increase food production and enhance the livelihoods of the poor by eliminating the negative functions and promoting the positive functions. As seen in Figure 4, the access to and availability of assets and inputs are affected by contextual factors (far right in the diagram).¹⁷
86. Research aimed at supporting sustainable agriculture must reflect the understanding that, for a system to be sustainable, the focus of research must shift towards seeking to maintain or accumulate natural, social and human capital assets. Approaches that regenerate and rebuild the natural resource base upon which agriculture depends are of special relevance to degraded or marginal areas and to small farms in general. The multifunctionality of agriculture also requires that research take account of a broader range of impact indicators. The typical effects on people's livelihoods (Figure 5) indicate that more than food is involved in the equation. Sustainable agriculture can influence the health of rural people directly or indirectly, and it can contribute to the enhancement of public goods (e.g. recharged groundwater resources). Too little attention is currently being given by researchers to aspects such as adding value or marketing, even though a range of options are available, e.g. post-harvest handling and processing.

16 Pretty and Hine (2001).

17 See Section VI for more on the Sustainable Livelihood Approach.



Source: Pretty and Hine (2001)

87. Many lessons on addressing poor people’s priorities have already been generated in LFAs. These need to be synthesized and distributed more widely among the researchers and policy-makers who are exploring opportunities for making the necessary changes to their own programmes and establishments.

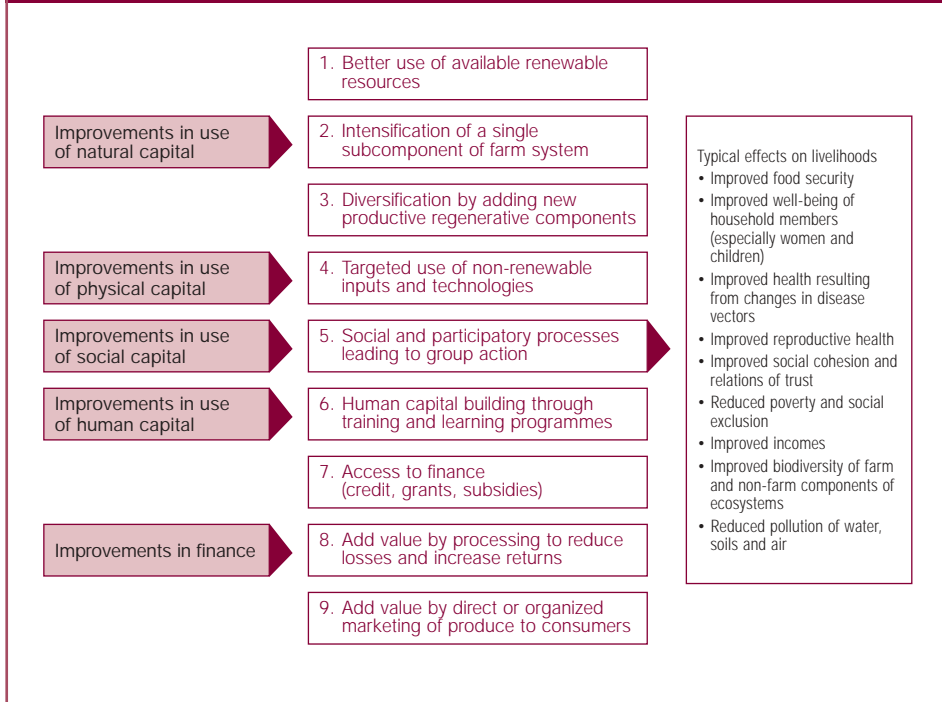
(b) Integrated natural resource management: the broader context for future agricultural research¹⁸

88. Today, there is a greater recognition that agricultural advances and development often have effects that resonate across a landscape, sometimes undermining the broader base of natural resources that people rely on critically for a wide range of needs. A new management and research approach that is emerging to address this situation was discussed at a CGIAR workshop on INRM in August 2000.

89. INRM focuses on ecosystems rather than commodities, on complex underlying processes (both biophysical and socio-economic) rather than simple relationships and on managing the effects of interactions among various elements of an ecosystem.

18 Main sources: CGIAR (2000) and Altieri (2002)..

Figure 5: range of entry points for sustainable agricultural improvements leading to more sustainable livelihoods



90. INRM-based research builds on existing farming systems research, but it reflects a recognition that such research is mainly descriptive and does not generate knowledge on the processes found within farming systems. This is why farming systems research has had such a limited impact. INRM research follows a systems approach, is process oriented, functions at multiple levels and with multiple stakeholders, and is amenable to scaling up and out leading to a measurable impact. Today, better conceptual understanding, innovative research tools and a multidisciplinary focus are enabling researchers to deal with the complexities of natural systems.
91. Commenting on the scientific basis of natural resource management (NRM), Altieri (2002) states that many scientists disregard a key point in the development of a more self-sufficient and self-sustaining agriculture: the need for a deep comprehension of the nature of agro-ecosystems and the principles by which they function. Agro-ecology is the discipline that provides the basic ecological principles for studying, designing and managing agro-ecosystems.
92. Agro-ecology supplies a methodological framework for understanding the nature of farming systems and the principles by which they function. A new research approach is needed that considers the interactive effects of ecosystems and socio-economic

systems at the eco-regional level. During the CGIAR workshop (see elsewhere above), scientists identified two definitions of NRM that may act as a guide for future efforts in NRM-oriented research:

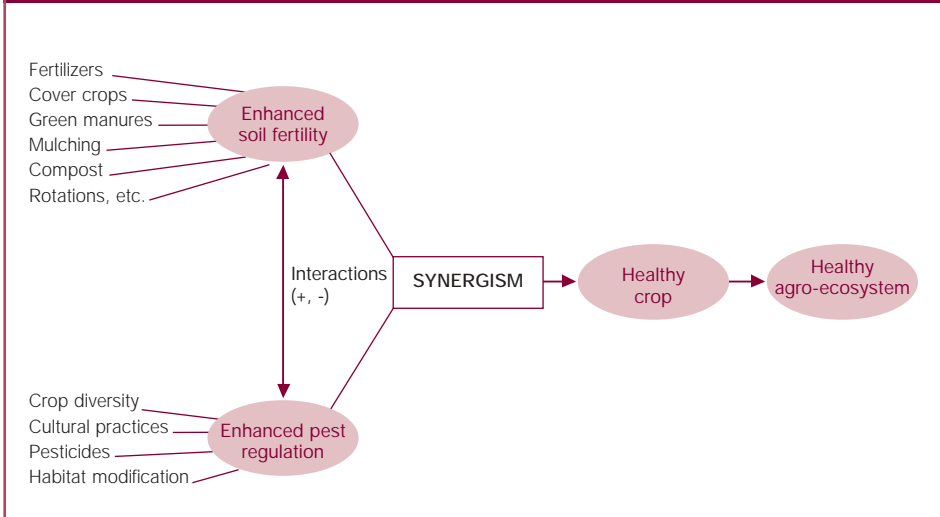
- NRM is the responsible and broadbased management of the land, water, forest and biological resource base (including genes) needed to sustain agricultural productivity and avert the degradation of potential productivity.
- NRM is the management of the bio-geo-chemical processes that regulate the ecosystems within which agricultural systems function. NRM methods are those of system science, a system that embraces the interactions of humans and their natural resources.

93. The related approaches are already leading to a rise in production in environments that are far from ideal, such as eroded hillsides or degraded rainfed farms. Yields have often doubled, partly (but not entirely) because the production base of LFAs was low at the outset. The potential for promoting sustainable agricultural development based on the principles of agro-ecology are of special relevance to the LFAs where the conditions are poor and the asset base is under heavy stress. It is important to emphasize the interdisciplinarity and synergies in the NRM approach. These are well illustrated by Altieri (2002). Figure 6 shows how the interaction between soil and pest management practices can, together, lead to more healthy and productive crops.
94. Research has demonstrated that a crop's ability to tolerate pests and diseases is associated with good soil fertility (high organic matter, active soil biological activity) and a set of optimal physical, biological and chemical properties. Positive interactions exist between soils and pests. Yet Altieri feels that scientists, probably influenced by their disciplinary backgrounds or commodity orientation, have nurtured the evolution of integrated pest management and integrated soil fertility management as two separate approaches. The sustainability of low-input systems depends very much on synergies between these two aspects.
95. The above discussion allows one to appreciate that ecological interactions are important in INRM research, and this has a bearing on how research should be undertaken. Assessing the impact of INRM research is complex, considering that it is not only productivity that must be assessed, but also other benefits and services that a regenerated ecosystem will provide. The assessment task is further complicated by the need to factor in additional indicators such as the empowerment of local communities that results from participatory decision-making and collective action.

The strategic contribution of livestock in poverty reduction

96. The majority of the world's rural poor depend on livestock as a resource to meet their needs. For the poor in LFAs, opportunities for more intensive farming are limited, and their dependence on livestock is evident. Livestock represent their natural capital assets and are valued for income as well as non-income functions. Animals are kept

Figure 6: interactions of soil and pest management practices used by farmers, some of which may result in synergism, leading to healthy and productive crops



Source: Altieri (2002)

for a wide range of reasons. In addition to providing services for crop production, they are sources of emergency cash, buffer stocks and savings. The animals raised by smallholders and pastoralists are already well adapted to the local environment, which is often harsh and unpredictable, marked by extreme temperatures, poor feed and water quality, and diseases.

97. Sixty percent of the Hindu-Kush Himalayan and Tibetan Plateau areas consists of rangeland ecosystems that: (a) support a large livestock industry; (b) accommodate important watershed functions, (c) provide valuable and biologically diverse resources; and, most importantly (d) contribute to the livelihood of millions of poor households. Regional programmes aimed at improving livestock and rangeland management have helped raise the awareness of the issues of pastoral development and conservation in these areas. Emphasis is being placed on the collaborative management of common property resources (CPRs) and organizational change so as to facilitate participatory rangeland management and pastoral development. A deeper understanding of the role of rangelands, pastures and livestock in the economy of the household and the community is necessary.¹⁹
98. Small-scale farmers could benefit greatly by strengthening the livestock components of their livelihood systems. Crop-animal interactions benefit small farmers by enhancing the sustainability of mixed farming systems, diversifying sources of income and reducing land-preparation costs. Today, livestock maintenance depends primarily on cereal straws. The introduction of improved forages could therefore greatly

19 ICIMOD (2002).

enhance productivity. A broad range of tropical grasses and legumes has been tested under rainfed and irrigated conditions in South Asia and, by the International Center for Tropical Agriculture, in South-East Asia. In Nepal, most of the fodder in the hill and mountain regions is tree foliage. In the irrigated areas of India and Pakistan, fodder growing is integrated into the cropping systems, and production has reached a commercial scale. The raising of cattle and small ruminants under fruit and coconut trees is recommended by the International Livestock Research Institute and other livestock research centres; work on shade-tolerant fodder species has been undertaken in Sri Lanka.

99. Most of the rural poor in the semi-arid tropics own at least some livestock, and the demand for livestock products is expanding. Livestock could therefore become a major focus of pro-poor research. The declining demand for millets and sorghum for human consumption could be addressed by promoting their use as livestock feed supplements. Desert areas with large populations of a diverse range of livestock are already delivering large quantities of milk and related products to neighbouring cities. Rajasthan on the outskirts of Delhi, India, is reportedly making a major contribution to the economy through its livestock sector, and this in spite of frequent drought. Rising population pressures and rapidly deteriorating (or reduced access to) grazing grounds and fodder sources point to an urgent need to explore ways to increase crop and livestock production without further degrading the resource base. Appropriate mechanisms, possibly via drought-tolerant tree and grass fodder species, could be developed to support the growth of a major industry in the semi-arid areas.
100. The demand for livestock products is expected to double within the next 20 years. Traditional husbandry systems still account for most of the livestock-related outputs of developing countries, and most of these systems are run by the poor. More participatory on-farm research is required in order to build upon the rich indigenous knowledge base. Livestock raising provides special opportunities for income enhancement among the poor. Researchers and policy-makers in South and East Asia simply cannot afford to undervalue livestock as a means of enhancing the livelihoods of the poor in marginal tracts.

Conservation and use of agricultural biodiversity

101. Programmes that adopt INRM approaches to focus on small farmers in LFAs and marginal areas are greatly enhancing the opportunities for addressing conservation issues such as the diversity of crops, trees and livestock. On-farm conservation of indigenous crops and animals allows for the continuous evolution and adaptation of germ plasm, thereby maintaining a form of insurance against future climatic and other environmental changes. Agricultural biodiversity must be conserved at all levels within the local environments. The mountains, uplands, forests, deserts and coastal landscapes of LFAs are host niches where diversity is still thriving. Small farmers are already maintaining sundry collections of livestock, crops and trees, as well as the often undervalued below-ground diversity (microbes).

Table 2: possible benefits accruing from on-farm conservation

	Economic and socio-cultural benefits	Ecological benefits	Genetic benefits
Farmer household	<ul style="list-style-type: none"> • Manage risk and uncertainty • Fit different budget constraints • Avoid or minimize labour bottlenecks • Fulfil rituals or forge social ties • Fill nutritional needs 	<ul style="list-style-type: none"> • Minimized use of chemical inputs • Soil structure amelioration • Managed pests and diseases 	<ul style="list-style-type: none"> • Insurance against environmental and socio-economic change
Society	<ul style="list-style-type: none"> • Global food security • Empowerment of local communities • Social sustainability 	<ul style="list-style-type: none"> • Reduced chemical pollution • Restricted plant diseases • Regulated hydrological flows 	<ul style="list-style-type: none"> • Insurance against environmental change, pests and diseases • Use for the agricultural industry

Source: Jarvis et al. (2000)

102. The R&D establishment must help maintain such farming systems and ecosystem services by building upon them rather than seeking to replace them. When developing new crops and systems or when addressing issues related to the conservation of agricultural diversity, the research establishment could benefit greatly by fostering closer linkages with farmers, farm communities and the farm knowledge base. Researchers must improve their predictions of the effects of their findings on other ecosystems. For example, reducing the use of chemical inputs (herbicides, insecticides) could greatly enhance the biodiversity in soils and, at the same time, reduce the negative impact of input use on the biodiversity of adjacent water bodies. Table 2 provides the results of an analysis of such benefits.

103. A thorough understanding of the factors that influence on-farm diversity is needed before implementing in-situ conservation programmes. The conservation (or erosion) of genetic diversity in farmers' fields is shaped by a complex mix of factors over time. These range from farmers' decision-making to local environmental change and to interactions between and within crop populations. Research is needed to answer questions such as the following:²⁰

- What is the amount and distribution of the genetic diversity maintained by farmers over time and space?
- What processes are used to maintain this genetic diversity on farms?
- What factors (market, non-market, social, environmental) influence farmer decision-making to maintain this diversity on farms?
- Who maintains this diversity on farms (men, women, old, young, rich, poor, certain ethnic groups)?

²⁰ Jarvis et al. (2000).

104. In addition to such questions on management practices, the Convention of Biological Diversity points to the need to identify policies that can promote the positive (and mitigate the negative) impacts of agriculture on biodiversity, while also enhancing productivity and the capacity to sustain livelihoods by expanding the knowledge, understanding and awareness of the multiple goods and services provided by different levels and functions of agricultural biodiversity.
105. The livestock sector deserves special discussion because of its importance in the context of the priority ecosystems identified by IFAD for Asia (Section V), where livestock holdings are a source of biodiversity. There are some 6 000 breeds of domesticated animals belonging to about 40 species across the world, and 15% of the world's species of cattle are raised by pastoralists in the semi-arid parts of India, Pakistan, West Asia and parts of Africa. On the other hand, the narrow genetic base that characterizes the commercial livestock sector and the gradual loss of animal diversity pose great dangers for the future. Diversity is eroding rapidly due to the recent transformation of agricultural systems. The farmers who raise local breeds are providing valuable services to the world community by conserving these genetic resources on their farms.
106. Aquatic biodiversity in bodies of fresh water is similarly threatened. With the decline in marine fisheries across Asia, freshwater is increasingly used for aquaculture. Fish-raising offers new livelihood opportunities for the poor, but it could, if not well researched and planned, have huge environmental effects because of habitat destruction and the introduction of exotic species. Freshwater species are, in many ways, more vulnerable than marine species, which must survive in more open and competitive environments. The sustainable use of aquatic biodiversity could nonetheless be viewed as another opportunity for addressing conservation issues, e.g. by promoting the farming of indigenous fish species. Incentives need to be identified and developed for stimulating the use, as well as the conservation of animal and fish diversity. Research to support the search for appropriate strategies is lacking.

THEME 2: strengthening social, institutional and policy dimensions

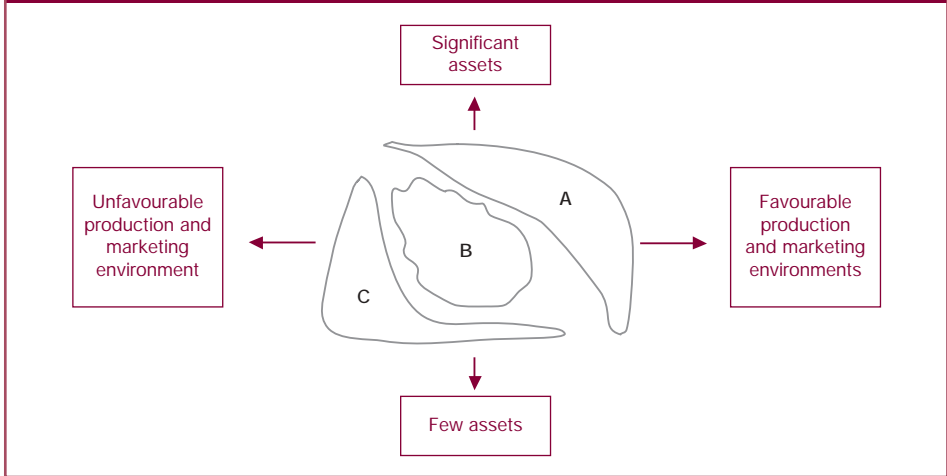
107. The discussion of this theme is structured under five subheadings: (a) classifying rural poverty groups for tailored interventions; (b) collective action, land tenure and property rights; (c) gender, human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) and migration, which are inextricably linked; (d) social capital and social solidarity; and (e) policy research within national agricultural research.

Classifying rural poverty groups for tailored interventions

108. To be more effective, R&D approaches must focus on the existing asset base of the various audiences and clients. In a recent study on the performance of agricultural knowledge and information systems vis-à-vis poverty, Berdegue and Escobar (2002) stress the need to learn to deal with diversity by tailoring approaches, as well as to frame such efforts within broadbased development policies (Figure 7).
109. Two criteria are used to classify rural households into poverty groups: (a) the asset position of the household (high or low); and (b) the state of the production and marketing environments faced by the household (favourable or unfavourable). Highly favourable production environments are situations in which the markets are working well, transaction costs for households are at a minimum, and the government regulates the market effectively. Unfavourable environments are situations in which some actors are able to make monopoly profits, transaction costs are high for the poor, and government regulations in the market do not exist, are selectively implemented, or discriminate against the poor.
110. Using these two criteria, rural households can be divided into three main poverty groups or “situations”, each requiring a separate set of policies and interventions in order to address poverty reduction goals.
“When the goal is poverty reduction, agricultural innovation policies and programmes cannot start from agricultural research and extension and move towards poverty. The starting point has to be the analysis of the different types of poverty (rural and urban), their determinants, the contexts in which they occur, and the livelihood strategies that the poor implement to respond to their condition. The more we move into conditions of poverty, deprivation and unfavourable environments, the greater the need for these types of broad-based approaches.”
111. It becomes immediately clear why many of the research outputs deriving from commodity approaches have been rejected by the poor. A framework developed by Berdegue and Escobar (2002)²¹ is of special relevance for R&D in LFAs. It suggests a need to tailor interventions and focus them on the specific needs of the various groups.
- Situation A: households with significant assets and operating in favourable production and marketing environments;
 - Situation B: households with a low to middle level of assets and operating in production, marketing and opportunity environments that are not particularly favourable; and
 - Situation C: households with few assets and operating in very unfavourable environments (e.g. landless labourers with few worthwhile employment opportunities typically fall into this category).

21 Synopsis of the framework based on the original 2002 paper by Berdegue and Escobar and on the discussion in Biggs et al. (2002).

Figure 7: classification of rural poverty groups for policy and intervention analysis



Source: Berdegue and Escobar (2002)

112. Agricultural policies and interventions to address each of these situations have to be tailored to the location, time, local culture and other socio-economic factors. For Situation A, a special emphasis is placed on commercially oriented initiatives and private-sector contributions. These farmers are rarely poor, but their intensive agricultural systems could create many jobs, including seasonal work for migrants from the LFAs. Situation A farmers are often linked with the non-farm sector through transportation, processing and marketing. As soon as private investment is directed to such environments, public resources should be directed to the other Situations.
113. For Situation B, where the farmers have the potential to embark on market-oriented agriculture, but are constrained by a weak asset base, support should focus on providing them with the resources and skills they need to develop a vibrant farm sector. Because farmers in this category already produce a large share of the world's food, research should focus on enhancing their access to assets and improving their linkages with the non-farm sector. Such interventions will yield direct and indirect benefits in terms of poverty reduction. Since the strategies must have a clear, strong market orientation, appropriate public policies are especially important.
114. For Situation C, successful innovation will depend on building local institutions, networks and organizations that can help mobilize very scarce resources within communities and link these to external networks. Strategies based on the following have been especially successful: on-farm research, participatory technology development and farmer-to-farmer approaches, as well as the strengthening of local organizations. For this category, research will probably be most effective if it is carried out in close collaboration with local organizations and NGOs and if the researchers provide technical and methodological support.

Tenure security, property rights and collective action

115. Property rights and land tenure security are often overlooked in agricultural R&D efforts; yet they are frequently the main factors influencing the choices and decisions of the poor with regard to land management, cropping practices and livelihood strategies. The manner in which land is regulated, rights are assigned and conflicts are resolved determines the incentives and opportunities available for the rural poor. For this reason, land tenure and access to productive assets are reappearing on the national and international R&D agenda. Asset ownership by the rural poor, good governance and political stability are becoming recognized as essential requirements for broadbased economic growth.²²
116. Collective action is crucial if effective resource management is to be achieved at the landscape level. Many NRM practices are not effective if they are adopted only by a single farmer, but become effective if coordinated across farms or even communities.²³ Collective action requires significant levels of social capital in order to allow people to: (a) gain access to or defend natural assets such as trees or water; (b) transform their assets into income; and (c) connect with the market and state and civil society organizations that structure the ways in which assets are acquired, protected and transformed.²⁴ Understanding and factoring collective action into research design is becoming crucial to success in resource-management-oriented research, including research aimed at addressing the environmental consequences of conventional agriculture.
117. Many natural resources that used to be under local (collective) control, such as pastures and rangelands, water resources, fisheries and forests, have been taken over by central governments at some time. Subsequently, poor management has often transformed them into open-access resources exploitable even by non-community-members. The degeneration that followed this weakening of local ownership was once blamed on poverty. However, scholars such as Jodha (1998), who have long worked on LFAs, argue that it is externally generated changes rather than poverty per se that lead to resource degradation. When the poor no longer have a strong collective stake in the resource base that assures their livelihoods and that they no longer manage, degradation occurs. Only an effort to revive the community stake in the resource base can reverse this process. In other words, commons must be controlled by the village communities.
118. The rights and responsibilities for managing rangelands, forests, lakes, flood plains and even irrigation systems must therefore return to the local level. It is within this context that the Community-Based Natural Resource Management Programme of the International Development Research Centre (IDRC)²⁵ in ten countries of Asia

22 IFAD (undated, a).

23 Meinzen-Dick et al. (2002).

24 Coward, Oliver and Conroy (1999) quoting Bebbington in part.

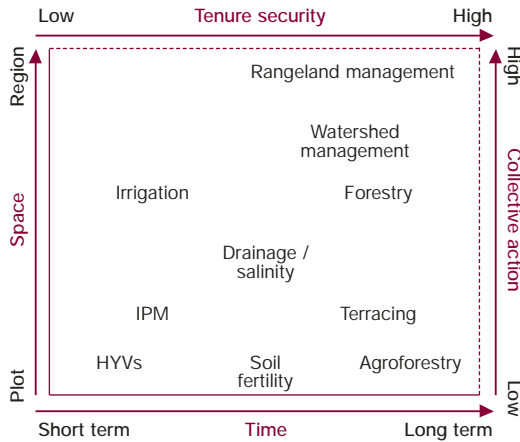
25 See <www.cbnrmasia.org>.

makes a lot of sense to poor communities and inevitably enhances the pro-poor orientation of research. The success of this devolution, however, will be conditioned by the presence of effective decentralized institutions. To ensure that the natural resources on which the poor depend can remain common property (and hence accessible to communities) and still be managed in a sustainable and equitable manner, it is necessary to restore and strengthen local organizations. Secure tenure and property rights are important features of a devolution strategy since people (especially the poor) will mobilize to protect a resource only if they are certain they will benefit directly and equally from this action. It is therefore necessary to put into place a combination of technical, social and institutional mechanisms in any effort launched to restore degraded resources.

119. Institutions for collective action and the protection of property rights can shape the productivity and sustainability of farming systems by encouraging farmers to adopt innovations and invest in environmentally sound NRM,²⁶ The security of property rights influences the initial adoption of technologies and their continued use. The uptake of existing technologies can be facilitated by a better understanding of the institutional elements required for adoption.
120. CGIAR's system-wide Programme on Collective Action and Property Rights has included the development of a conceptual framework to guide the identification of approaches for particular institutional contexts (Figure 8). Some of the basic principles are the following: (a) practices that operate on a landscape scale may be more appropriate where traditions of cooperation are still strong; (b) technologies that require a long time to produce benefits are likely to be most successful where land tenures are long and reasonably secure; and (c) farmers with insecure land tenure benefit more from technologies that produce benefits in the shorter term. The knowledge derived from careful situational analysis can therefore help identify the extent to which collective action at the community level can influence technology adoption or foster the development of new technologies that are less dependent on collective action.
121. In conclusion, research institutions that make the shift towards resource management and embrace the issues of soil, land and water degradation, biomass depletion and the destruction of ecosystems will inevitably also confront land tenure and other institutional issues. They will find it meaningful to accept the importance of collective action.

26 Meinzen-Dick et al. (2002).

Figure 8: conceptual framework. Property rights, collective action, sustainable agriculture and natural resource management



IPM integrated pest management
 HYVs high-yielding varieties

Source: Knox McCulloch, Meinzen-Dick and Hazell (1998)

Gender, HIV/AIDS and migration are inextricably linked

(a) Gender

122. The role women play in Asian agriculture parallels and, in some cases, exceeds that of men. That women account for more than half the labour force is now widely recognized thanks to gender awareness efforts over the past decade. Perhaps less known is the fact that the number of women living in absolute poverty is rising at a more rapid rate than the corresponding rate among men and that this feminization of poverty is often associated with another phenomenon, namely, the feminization of agriculture. Indeed, women are increasingly in charge of farming operations in areas marked by heavy migration among men. Moreover, migration is a major factor in the spread of HIV/AIDS. All three phenomena have important implications for the design of agricultural R&D interventions.

123. In Asia, with some exceptions that are mainly linked to international migration, men find it easier to migrate to take advantage of emerging markets nurtured by economic globalization and trade liberalization. Throughout Asia, women now constitute the largest group of poorly paid or unpaid agricultural labourers, with little security and no insurance or other mechanisms to protect themselves. The adverse effects of this trend may be exacerbated by traditional inequalities within the household and in local society. Rural women are particularly unprepared for and especially vulnerable to external changes, e.g. socio-economic downturns, changes in the structure of farming and household composition, natural disaster and disease

epidemics. In China, where changes are happening very quickly, recent surveys have found that women constitute 85% of the agricultural labour force in the three south-west provinces of Guanxi, Yunnan and Guizhou.²⁷

124. Under such circumstances, the ability of women to own or cultivate land over the long term will clearly affect the quality of the management of natural resources in general. Their lack of formal land rights often limits their ability to obtain credit, and the fact that women often have less education and fewer tools means that they are also less likely to adopt new technologies. A relatively unexplored subject is the way the interaction between gender and weaker property rights to land and trees can diminish the incentive of women to adopt higher value permanent crops and environmentally sustainable farming practices.²⁸
125. The linkage between women's access to assets and the expansion of education, a major factor in development, is another important element. Research by the International Food Policy Research Institute in Bangladesh, Ethiopia, Indonesia and South Africa indicates that an increase in the assets held by women raises the share the household will spend on education, and other studies of the International Food Policy Research Institute show that improvements in women's education accounted for up to 43% of the overall reduction in child malnutrition.²⁹ Women's limited control over productive resources therefore has important consequences for agricultural productivity. It affects property rights (the right to use and manage land resources), and property rights greatly influence the quality of land care. In fact, anyone with long-term access rights – women or men – can be expected to have a greater incentive to sustain the land and to develop ways of preserving and regenerating it.

(b) HIV/AIDS

126. An emerging issue in Asia is the spread of HIV/AIDS. Cambodia, China, India, Myanmar, Nepal and Thailand are some of the most affected countries. In South Asia, as many as five million people are said to be living with HIV/AIDS, and the rate of spread is higher there than it is in Africa. The fact that HIV/AIDS is spreading into rural areas is a matter of particular concern because migration, a major channel, is on the rise in Asia both within and across national borders.
127. A recent study undertaken for IFAD³⁰ emphasizes the need to look into and tackle the structural factors that create and sustain vulnerability to HIV/AIDS, i.e. poverty, migration, patriarchal gender relations and social marginalization. The "labour frontier" (the origin of much migration) is usually associated with rainfed agriculture, semi-arid plains or certain hill and forest areas. In Nepal and in Uttaranchal State in India, for example, most of the men have migrated to the plains,

27 Song and Jiggins (2000).

28 Quisumbing et al. (1998).

29 IFPRI (undated, a and b).

30 Nathan and Kelkar (2002).

leaving women in charge at home, and some of the men return with the disease. The phenomena of poverty, migration, gender inequality and HIV/AIDS are inextricably linked, and the linkages are well documented.

(c) Migration

128. The IFAD study mentioned above also suggests that major labour-supply areas must therefore be identified and the characteristics that may explain the high incidence of out-migration must be studied, e.g. semi-arid climate, scarcity of arable land, landlessness, livelihood vulnerability and presence of distress migration. A major difference often exists, for example, between the sort of migration that may be undertaken by the landless, many of whom are uneducated or poorly educated, and that of landholders, who are often more educated. Essentially, the former tend to migrate into the lower sections of the urban economy, while the latter have access to more well paying jobs. Because women are generally both landless and less educated, the terms under which they can migrate are particularly unfavourable, and many of them end up in the commercial sex trade, where they are especially vulnerable to sexually transmitted infections.
129. The goal of a development intervention should not be to deny people the right to migrate, but rather to help them better their livelihoods and thereby improve the terms on which they will be able to migrate if they still so choose. Micro-level investigations in Madhya Pradesh State in India have found that enhancing family food security is instrumental in improving the terms on which family members could migrate as wage labourers. Families that had run out of food before the harvest were forced to accept lower wages, while food-secure families were able to take advantage of the higher wage rates at harvest times. The more severe the survival problems, the worse the terms on which migrations were taking place. The worst cases were linked to large-scale distress migration during periods of drought and flood.
130. Agricultural researchers and development specialists are being obliged to address the consequences of HIV/AIDS in rural areas, for the disease is affecting not only agricultural productivity, but also the age composition of farm households. It is decimating the working age population. The fact that the elderly and the very young remain to carry on cannot fail to influence the focus of agricultural research. The underlying causes of the problems outlined above may be addressed by concentrating on those geographic areas where seasonal and distress migration are common, with a view to improving the conditions under which both men and women are able to migrate should they so wish. It is also necessary to identify and address the other underlying factors of vulnerability, such as landlessness and poor education. Invariably, this focus will generate awareness that women are particularly disadvantaged.

Social capital and social solidarity³¹

131. The effectiveness of development efforts, especially in rural communities, is closely linked to the amount of social capital that is locally available. A primary component of social capital is mutual trust and understanding among the individuals and the households that make up the community. Social capital promotes cooperation, reduces transaction costs and makes it possible to optimize the solutions to a vast array of problems linked to NRM, economic ventures and the creation of various public benefits. In many communities, social capital is a scarce commodity (notwithstanding the rhetoric about solidarity whenever local people are questioned about the social relations in their community). This weakening of social capital has important implications for the implementation of development strategies, e.g. efforts to decentralize resource management by returning control over assets to local communities may not be as effective as hoped.
132. In recent years, the concept of community-based resource management has gained considerable popularity among forestry departments, NGOs and international development agencies, many of whom see the approach as a solution to the problems of environmental degradation in the uplands of South-East Asia. Yet remarkably little attention has been paid to the way the internal social organization of villages in general and the increasing shortage of social capital in villages in particular might constrain the ability of villages to manage the natural resources effectively that are to be entrusted to them. A prevalent assumption seems to be that rural villages are somehow inherently endowed with the institutional capacity to organize successful collective action in a manner that will ensure that resources will be used in an equitable and sustainable manner. Social solidarity is assumed to exist and to be able to foster the collective management of community resources.
133. The fallacy of this assumption has been repeatedly revealed by empirical studies of rural villages. Social organization is not a constant, and the communities that are deficient in supplies of social capital are often the poorest villages. In many villages where social capital is in shorter supply than financial capital, the villagers – whatever their individual intentions and desires – will actually lack the institutional capacity to manage local resources for the common good.

Policy research within national agricultural research

134. It is generally accepted that policies influence whether or not the poor can benefit from research-generated technologies or innovations. Thus, emphasis is being placed on doing research on policy and institutional issues, alongside the classical technical issues. Yet, the importance of policy research is rarely highlighted by the NARS centres, nor are the best researchers much attracted to policy work.

31 Based on Rambo (2000). While the author is discussing primarily the situation in Viet Nam, the section of the paper used here is of relevance to communities in most of the marginal areas and LFAs of Asia.

135. This reality is a serious impediment to achieving a strong poverty orientation within agricultural research establishments. More interdisciplinarity is needed to enhance the policy impact of research by including contributions from sociologists, political scientists and anthropologists, as well as economists and biologists. An equally important and urgent need is to broaden the cadre of social scientists occupying senior and managerial positions within NARS centres. The NARS should not view their partnerships with universities and private agencies as a way of getting around their lack of staff with policy and social science backgrounds. Rather, these partnerships should be viewed as opportunities to strengthen in-house policy research capacities.
136. The NARS centres should also invest directly in creating specialists capable of doing policy research. International research institutions can and should provide strategic capacity-strengthening assistance, e.g. on interdisciplinary research methods. They could also facilitate regional and in-country exchanges among peers and carry out cross-country syntheses on relevant themes (rather than have representatives from the countries do this). The preparation of policy briefs could greatly enhance the utilization of research. Regional and international research institutions could also create opportunities for greater cooperation among national and regional scientists by seconding staff and engaging in collaborative research. By working together on a common (agreed) agenda, all partners could improve their own capacities, while helping to create a common pool of knowledge and best practices.

THEME 3: value-added processes along the post-harvest chain

137. This theme comprises three aspects: (a) post-harvest technologies and support mechanisms; (b) subsistence-oriented smallholders undertaking the transition to market-oriented approaches; and (c) making trade work for the poor.
 - (a) **Post-harvest technologies and support mechanisms**
138. Research by public-sector research institutions into post-harvest technologies (storage, packing, transportation and processing) continues to be neglected. While basic and strategic research into storage-related technologies for grains has received much attention in past decades, post-harvest grain losses are still (conservatively) estimated to be high (at least 15%). In many Asian countries, over one third of the value of rice is lost in one way or another after the rice is harvested.
139. A large part of the losses occur at the level of the small farmers who suffer most from a lack of information and poor access to improved technologies for drying, storing and milling. Research should therefore be more adaptive and problem oriented, and it should be combined with efforts to compile and disseminate best practices and equipment designs (including adaptations by local entrepreneurs).

140. The commodities most in need of post-harvest technology development are probably fruits, vegetables and flowers, among which losses are above 29%. Farmers are diversifying into these crops because they offer good income opportunities, but this exposes them to a higher risk due to the higher perishability of the produce. The small-scale storage and processing of fish is another relatively neglected research area where improved technologies would benefit the poor and, especially, women. Better timber processing technologies would help generate much-needed off-farm employment, and more research is needed to develop, test and incubate alternative forest products and processes that are appropriate for small-scale operators. In pursuing such strategies, forestry researchers could learn from the lessons acquired during work on non-timber forest products. Post-harvest forest research must balance the interest in large-scale commercial plantation forestry with the new needs emerging from the growth of small-scale on-farm timber production.
141. With the opening up of access to global markets, a greater emphasis on quality, safety and standards can be expected. The private sector may deal with the research related to processing, but a whole range of pre-processing procedures are likely to remain neglected. Quality control, packaging, transportation and storage techniques not only help generate higher (value-added) revenues for different players across the marketing chain, but, because they are labour intensive, they also help generate much-needed rural employment.
142. Smallholders require assistance in order to take advantage of the growing range of new opportunities and to negotiate better terms and conditions. They need well-organized post-harvest chains that can handle storage, transportation, processing and marketing efficiently. The potential is huge for research partnerships involving international centres, NARS centres, local private industry and farmer associations. Research on post-harvest systems will continue to focus on technology development, but it will be most effective if undertaken with a broader set of research topics on the agenda.
143. An illustration of areas that could be addressed through research is provided by a multi-country project conducted by the International Food Policy Research Institute and its partners. Its objectives included the following: (a) analyse rural agro-industrial systems and post-farm aspects of the supply chain; (b) identify and analyse alternatives for enhancing the contribution to income, food security and employment of the rural poor from improved post-harvest activity and rural agro-industries; (c) identify constraints to the development of post-harvest activities and rural agro-industries; (d) identify and analyse the market structure, marketing and processing enterprises involved; (e) analyse the institutional mechanisms needed to raise the access of rural households to markets, information and assets; (f) analyse the role of (and capacities needed by) policy analysts and programme managers in designing and developing post-harvest systems oriented towards poverty reduction; and (g) communicate the strategies and policies derived from research at the national and international levels.³²

32 IFPRI (undated, a).

144. A significantly stronger emphasis on research on post-harvest issues, associated with a focus on the particular needs of small-scale producers, could facilitate access by these producers to formal and specialized markets (both domestically and internationally) and, at the same time, create additional rural employment. Hopefully, the substantial levels of losses and spoilage that are accruing across the marketing chain and that have thus far largely been ignored by the research establishment in Asia will finally be addressed.

(b) Subsistence-oriented smallholders undertaking the transition to market-oriented approaches

145. In order to augment their incomes, small-scale farmers throughout Asia are engaging in market-oriented production or in wage labour, and the mobility of people in remote areas is increasing. Nowadays, very few of these people are purely subsistence farmers, and rural households are becoming more dependent on outside markets for goods and commodities. Small farmers are also very responsive to market conditions, e.g. the rapid growth of a smallholder dairy industry in the Kathmandu valley in Nepal; the rapid expansion of fruit trees in Himachal Pradesh in northern India; the shift from upland rice to vegetables and corn in southern Philippines; the rapid development of the coffee industry in Viet Nam. All these developments were greatly influenced by markets, with the farmers taking advantage of new opportunities. In the marginal areas, farmers have access to a broad diversity of ecological niches for products with which they may enjoy a comparative advantage. Anticipatory and participatory research is needed to explore new products and new markets for areas that are inhabited mainly by poor and extremely poor people.

146. Information, roads and transportation infrastructure, prices, storage and processing facilities: all these factors influence the responses of farmers to market opportunities. Commodity prices affect their approaches to production (changing pesticide use to meet cosmetics standards, monocropping, use of hormones to augment milk and meat outputs). A major problem for small farmers is their inability to predict market demands and prices; those engaged in perennial farming systems (fruit trees, agroforestry) have less flexibility to adapt their production strategies to markets than do those who grow annuals. Diversification is critically important for small farmers who need to maintain multiple (hopefully, interrelated) enterprises. Research is also needed to determine which products can be sustainably harvested from nature, i.e. without endangering the environment. Research programmes could link up with the local private sector to develop markets for timber from new tree species grown on farms or to process new fruits.

147. In addition to being able to predict demand, another major need for poor farmers is assurance of fair prices. A typical argument is that too much of the money consumers pay for products goes to middlemen and traders. While there is some truth in the concern that small-scale producers or collectors are not getting a fair share of the final market value of their products, blaming the middleman may not always be valid.

According to studies conducted in remote upland environments, the small-scale traders are often not much more well off than the producers, and they perform essential functions (transportation, assumption of risk and credit delivery) that the producers would not be able to perform cost effectively. Rather than replace the middlemen by an innovation that may not be sustainable after the project ends, a better strategy is to improve the bargaining power of the producers (by organizing and training them). One of the most effective and simplest ways to do this is to assist them in gaining access to reliable information on the prevailing market prices for their products.³³

148. The role of microfinance in supporting small-scale agriculture and related enterprises also deserves more attention in agricultural research. How can agricultural credit be more well integrated with other financial services (savings and insurance) to protect people from emergencies?
149. Although policy-making is the most important factor here, R&D also has a role to play, e.g. in developing new mechanisms, risk-aversion strategies and insurance schemes and in providing valuable information for planning purposes. The R&D establishment could do far more to test and develop information-support structures that local governments could use more easily. Global trends are favouring market-oriented agriculture, and small-scale producers have a potential to compete, but they need to learn how to meet the quality and safety standards demanded by a picky consumer population. The sort of support that farmers need in order to make this transition is a subject for research enquiry. More research is also required into approaches towards value-added processes and ways to ensure that more of the added value that accrues in marketing chains can be captured by the small producers (and poor countries).

(c) Making trade work for the poor³⁴

150. The rules of the game for international trade in agricultural commodities remain largely inimical to the interests of developing countries. The stark reality is that, in 2001, the European Union spent more than six times as much in supporting agriculture and fisheries in the European Union as it did on international development assistance (euro 40.1 billion against euro 6.3 billion). This, along with tariff and non-tariff barriers, clearly limits the opportunities for developing countries. Agricultural subsidies in the rich countries reduce production costs or artificially raise the prices received by the producers in these countries, leading to overproduction and overexploitation. The use of export subsidies or refunds to finance the disposal of agricultural surpluses on international markets depresses world prices. While these practices may benefit some consumers, the overall distortion of domestic markets negatively affects poverty and food security in many poor countries.

33 IFAD (undated, b).

34 Main source: DfID (2002).

151. The impact of trade barriers is enormous. It has been estimated that the gains of developing countries from a 50% cut in tariffs (by both developed and developing countries) would be on the order of USD 150 billion, i.e. about three times what these countries currently receive as aid. The tariffs imposed by high-income countries on many agricultural goods from the developing countries – especially meat, sugar and dairy products – are almost five times those attached to manufactured goods. High and complex tariffs, together with stringent formal and informal product and performance standards, limit access by poor countries to international markets. They discourage diversification into higher value products and retard the emergence of domestic agro-processing industries. The weak surveillance capacity of poor countries makes them particularly vulnerable to unfair or illegal practices.
152. All the above challenges occur in a context in which the countries with an agriculturally based economy have lost global market shares and have seen their agricultural trade balances deteriorate. Agricultural trade has expanded, but real international commodity prices have fallen. Agriculture's full potential for growth and to support poverty reduction can be realized only if small and medium-scale enterprises are able to compete. They must be given every opportunity and assistance in doing so.
153. Researchers can help by strengthening the regional and international dimensions of the analysis, e.g. by conducting research on the ways agricultural and trade policies affect sustainable livelihoods, as well as assessments of the trade-offs in various patterns of economic growth and a systematic incorporation of poverty considerations into sectoral policies and programmes. Yet, to be established also is the precise nature and magnitude of: (a) the trade and non-trade barriers facing potential agricultural exports from developing countries; (b) the factors constraining in-country value-added processes; and (c) the factors limiting production responses by poor people. Research on how trade is distorted by domestic farm-support mechanisms and overregulation or on the way the control of local commodity markets and prices by governments affects opportunities for small farmers is warranted on a country-by-country basis if the opportunities offered by growing domestic and global markets are to benefit the majority of the poor producers in the developing world whose livelihoods are based on agriculture.
154. The agricultural research community cannot relegate these and related concerns to politicians and policy specialists. The context and environment under which small producers live and work have changed dramatically in the last decade, and research establishments must factor these changes into their planning and into the design of research. Otherwise, long-term and sustained changes in the lives of the poor may not be properly analysed by agricultural researchers, however laudable their intentions or solid the scientific basis of the research. Public-sector research remains responsible for generating public goods that will be more equitably accessed and more freely shared.



V. ECOSYSTEM PRIORITIES FOR ASIA

155. Based on its regional poverty assessment and a review of its past support for agricultural research in the region, IFAD has identified the following five ecosystems as priority areas for pro-poor research and, hence, for grant funding: (a) montane and hillside agriculture; (b) forest-related systems; (c) semi-dry and dry areas subject to degradation; (d) irrigated areas and systems under stress; and (e) coastal and wetland systems.

ECOSYSTEM 1: montane and hillside agriculture

156. Mountains dominate the landscapes of Afghanistan, Bhutan, north west China, northern India, Nepal, Pakistan, and the Central Asian Republics. Mountains are also home to some of the most neglected populations in these countries. According to estimates of the Food and Agriculture Organization of the United Nations (FAO), over half the mountain dwellers in developing countries are food insecure.
157. Mountains are not homogenous. The diversity of environments and of peoples and cultures poses special challenges for any development effort aimed at reaching the poor, so many of whom are living in isolated and dispersed montane communities. Mountains are also important more broadly due to the biodiversity they host. Estimates suggest they contain over half the world's biodiversity. Yet, mountains are generally very fragile environments.
158. Mountain people rely on common property resources (CPRs) for their livelihoods, and the positive links between CPRs and crop and livestock farming are now being appreciated. For example, forest biomass provides feed for livestock, which convert it into manure for fertilizing crops. Mountains also provide a large range of goods and services, most of which benefit the communities downhill: water, timber and minerals, for example. Freshwater supplies in much of Asia depend on the rivers that rise in the Himalayas.
159. Montane and hillside agriculture in Asia can be divided into two broad categories: (a) the montane tropics and subtropics; and (b) the uplands of the humid and sub-humid tropics. The two categories are briefly discussed below.

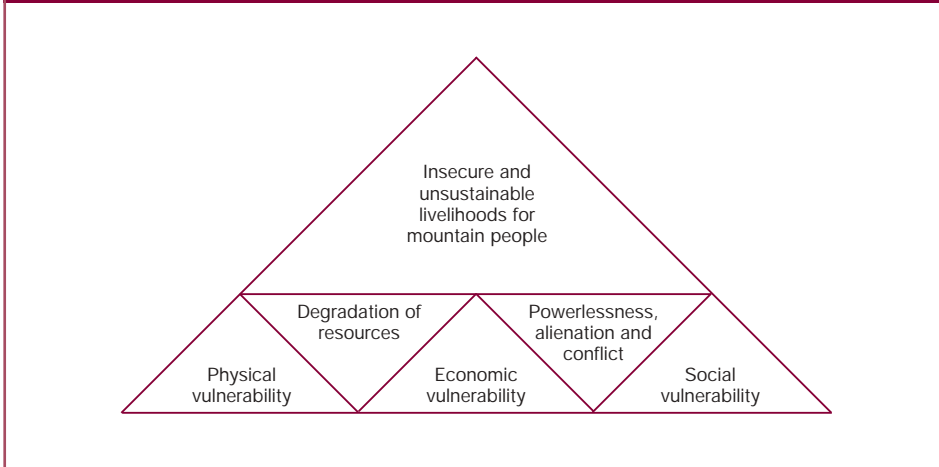
The montane tropics and subtropics

160. The largest mountain area in Asia is the Hindu Kush-Himalaya complex (Bhutan, China, India, Nepal, Pakistan), where over 80% of the population earns its livelihood through agriculture. Mountain agriculture, which depends on CPRs such as forests, grasslands and rangelands, is less reliant on external inputs. Although small, these farming systems usually consist of multiple, highly integrated components. Indeed, diversity is a central feature.
161. Vulnerability is a key element in mountain poverty. The International Centre for Integrated Mountain Development has created a useful “mountain vulnerability triangle” (Figure 9) to depict how economic, physical and social vulnerabilities lead to insecure, unsustainable livelihoods among poor mountain people. Physical and economic vulnerability is intimately linked to the mismanagement and degradation of natural resources, and mountain peoples are marginalized because they lack access to infrastructure, markets, services and information.
162. There is a need for greater sensitivity to the mountain specificities (inaccessibility, fragility, marginality, diversity) that shape the pattern and pace of change, as well as the relevance and effectiveness of development interventions. The nature and extent of the links between the mountains and the downhill economies must be viewed accordingly.³⁵ The differentiated treatment and prioritization of mountain agriculture in mainstream national policies are essential.
163. According to a recent review³⁵ of trends in mountain agriculture and mountain farming systems in the Hindu Kush-Himalayas, the area planted to food grain crops has remained steady over the last 10-15 years despite strong diversification into horticultural crops. The rapid expansion of the production and marketing of horticultural crops by mountain households is identified as the most striking trend, and the review concluded that the prospects for expanding the area under cereals are limited. The review also found that cattle and sheep populations had declined across the region, while buffalo and goat populations had increased. A reduction in open-access grazing lands and community-imposed restrictions on grazing for cattle and sheep are possible explanations for the shift to buffaloes, which are now frequently being stall fed. The potential for cash income generation through both milk buffaloes and horticulture and better marketing and transportation infrastructure have also been driving forces behind these changes. However, seasonal fodder shortages are serious, even acute, in many countries, and this, along with poor animal health, is depressing the growth of the livestock sector.

35 Jodha (2002a) (2002b).

36 Tulachan (2001).

Figure 9: mountain vulnerability triangle: a framework for understanding mountain poverty



Source: ICIMOD (2002).

164. Landholdings in the Hindu Kush-Himalayas region are characteristically small and are becoming more fragmented, leading to encroachment on forest areas and marginal lands. As a result of population pressures, deforestation is worrisome in all countries of the region. In the mountains, farming alone does not provide secure livelihoods, and family members are migrating to seek wage employment. In some parts of Nepal, farming households are headed mainly by women, as most of the men are away working as agricultural labourers in neighbouring India. On the other hand, migration is not yet an issue in the eastern Himalayas, where the natural resource base is somewhat more abundant.
165. Farmers are already exploiting the potential for horticulture on their small landholdings, but poor, underdeveloped, or unreliable planting materials, husbandry practices, input supplies, harvest-handling technologies, packaging, storage and processing infrastructure, and markets remain major constraints in most countries. There are more similarities than dissimilarities among the countries with regard to these constraints. All the above are rich areas for research that have not received adequate attention by the research community.
166. The problems notwithstanding, the future of horticulture, on-farm forestry and other types of agroforestry, as well as stall-fed livestock production systems, remains promising, provided adequate support services, including research, are made available. Intensification must focus on taking advantage of the diversity and niches that exist in mountain habitats in ways that will generate minimal negative impact on otherwise fragile environments. Water use must be made more efficient by introducing water-saving technologies such as drip irrigation and poly-houses (e.g. for vegetables). As traditional cultures often dictate the local practices governing the

use of water, land and forests, indigenous knowledge must be adopted as the motor of mountain development. Integrated approaches to pest and nutrient management can reduce the risk of polluting water bodies and soils, and stall-fed livestock production systems can relieve the rising pressure on CPRs. Mountains are particularly vulnerable to pollution from crop and livestock production. So, special attention needs to be given to this issue.

167. Such a focus is amply justified by the range and importance of the ecosystem services provided by mountain communities. Research should focus more on how mountain communities can or should be compensated for their stewardship of natural resources and for the benefits they deliver to downhill communities. Better ways must be found to “capture” the economic and financial value of water and other environmental resources. Conflicts over water between downstream users and mountain peoples are becoming common, and there is an urgent need to develop appropriate public policy backed by research, along with capacity-building aimed at strengthening the negotiating skills of mountain communities.
168. The current trend towards the privatization of resources in the mountains and its impact on local people (especially women, who depend heavily on CPRs and who are playing a more important role in farming and in montane societies) are another reality to which adequate responses must be found. Better management of knowledge and information that builds on the existing knowledge base and improves access for a wider range of stakeholders is high on the list of priorities. The scope for appropriate research in these areas is greatly enhanced by advances in information technologies and spatial databases. It is critical to sustain the ecological integrity of small farms and the livelihoods of mountain communities, while also assuring the efficient conservation of mountain resources and the related services. R&D efforts should have a strong problem-solving thrust and build firmly on initiatives that the farmers may have begun to explore and develop.

The uplands of the humid and sub-humid tropics

169. The humid and sub-humid tropics of Asia include vast areas with moderate to steep slopes where many of the continent’s indigenous peoples and cultural minorities live: in mainland South-East Asia (Cambodia, the Lao People’s Democratic Republic, peninsular Malaysia, Myanmar, Thailand and Viet Nam), in the islands of South-East Asia (Indonesia and the Philippines) and in the hill tracts of Bangladesh, central India and Sri Lanka. These uplands are ecologically important as sources of minerals, timber, water, hydroelectric power and biological diversity. They serve as carbon sinks. They are, however, also extremely fragile and highly vulnerable to misuse and overuse.
170. The right of individual groups and cultural minorities³⁷ to exclusive occupation and management of their lands has received scant attention in the past. The problem is compounded if the traditional lands of a cultural minority straddle a border. In the highland areas on the borders of the Lao People’s Democratic Republic, Myanmar

and Thailand, for example, the tradition of shifting cultivation among the hill tribes has meant that many families cross and recross national boundaries in pursuit of new lands. Their citizenship and, hence, their legal rights to land are open to query and even less secure than they are among other tribes. Lack of tenure security is invariably a serious constraint to the sustainable management of local resources.

171. Upland areas are characterized by great cultural and social diversity. This could be a valuable resource and storehouse of indigenous knowledge, as well as a source of national pride. However, the presence of many different local groups can be a serious obstacle to the emergence of a shared consciousness of upland problems. There are few social structures to integrate peoples from the various ethnic groups³⁸. The cultural diversity of many of Asia's uplands therefore offers special research challenges for the development of feasible and self-sustaining solutions to the resource degradation and rising population pressures that are exacerbating poverty in upland areas.
172. Similar in-depth studies of local processes of land use and livelihoods are needed in other countries and subregions before research or other work can be expected to make a strategic contribution to environmentally sound poverty reduction. Higher resolution geographic information systems and remote-sensing techniques, combined with participatory analysis of land-use processes, could greatly facilitate the quality and expansion of R&D work in Asia's uplands.
173. These uplands are increasingly valued for their environmental services. This leads to concerns about the degradation of watersheds and the resulting tensions between lowlanders and uplanders. A programme called Rewarding the Upland Poor for Environmental Services, led by the World Agroforestry Centre with IFAD support, is exploring new ways to reward these populations for their efforts to protect watersheds, conserve biodiversity and sequester carbon. Reward mechanisms for the providers of such environmental services could include tax breaks, better infrastructure, more secure property rights, better market access and improved livelihood support services. An array of payment mechanisms should be developed and tested. New market mechanisms are emerging that have the potential to reward upland communities for their efforts to maintain or restore local agro-ecosystems.³⁹
174. CPRs are widely used by Asia's poorest upland farmers. Due to population pressures or control by outsiders, these resources are deteriorating. There is a consensus that the regeneration of open-access resources and CPRs in the uplands of Asia will be most effective if undertaken by the local communities in their capacity as the recognized owners. Only they are in a position to reduce excessive extraction and thereby allow these resources to regenerate. The management and use of areas that were previously under state control and managed as open-access resources are being entrusted to local communities for their exclusive use.

37 Douglas (1998).

38 Rambo (2000).

39 World Agroforestry Centre (undated).

175. Market access is a major concern for the upland farmers of Asia, most of whom, nowadays, are no longer purely subsistence producers. Most of them seek to engage in some form of market production or wage employment. Good market access has become a prerequisite, and this may involve one or more of the following actions: the improvement of tracks and roads, the identification of local products with a market in the lowlands, the development of local market information systems and local processing that adds value to marketed upland products.
176. Limited access to credit conditions the adoption of many potentially profitable practices. Risk-avoidance is a major reason why upland farmers tend to prefer adaptive improvements as opposed to radical change. A study of the risks faced by farmers might bring to light opportunities for developing more acceptable recommendations. Many constraints are area specific, and past land-use decisions often affect future ones. Social equity, cultural sensitivity and economic fairness should be key objectives of efforts to further upland development.⁴⁰

Upland rice: a neglected crop

177. Many of the highly heterogeneous upland rice systems are located in hilly areas of sub-humid and humid Asia, e.g. under the slash-and-burn systems of the Lao People's Democratic Republic and Viet Nam. Although a remarkable substitution of upland rice by cash crops has occurred in countries like the Philippines and Thailand, farmers have not abandoned upland rice entirely. This is especially true of the poorer ones who rarely have lowland fields and who often plant upland rice because the harvest comes a month earlier than the harvest of the lowland rice. The upland rice helps bridge the seasonal gap in the food supply. Though the overall role of upland rice in Asia may be declining, millions of poor people, especially indigenous peoples, continue to grow it. The role of upland rice in the livelihood systems of upland farmers remains poorly understood, although it is highly valued in food systems among ethnic minorities.
178. Upland rice therefore warrants a limited, but targeted effort to improve the productivity of germ plasms and cropping systems. Windows of opportunity exist for improving productivity through recent scientific advances, e.g. marker-assisted selection and breeding techniques, in combination with enhanced and more highly integrated NRM practices (water conservation, agroforestry, watershed management, regenerative agriculture). Research should also assist farmers in enhancing the productivity of cultivars that they may want to conserve in place.
179. Much of the research outlined above will necessarily have to be undertaken in partnership with national and local research institutions, often through a participatory mode, i.e. placing farmers in the driver's seat and building upon their knowledge. As emphasized throughout this sourcebook, IFAD is interested in supporting broadly-based approaches with strong pro-poor perspectives that can

expand the choice of options and not merely the availability of new tools. Breakthroughs have long been awaited and promised for the benefit of upland rice farmers, and it is time for a concerted response and results-oriented approach.

ECOSYSTEM 2: forest-related systems

180. The issues addressed in the discussion below are grouped under the following headings: (a) forests and poverty; (b) protected areas as “hot spots” of poverty; (c) shifting cultivation: need for a constructive engagement; (d) the impact of farming on forests; (e) simulating natural ecosystem functions on small farms; (f) enhancing the livelihood contributions of forests; and (g) new challenges and new opportunities for researchers.

Forests and poverty

181. About 1.6 billion people across the world rely on forest resources for their livelihoods.⁴¹ The main contributions that forests can make to the livelihoods of the rural poor are evident: new land for crops and livestock, wild forest products to complement on-farm production and a source of income. For many people, their dependence on forests is a function of their poverty.
182. Forestry development has, at different stages, reflected a focus on the forest industry, on forestry and rural development, and on forestry and the conservation of biodiversity.⁴² Over the past two decades, many Asian governments have pursued devolution approaches to transfer forest-related decision-making from central government bureaucracies to local communities, user groups, or local governments.
183. As in other areas of natural resource development, there is a need to address the links between forests and poverty. Yet, the role of forests in poverty reduction and in the livelihoods of the poor is not always adequately recognized and is often undervalued. The meeting of the United Nations Conference on Environment and Development in Rio de Janeiro in 1992 highlighted the relationship between poverty and the use and conservation of forests. More well understood today are the ecosystem services associated with forests, which serve as “water towers” for the plains, as carbon sinks and as major biodiversity reserves. Indeed, there is an expanding role for forests in the provision of global environmental services such as carbon sequestration, the protection of biodiversity and the protection of watersheds.
184. A recent review undertaken by the Center for International Forestry Research (with IFAD support) in three Asian countries concluded that “devolution policies have reflected the conceptual frameworks and interests of foresters and as a result have

40 Douglas (1999).

41 Dixon, Gulliver and Gibbon (2001).

42 Arnold (2001).

disappointed local forest users with different expectations of devolution”. The review emphasizes the need for democratic decision-making and stronger support for local livelihoods. It describes how policy changes could allow more space for local users to express and act on their own interests and stresses the importance of building on the initiatives of local users and the need for pluralism in forest management (to avoid takeovers by local elites). It proposes platforms for public debate, supports popular mobilization over forest issues and stresses the importance of taking account of forest and forest product tenure systems and of adopting a livelihoods approach (if local forest users are to benefit from devolution). It also emphasizes the need for capacity-building so that the poor can take advantage of policy innovations and influence reforms. The authors highlight that, until the issue of the political process has been worked out, technical assistance is likely to reinforce the conceptual models and support the interests of foresters as in the past.⁴³

185. Vulnerability can be reduced through more secure access and control over forest resources, as well as through strengthened negotiating power in order to foster political empowerment. The ability to resolve disputes and disagreements over the access to and control over resources may require new skills in conflict management and resolution, an area of which many researchers are wary.

Protected areas as “hot spots” of poverty

186. A study by the World Conservation Union and Future Harvest⁴⁴ draws attention to the status of many protected areas originally established to protect biodiversity. It shows that nearly half the world’s 17 000 nature reserves are also being farmed by growing numbers of poor people seeking land. More than 1.1 billion people now live within the world’s 25 biodiversity-rich “hot spots”. Agriculture is the chief cause of the destruction of these valuable habitats, as well as a profound threat to wild biodiversity. By the year 2020, agriculture-induced deforestation will be threatening critical habitats in many parts of South-East Asia.
187. The authors of the study propose the adoption of “eco-agriculture”, i.e. an approach for managing entire ecosystems and landscapes according to a unified strategy designed both to feed people and protect wildlife. Six key strategies are envisaged: (a) reduce habitat destruction by increasing productivity and sustainability on lands already being farmed; (b) enhance on-farm wildlife habitats and establish farmland corridors to link uncultivated species; (c) establish protected areas near farming areas, rangelands and fishing grounds; (d) mimic natural habitats by integrating productive perennial plants into farming systems; (e) use farming methods that reduce populations; and (f) modify resource management practices to enhance habitat quality in and around farmlands. They also suggest that landscape management along these lines will require close partnerships between the ecological and wildlife sciences and the agricultural sciences, working in association with operational-scale conservation and agricultural development programmes. Developing the scientific basis and policy framework is seen as an exciting challenge that should attract the best minds from numerous fields.

Shifting cultivation: need for a constructive engagement

188. Over 300 million people remain engaged in shifting cultivation. Some of the most critical, but also the most neglected challenges are found in the forest margins, where various forms of shifting cultivation are practised. A system-wide programme on alternatives to slash and burn has initiated valuable research to address some of the issues. Practical ways to improve fallow management and intensification options must be identified. Research of this nature has to be scaled up and the results utilized. This will occur only if there is more community and local government engagement in action research. Site-specific bio-physical research alone is not sufficient on its own. A collaboration of scientists in the biophysical and social sciences in the forestry, agricultural and environmental sectors will be required in order to move beyond the creation of benchmark sites and the mere accumulation of scientific findings to the stage of witnessing the adoption and application of more of these findings. Major breakthroughs will be achieved only if national and local institutions become effectively engaged in participatory and applied research in the locations where shifting cultivation is being practised.

The impact of farming on forests

189. Reflecting on the less well appreciated contributions of the green revolution to crop agriculture, many scientists and policy-makers recall that large areas of forests have recently been conserved because the intensification of agriculture has reduced the rate at which new lands have had to be brought under cultivation. They also note that the potential for further intensification on the more productive agricultural lands is limited, and expansion into new lands is increasing. The initial findings of an FAO study indicate that agricultural land is expanding in about 70% of the world's countries, declining in 25% and roughly static in 5%.⁴⁵ In two thirds of the countries where agricultural land is expanding, forest area is declining; in the remaining third, forest area is expanding. Significant areas of the land being converted to agriculture are low quality, traditionally considered unsuitable for crops. Many observers feel that the competition for good land will become more intense and that the forests will inevitably become more restricted into the poorer areas. Tree farming in the tropics and subtropics can succeed on lands that are of intermediate productivity, much of which is unsuitable for agriculture.

Simulating natural ecosystem functions on small farms

190. It seems inevitable that the size of forest areas will decrease in many parts of the world. Through the intensification of agricultural systems through on-farm forestry and agroforestry options, it may be possible to maintain the ecosystem functions now performed by forests. Where wide-scale deforestation has taken place or in areas close

43 CIFOR (1999).

44 McNeely and Scherr (2001).

45 Sayer, Vanclay and Byron (2003).

to urban centres, the demand for timber, fruits and other forest products is high. Farmers are already responding to the loss of forest resources by engaging in tree farming, which could be a means for reproducing the natural ecosystem functions of trees. Support for tree farming could also diversify the production range, reduce risks and build up the assets of smallholder farmers.

191. Smallholder tree-planting systems are often successful because the trees planted by farmers are a conscious investment of labour and other resources for which the farmers have forfeited other options. Most plantings have focused on industrial exotic species for which stock is readily available. Indigenous species that currently assure valuable ecosystem functions are grown only on a small scale. It is necessary to identify and develop reliable sources of germ plasm for indigenous species and make available the required technical information on propagation systems and growth rates. Technical and institutional models are needed to facilitate the domestication of indigenous species on farms and community lands⁴⁶. On-farm participatory research is needed to help determine what kind of trees may be grown and how their management can maximize ecosystem functions. It is also necessary to address the issues involved in boosting access to markets that are likely to be influenced by forest-conservation regulations and control by unscrupulous middlemen.

Enhancing the livelihood contributions of forests

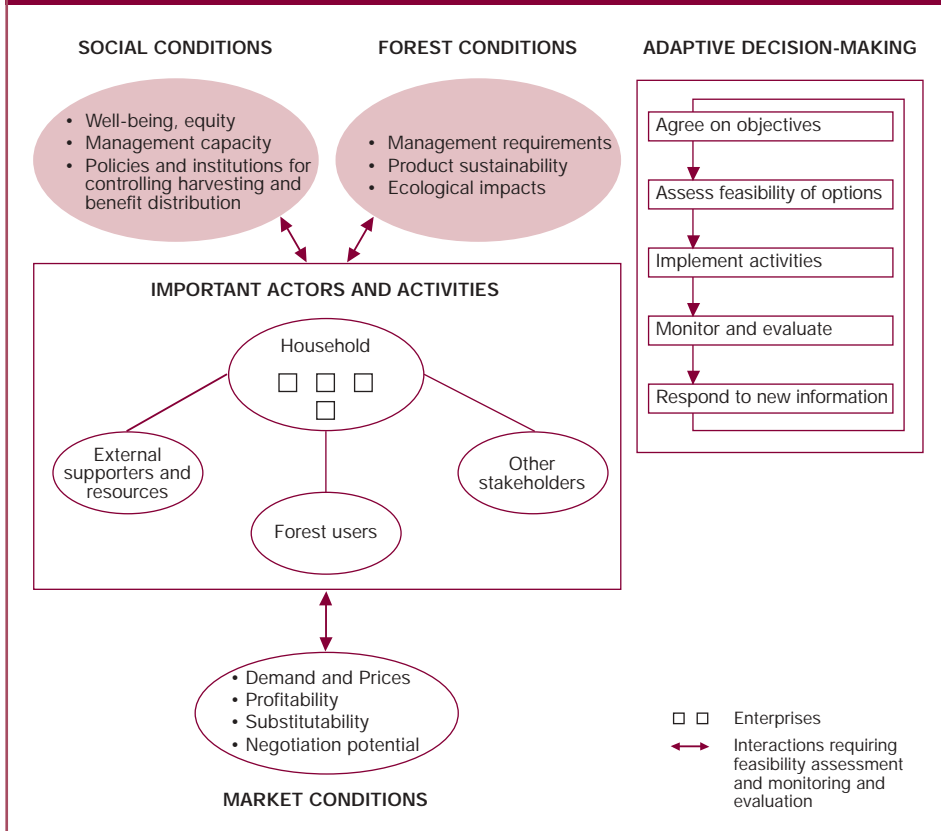
192. Forests are recognized as sources of products for domestic and farm use. The gathering of non-timber forest products is important for the subsistence and economies of most forest communities because they are a source of food, medicines and income. The promotion of community-based enterprises featuring the sustainable use of forest resources as a way of addressing both livelihood and conservation goals has generated mixed results. FAO studies of sites in Asia and the Pacific⁴⁷ conclude that a community-based enterprise strategy would also promote conservation only if it is adequately linked with market factors (such as access) and only so long as the enterprises are able to adapt to changing circumstances.
193. A good overview of the development potential of non-timber forest products is available in the proceedings of a workshop organized by the Center for International Forestry Research and the World Conservation Union in Bogor, Indonesia, in the late 1980s.⁴⁸ Figure 10 presents the conceptual framework used by participants at that meeting. Household forest enterprises are viewed as a point of convergence of the market, social factors and the condition of the forest. They are a product of what is feasible in the market, in the forest and within the household economy; they also shape the local economy and ecology. Inserted within the household economy, they coexist with the other enterprises and economic activities of household members.

46 Roshteko (2002).

47 Dixon, Gulliver and Gibbon (2001).

48 Wollenberg and Ingles (1988).

Figure 10: the enterprise system and information flows necessary for forest product conservation and development



Source: Wollenberg and Ingles (1988).

194. A household's decision to engage in forest product development is therefore best understood by keeping the central role of diverse household needs, capacities and priorities in perspective. The household economy and its range of enterprise activities are affected by relationships with various groups of actors and activities, i.e. other users that have a stake in forest resources will influence the forest enterprises of individual households. The framework, which reflects collective experience, confirms that the promotion of successful forest enterprises calls for: (a) focused attention to market, forest and social conditions; (b) information channels for assessing those conditions; (c) the identification of relevant stakeholders; and (d) interactive decision-making.

New challenges and new opportunities for researchers

195. The challenges for forest science are similar to those for agricultural science: develop alternative approaches that can meet multiple objectives at the lowest cost and that show a potential for a rapid scaling-up across diverse agro-ecological environments.

Forests must be managed within landscapes rather than as separate stands, and the different parts of a landscape may be treated differently (though some stakeholders may want to combine production and conservation agendas). The role of trees and forests in the rehabilitation of degraded drylands or intensively cultivated slopes and in fallow management in shifting cultivation systems warrants more attention by researchers in the natural sciences in order to optimize the contributions of the research work to poverty reduction. In the assessment of new approaches to the sustainability of forest management and ecosystem functions, the potential contributions to local livelihoods should be considered as an important criterion.

196. Research capacities to address poverty and livelihood issues through forestry science are often weak, and more needs to be done to bring about a reorientation in the curriculum, training, research, planning and evaluation processes. FAO, in the *State of the World's Forests, 2003*⁴⁹, exhibits a concern about the research capacity in developing countries in these terms:

“In many countries where forests could have a critical role in sustainable development and enhancing livelihoods, there is little research capacity. In addition, investment has traditionally gone towards improving wood production and processing technologies so that other ecosystem functions and social dimensions, such as poverty alleviation, are often neglected.”

It further warns that:

“If current weaknesses in forest sciences and technology persist, the gap between developed and developing countries is likely to widen. It will also be difficult to adopt sustainable forest management on a wider scale and to address the growing number of social and environmental issues related to forest resource use.”

ECOSYSTEM 3: semi-dry and dry areas subject to degradation

197. The discussion of research priorities related to this ecosystem focuses on three aspects: (a) offering viable options for rainfed farmers in the SAT; (b) water-harvesting and watershed management; and (c) areas and people experiencing desertification: a role for agricultural and natural sciences.

Offering viable options for rainfed farmers in the SAT

198. Most of the world's 500 million rural poor live in arid or semi-arid parts of Africa and Asia. Rainfed agriculture accounts for three quarters of the total cropped land and assures around 60% of the total agricultural production. Because many of these areas are farmed by the poorer sections of society, almost anything that can be done to improve their productivity can be considered poverty reducing. These drylands are being recognized as sources of ecosystem services on a broader scale. Local species of trees, crops and livestock are able to tolerate drought and low rainfall conditions, and their value for biodiversity is recognized as other parts of the world are experiencing the effects of global warming.

199. A major study commissioned by the International Crops Research Institute for the Semi-Arid Tropics on the R&D challenges in SAT areas⁵⁰ makes a strong pitch for a focus on the poor people living in these areas:

“Although there are likely to be more poor people in the humid and sub-humid... developing countries, it seems clear that the semi-arid tropics will continue to deserve priority by the international R and D community. It is in the SAT that the challenges of poverty and food and nutrition security will remain well into the new millennium in spite of the generally optimistic outlook for the developing world as a whole. There are particularities about the SAT that require a special focus if these triple scourges are to be eradicated. These include the vagaries of the climate, the breadth, depth and nature of poverty, the degrading natural resource base, poor infrastructure, neglect in national R and D priorities and the dynamics of change in both demand and production patterns.”

200. Many themes and topics of relevance to R&D can be drawn from the above study, including the following: (a) intensification of agriculture in the form of higher yields, multiple cropping and reduced fallow periods; (b) development of integrated soil-water-nutrient management technologies; (c) diversification; (d) improving the productivity of existing livestock components, including integrated crop-livestock management systems; (e) productive use of the biomass of area-specific crops; (f) promotion of non-farm rural employment and enterprise, associated with studies on migration and the feminization of agriculture; (g) understanding the dynamics and determinants of poverty in semi-arid areas; (h) development of post-harvest options; (i) promotion of access and tenure rights to land in general, water and grazing lands; (j) improving watershed management with an emphasis on water-use efficiency, soil conservation and carbon sequestration; (k) studies of land degradation; and (l) definition of water policies and water-related institutional innovations.
201. What becomes obvious from this range of topics is that problem-oriented or thematic mandates are more important than commodity or species-specific mandates. For research to become more successful in addressing poverty, partnerships with national research institutions must overcome the difficulties attached to the diversity and heterogeneity of the SAT. Most of the research would thus have to be applied and adaptive rather than basic or strategic. Regional and international research institutions should not only play a backstopping and facilitating role, but also focus on generating public goods that are relevant, usable and applicable. Far too many technology discoveries are still on the shelf, and generations of the poor living in the SAT are being bypassed by research.

49 Sayer, Vanclay and Byron (2003).

50 Ryan and Spencer (2001a).

Water-harvesting and watershed management

202. Water will continue to be the main limiting factor in the semi-arid areas of South Asia. In rainfed agricultural areas, watersheds will remain the focus of research on INRM, including soil and water management. Water-harvesting will be an important element of integrated strategies, and it will provide the key to transforming the economic and ecological base of villages. Crop growth can be enhanced by creating micro-catchments to harvest and store water in the plant zone. Small-scale reservoirs can help recharge groundwater resources and supply supplemental (even life-saving) irrigation.
203. It is likely that the only way to balance the growing demand for water and the diminishing availability of water will be to shift from today's reliance on groundwater and rivers to the capturing of rainwater. A study of several villages hit by drought in the states of Madhya Pradesh and Gujarat (India) revealed that, of the villages adopting rainwater-harvesting measures or watershed development, none had experienced drinking water problems, and some even had water for irrigation.⁵¹ The author of the study felt that every village in India could probably secure its water needs by capturing rainwater. What is exciting about the findings is that community-based, small-scale water-harvesting technologies seem to be more efficient than conventional dams. The experience of these villages offers proof that "small" is ecologically efficient since ten small dams (1 hectare) are able to store more water than a single dam with a 10 hectare catchment. Work carried out elsewhere in India (Sukhomajri and Ralegaon Siddhi) has demonstrated very well how rainwater-harvesting can be used as an entry point for eradicating rural poverty by generating employment, reducing migration and broadening the local livelihood base. Rainwater-harvesting requires collective action to succeed, and this can be adopted as a starting point for reviving the neglected tradition of community-based local resource management.
204. Concerns about widespread soil degradation and depleting sources of water and thinning tree cover, have prompted major investments in watershed development. The results have been mixed. While many observers believe too few impact studies have been undertaken (considering the level of investments), the studies that have been carried out have found evidence of environmental, social and economic benefits, as well as areas where improvement is necessary. According to an evaluation study on watershed projects in India,⁵² for example, village-level access to irrigation water improved because of the introduction of water-harvesting measures, while local employment opportunities increased, soil erosion on uncultivated lands slowed, and fodder supplies from common lands expanded. However, problems remained with regard to equity (the landowners benefited more than did the landless), as well as maintenance. Most of the structures were highly subsidized, and there was evidence of weak ownership, suggesting that people may have participated mainly to gain access to employment opportunities.

51 Agarwal (2001) is the source of the paragraph.

52 Kerr, Pangare and Pangare (2002).

205. The formal research establishment has lagged behind in efforts to explore and build upon local water-harvesting traditions, and many watershed management projects, even the more technically appropriate ones, have failed to take account of local realities. Furthermore, both research and projects have been insensitive to the importance that local populations often assign to issues such as equity and the distribution of benefits and services.
206. Collective action by villagers is essential for successful implementation of watershed rehabilitation and management, effective water harvesting, and the like. Projects are therefore giving more emphasis to the end-users of water, especially to foster and enhance the community-level sense of ownership. The term “participatory watershed management” is increasingly being used. It is important that participatory approaches be easy to replicate and scale up. Landscape and watershed-level research is needed to help in understanding natural resource interactions. This implies a need for longer time frames, as well as the obvious need for more interdisciplinary and team-based participatory research approaches. The nature of the issues require that complex technical, economic and social factors be addressed and that appropriate mechanisms be explored for organizing stakeholders, facilitating local collective action and resolving conflicts.
207. The sustainability of water-based technologies should be viewed in terms of the diverse dimensions of these technologies: agronomic, environmental, economic and institutional. The natural assets that are enhanced through the regeneration and improved management of the resources within a watershed must be used carefully, and this will be possible only if the local community controls and benefits from them. Fundamental changes in governance may be required away from top-down bureaucratic approaches to more participatory and decentralized ones, whereby management is assured by the local community. Approaches must become more holistic, and researchers must adopt broader and more integrated frameworks that are more sensitive to gender, environmental and equity concerns. The large numbers of projects already on the ground provide many opportunities for comparative research and analysis in efforts to reorient existing and future programmes.

**Areas and people experiencing desertification:
a role for agricultural and natural sciences**

208. Desertification can be defined as the degradation of productive drylands (rangeland, cropland and woodland) into less productive desert. The term does not refer to the expansion of existing deserts. Overgrazing, deforestation, intensive land use and poor water management are often associated with drought, i.e. when rainfall is significantly below normal. Increases in population and poor land-use practices are often identified as other major causes of desertification. However, the relationship between population and desertification is not so clear cut and straightforward as once believed. Nowadays, climatic variation is considered as important as human activities. The Framework

Convention for Climate Change warns that drylands are particularly vulnerable to adverse climatic changes. The United Nations Convention to Combat Desertification also acknowledges the influence of climatic variation and warns that the causes of desertification are complex.

209. Desertification threatens food and water supplies, as well as livelihoods, and it exacerbates already high poverty levels. Drylands normally respond quickly to the fluctuations of wet and dry years, but this resilience is being compromised by greater desertification. The consequences of desertification also affect people living outside the immediate area because the vegetation in dry zones actually stores large amounts of carbon, and, contrary to popular belief, drylands are extremely rich in biodiversity. Biological resources in the drylands are becoming more well appreciated as the effects of global warming become more obvious and frequent. Desertification not only has enormous social costs, it is also a drain on economic resources. As men migrate in search of better livelihoods, women must bear an extra burden of work and responsibilities. The assets on which these women depend are often degraded or devalued, and the result is often greater famine and poverty.
210. In terms of the number of affected people, the continent hardest hit by desertification is Asia, though the impact is variable. There are vast degraded areas in India, the Islamic Republic of Iran and Mongolia. However, China is one of the most heavily affected countries, with 27% of the country's area now considered desert. According to the United Nations Convention to Combat Desertification, the economic losses can be estimated globally at around USD 6.5 billion and the number of people affected more or less directly at over 400 million.
211. It may not be unfair to say that the science and technology establishment in most Asian countries has simply not done enough to address the role of land degradation as a major cause of rural poverty, particularly desertification in the semi-dry and dry zones. Areas where more research is required include: (a) the stabilization of sand dunes; (b) the design of windbreaks; (c) the development of water-capturing technologies; (d) the identification and promotion of arid-zone reforestation technologies; (e) the rehabilitation of natural pastures and rangelands; (f) the enhancement of controlled-environment production systems; and (g) the enhancement of desert livestock productivity and related animal health systems. Little is known about the research or knowledge implications of adopting an integrated and ecosystems approach to resolving the problems raised by desertification.
212. The foreseeable social and ecological returns from investment in dryland areas should be sufficient motivation to overcome the challenges. Yet, few scientists are involved in the research, and very little exchange is occurring among those who are. Regional and international institutions should make a long-term commitment to fostering and financing exchanges among countries. The acquisition, transfer and adaptation of technologies and institutional innovations could be facilitated by promoting access to

information technologies and electronic conferencing (exchanges of video material among countries). Advanced institutions of learning and centres of excellence should seek ways to mentor and guide the testing and development of potential innovations. Satellite-imagery engineering and geographic information systems are valuable tools that could be used to estimate the magnitude and nature of the problems related to desertification and land degradation, analyse the issues of reversibility, and generally assist in planning more effective interventions and in monitoring progress.

213. Some of this work can be done directly by multilateral institutions, while the application and utilization of the knowledge can be enhanced by adopting more decentralized strategies that involve local research institutions and local communities in the identification and development of solutions. On-farm research is an efficient way to address the problem of poor access to the results of on-station research. Goals such as community-based NRM and sustainable and equitable land use imply: (a) a need for more participatory approaches; (b) acknowledgement of the need to clarify property rights (given the predominance of CPRs); and (c) an effort to empower community institutions so as to foster efficiency and sustainability.
214. The complexities of desertification make this a doubly difficult theme for scientists and development workers. The failures have been numerous, and the neglect has been long standing; yet the need for viable options remains great. Awareness that desertification is a reality for millions of poor people in Asia should prompt the research establishment to address these problems with a sense of urgency. Although the population numbers may not seem striking in relative terms, the depth of poverty, the worsening trends and the implications of neglect by R&D establishment warrant a broader recognition of the importance of dealing with resource degradation in the dry and semi-dry areas of the continent.

ECOSYSTEM 4: irrigated areas and systems under stress

215. In many countries of Asia, water for irrigation no longer comes primarily from canal systems, but from groundwater. In many parts of China, India and Pakistan, too much groundwater is being extracted in agricultural and densely populated areas, while pumping at unsustainable rates has contributed to a significant lowering of water tables (in some coastal areas, to the intrusion of salt water). In certain places, urgent policy intervention is needed because renewable groundwater resources are low and usage is high.
216. There is no denying that the expansion of irrigated land area – from 85 million hectares in 1966 to about 161 million hectares in 1992 – was a major factor explaining the growth in food production during the green revolution in Asia.⁵³ However, this growth

53 FAO (1993).

was accompanied by many complex ecological difficulties. For example, salinization caused by intensive irrigation and poor drainage is a serious problem in South Asia, China and north east Thailand. Time-series data for 1971-93 from India and Pakistan's Punjab suggest that the intensification of land and water use provoked severe resource degradation (salinization and waterlogging) and that overall productivity growth slowed. The productive capacity of many irrigated tracts in favoured zones dropped dramatically, even as the rates of growth in food production improved.

217. Per capita water availability in Asia reportedly declined by about 50% between 1985 and 1990, and countries such as China, India and Pakistan are expected to reach water stress during the next two decades. China, India, Pakistan and Thailand all need to improve irrigation efficiency if they are to sustain rising farm incomes and employment opportunities originally driven by the spread of irrigated agriculture.⁵⁴
218. Poverty and affluence coexist in irrigated areas, where large numbers of poor people live alongside the relatively more well off, particularly in some countries of South Asia. Continued attention to irrigated areas is therefore justified for the sake of poverty reduction, but the focus should shift towards: (a) addressing the environmental issues arising from intensification; (b) improving the efficiency of irrigation systems; (c) developing lower cost water conservation and irrigation schemes; and (d) promoting the more equitable distribution of scarce water resources. Experience has shown that this last can be fostered by transferring scheme management to users.
219. The problems resulting from the intensification of irrigated agriculture are well known. In light of the serious environmental degradation that has taken place in many irrigated tracts, research is needed on ways to enhance productivity in more environmentally sound ways. The environmental consequences of irrigated agriculture are already a relevant subject of research enquiry for the future, including the rehabilitation of salt-affected areas and the introduction of legume crops and reduced tillage options. The conditions of saline and alkaline soils differ widely, and tailored approaches are required to reclaim these soils for crop cultivation. Because irrigation is by far the most important user of water, research on water-saving options and the use of wastewater for crops and livestock merits closer attention. Soil fertility problems and loss of nutrients are often associated with monocropping and intensification. Diversification could therefore be one of the components of a rehabilitation strategy.
220. Existing farming systems may have to be redesigned, and system redesign implies the need to find substitutes for chemical inputs, as well as opportunities for synergies that can enable a transition away from high-input conventional farming. Under the IFAD-assisted Rice Wheat Consortium project in the Indo-Gangetic plains, which supports minimum and zero tillage and water-saving options, scientists are working closely with farmers on new ways to manage rice and wheat residues (up to 7 or 8 tonnes/hectare/year). When burnt during land preparation, these residues generate as much as 13 tonnes of carbon dioxide per hectare. Agro-ecosystem

functions also need to be prioritized. The promotion and protection of biodiversity as opposed to monocropping would not only improve agro-ecosystem functions, but would also further the goal of income diversification. Much research will probably be oriented towards addressing conservation and environmental objectives with a view to conserving agriculture ecosystems.

221. An emphasis on institutions will continue to be relevant. In their review of the evolution of Asian irrigation, Barker and Molle (2002) conclude that there has been a serious lag in the development of appropriate institutions to deal with the new environment of water scarcity. For them, a major challenge lies in creating institutions that can: (a) allocate water equitably among competing uses and users; (b) integrate the management of irrigation at the farm, system and basin levels, thereby reducing upstream-downstream and head-tail conflicts; (c) integrate the management of irrigation using groundwater and surface water; and (d) address the problems of irrigation development, including the disposal of waste water and attention to other environmental concerns, health, etc. These are promising elements of an agenda for an integrated water resources management strategy.
222. It is becoming accepted that past policy environments (trade, the use of inputs, pricing) have encouraged monocropping, the overexploitation of groundwater resources and the misuse of chemical inputs, resulting in the degradation of vast irrigated tracts. There is thus a need to support research and discussions on these issues among scientists, policy-makers and development administrators. Water management in irrigated areas must become more sensitive to the issue of equitable distribution in a water-scarce world. Major policy and institutional reforms must be undertaken so that research can nurture the development of policies tending to optimize the management of water and other resources.
223. In India, the growing use of groundwater over the past 25 years has largely escaped government notice because this groundwater boom involved the informal sector in which public agencies played only an indirect role. Because policy has lagged behind the reality of groundwater development, policy-makers must update policies and take steps to: (a) understand the situation better (e.g. the trends and driving forces behind groundwater use); (b) carry out resource analyses to identify hot spots of unsustainable groundwater use; and (c) manage groundwater actively from the early stages of exploitation. The potential consequences of overexploiting groundwater, a precious and productive resource, could be catastrophic.⁵⁵
224. In conclusion, the regeneration of resources within irrigated landscapes where the green revolution once thrived requires a radical change in the way research questions are derived and prioritized and in the approaches employed to address them.

54 Barker and Molle (2002).

55 TATA and IWMI (2002).

ECOSYSTEM 5: coastal and wetland systems

225. The following discussion of ecosystem 5 addresses four aspects: (a) some cross-cutting issues; (b) marine fisheries; (c) inland (freshwater) fisheries; and (d) aquaculture.

Some cross-cutting issues

226. Fishing communities are under severe pressure due to rising coastal populations, changing land uses, destructive fishing methods, and the development of aquaculture, infrastructure and industries. The result is a steady degradation of coastal and wetland habitats. The sea and many inland bodies of water (rivers, lakes and wetlands) have, at least until recently, been largely open-access resources. Government intervention in response to the growing demand for water has raised both the number of stakeholders and the demands on water. The effect has been an acceleration in the process of degradation, often exacerbated by poor attention to the property regimes of aquatic resources. Like other CPRs, most marine and many freshwater fisheries are vulnerable to overexploitation and misuse, even control by outsiders. Open-access fisheries are the main means of livelihood of many inhabitants of coastal areas, especially the poor. Poverty issues have generally not received as much consideration as environmental issues.
227. Wetlands, which are the transition zones between land and bodies of water, include estuaries, marshes, lakes and river banks. Biologically diverse, they are often a valuable means of livelihood for the poor, and they also provide major ecological services, the value of which is now becoming more appreciated. The viability of inland and marine fisheries often depends on the wetland environments where the spawning grounds are located, and wetlands frequently supply water for irrigation and flood recession cropping. A variety of wildlife, especially birds, depends on the wetlands and contributes to their productivity and stability.
228. Coastal habitats, which also furnish valuable ecological services (climate regulation, waste treatment, protection by mangroves against coastal erosion and flooding), are often degraded to a point where species diversity has declined. Combined with overexploitation of fish stocks and weakening community resource control, degradation is affecting the livelihoods of coastal fishers. Their opportunities for developing agriculture, agroforestry and livestock production have been grossly neglected even by more recent “integrated” coastal resource management projects. A rapid analysis of the livelihood systems of households living in coastal communities inevitably brings to light the importance of these linkages.
229. The significant role of women in the fisheries subsector is often overlooked. Women are especially active in post-capture handling, processing and marketing, areas in which they dominate in the labour force.⁵⁶ Any changes in the fish production and processing patterns that tend to diminish the role of women will affect the well-being of these

women's families in terms of income and fish intake. Better fish-handling technologies that allow women to reduce losses would not only boost fish supplies, but also improve the livelihoods of women.

Marine fisheries

230. Globalization and steadily rising competition for aquatic environments are placing fishers communities in danger of losing access to and control over a resource base that may also be dwindling due to environmental changes and overexploitation. The basic challenge is to establish and maintain institutions (namely, norms and rules) that can help guide decisions by local communities⁵⁷ which are being invited to undertake an empowering “co-management” role. This term is used whenever a fishery is jointly managed by a local community and government, with the latter providing essentially an enabling legislative framework. As in the case of rangelands and forests, there is a need to foster and nurture local institutions that can manage their fisheries resources in a sustainable and equitable manner.
231. Innovative coastal resources management schemes such as those sponsored through IDRC's Community-Based Natural Resource Management Programme have had a significant impact on coastal resources in countries such as Cambodia, Indonesia, the Philippines and Viet Nam. The programme experience in the coastal areas of South-East Asia has much to offer to countries in South Asia, where community-based resource management approaches have yet to be widely tried or utilized.
232. In the long run, the opportunities for increasing fish supplies through capture fisheries will depend on: (a) investing in resources and habitat rehabilitation; (b) tapping underexploited areas; (c) establishing and enforcing agreed catch limits; and (d) reducing discards and wastage.⁵⁸ Integrated approaches to coastal resources management will help reverse coastal degradation and enhance the well-being of coastal populations only if the approaches also take into account not solely the environment, but also agriculture, fishery, agroforestry and livestock dimensions of local livelihoods.

Inland (freshwater) fisheries

233. The Mekong River basin, one of the world's most diverse and productive ecosystems, covers parts of Cambodia, China (Yunnan province), the Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam. Large-scale development plans for the basin do not always consider local interests or the potential environmental impact on local CPRs. The fact that major Mekong resources such as water, fisheries, land and

56 Williams et al. (2002).

57 Nielsen et al. (2002).

58 Ahmed et al. (1999).

forests are CPRs is often overlooked in the assessments of the benefits and costs of development schemes. Where they are weighed, their real value is systematically underestimated. Yet, a rich array of aquatic resources are generated through various related environments, and the productivity of farms and grazing grounds is often maintained through relationships with the river, which deposits fertile soil during floods, recharges groundwater, etc.

234. The livelihoods of 65 million farmers and fishers in the Mekong basin are dependent on the natural resources and ecological wealth created by the river. Because of growing material aspirations, population pressures and expanding requirements for food, the task of feeding these people while also protecting the Mekong's natural resources is a major challenge. Natural-resource-accounting approaches should replace the conventional calculations of economic growth. The calculation framework should reflect a recognition of the rights of the local communities and ensure proper valuation of the role of the commons at various levels. Technological, policy and institutional options must be urgently identified.⁵⁹
235. The community-based management of open-access inland fisheries is a major arena for assisting the poor. Nearly 70 million people live in flood-prone ecosystems or in depressed basins and lowland areas adjacent to rivers and coastal areas where population densities are generally high. Around 10 million hectares of rice lands in South and South-East Asia are subject to uncontrolled flooding during the monsoon seasons, and only the traditional, long-cycle, deep-water rice varieties can be grown. Land and labour productivity is low, and underemployment and poverty are widespread in such areas in Bangladesh, Cambodia, eastern India, Thailand and Viet Nam.

Aquaculture

236. Other opportunities for the intensification of aquaculture exist, though more attention must be paid to environmental sustainability. There is room for improvements in the productivity of fish polyculture systems (based primarily on natural foods) in inland bodies of water even as natural fish diversity is maintained. A WorldFish Center review⁶⁰ of integrated agriculture-aquaculture systems in Asia concludes that considerable potential exists for the integration of aquaculture within crop-livestock systems in the region, but that the dynamic nature of the systems due to economic and environmental changes must be recognized. Participatory, flexible and adaptive technologies that farmers can integrate into existing farming systems have worked much better in poverty reduction or livelihood-oriented aquaculture programmes. Integrated agriculture-aquaculture in mixed systems on small farms in Asia are now recognized as a tool for poverty reduction, nutritional improvement and employment generation.

59 Ahmed and Hirsch (2000a) (2000b).

60 Prein (2002).



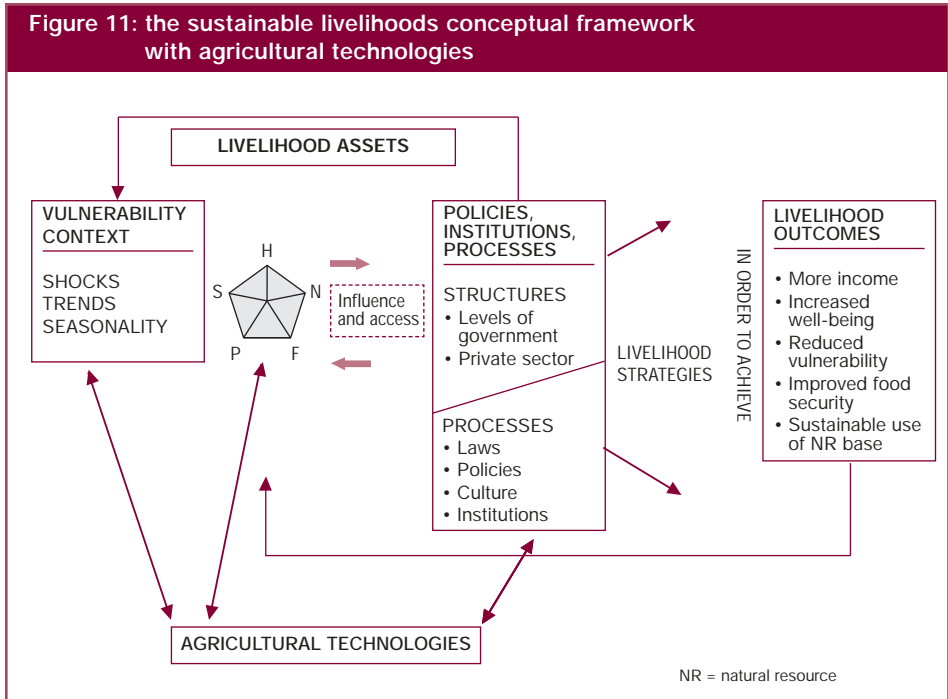
VI. METHODOLOGICAL IMPLICATIONS OF A SHIFT TOWARDS PRO-POOR RESEARCH

237. This section outlines some of the methodological implications of a shift towards pro-poor research, as follows: (a) the sustainable livelihoods conceptual framework: implications for poverty-oriented research; (b) the importance of decentralized modes of doing research; (c) participatory R&D and the implications for organizational change; (d) biotechnology and the rural poor; (e) a broader social and community context for agricultural research: a prerequisite for successful participatory research; (f) incorporating gender analysis in agricultural research; (g) broadening and deepening the role of the social sciences in national and international agricultural research systems; (h) capacity development in R&D organizations; and (i) nurturing reform in agricultural research institutions.

The sustainable livelihoods conceptual framework: implications for poverty-oriented research⁶¹

238. According to the CGIAR/NGO Committee, about 1.9 billion to 2.2 billion people remain relatively untouched by modern agricultural technology. Many poor smallholders are characterized by meagre holdings, little or no capital, few off-farm employment opportunities, complex and diverse farming systems and complex income strategies. They operate in erratic environments and are exposed to frequent market failures. Their access to land and other resources is limited.
239. Today, the development community is using broader frameworks as tools for understanding and working with the poor. The sustainable livelihoods conceptual framework, a form of livelihoods analysis that is used by a large number of organizations, including the United Nations Development Programme, IFAD and the Department for International Development (United Kingdom), is illustrated in Figure 11. The purpose of this tool is primarily to help understand the diversity of economic activities in which poor people are engaged, though it can also be used to assess and prioritize development interventions.
240. The sustainable livelihoods framework is primarily a conceptual framework for analysing the causes of poverty, the quality of access by the poor to resources (assets or capital) and to livelihood opportunities, and the relationships and interactions among

61 See Adato and Meinzen-Dick (2002).

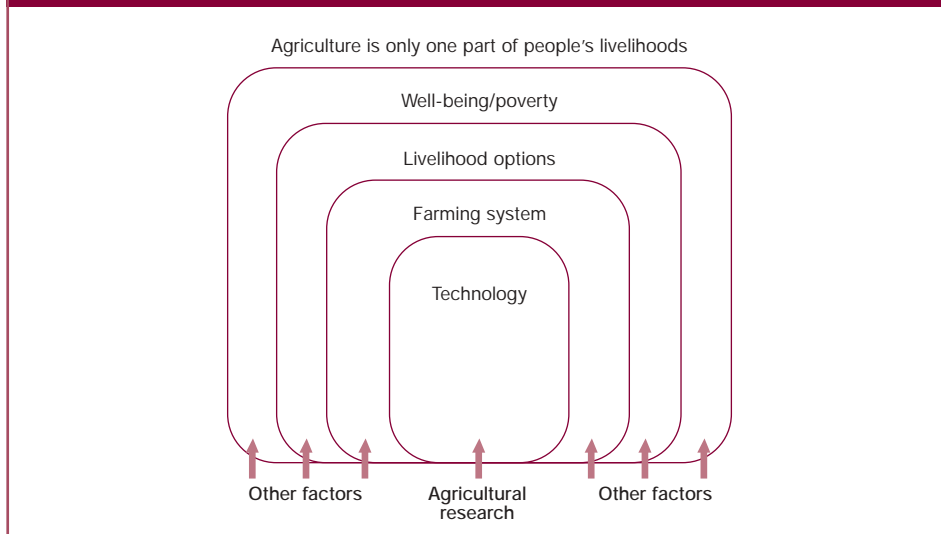


Source: Adato and Meinzen-Dick (2002)

relevant factors at the microeconomic, intermediate and macroeconomic levels. A key feature of the framework is that it recognizes people as actors with assets and capabilities and as individuals able to act rationally in pursuit of their own livelihoods goals.

241. A shared vision of the framework and its guiding principles would improve the relevance of agriculture and NRM research for poor people, especially those people living in LFAs. The following discussion of the framework highlights the need to consider more holistically the multiple and interactive influences on people's livelihoods. The framework analyses livelihoods, including their dynamic nature (how they change), as well as the multiple strategies that people use to secure their livelihoods. Now that the goals of agricultural research are broadening into the areas of poverty reduction and resource management, the framework, complex though it may be, will be especially meaningful for researchers.
242. The sustainable livelihoods framework can open up new opportunities for reflection on the multiple factors that influence people's livelihoods. It can then help narrow the scope of study to the factors likely to have the most impact or to be most relevant to the targeted stakeholders. Assets such as land and credit have always been recognized as important, but the framework also takes account of human, social and physical assets. The potential interaction and complementarities of five kinds of assets (natural, social, human, physical and financial capital) should be reflected in research efforts.

Figure 12: role of agricultural research and technology in livelihoods and well-being



Source: Adapted from Small and Svendsen (1992) by Adato and Meinzen-Dick (2002).

Figure 11 identifies at least three areas where agricultural research could make a valuable contribution: (a) by addressing the vulnerability context; (b) through linkages with the asset base; and (c) at the level of policies, institutions and processes.

243. Agricultural research can reduce, or (inadvertently) increase, vulnerability because research and technologies have strong repercussions on several aspects of the human, physical and natural asset base. The process of agricultural research can also help create or strengthen social assets, e.g. through farmer field schools engaged in participatory learning activities. Policies and institutions can influence people's options in pursuing their livelihood strategies, as well as the distribution of assets within and among households. They also influence the decisions of researchers in technology development.
244. Using the sustainable livelihoods framework improves the diagnosis and therefore the understanding of poverty and livelihoods by fostering interdisciplinary teamwork and partnerships and by building relevant feedback mechanisms. The research design becomes an iterative process. The framework can also be used to measure the impact of agricultural research, though this is not the most direct way of doing so due to the many factors at different levels that would have to be considered. Many of these factors do not relate to technology, and agriculture may not even play a central role in the analysis. After all, agriculture is but one part of poor people's livelihoods, and research and technologies are likely to affect only part of the overall livelihood system (Figure 12). Understanding that other factors impinge at each point can be critical to improving the impact of agricultural research.

The importance of decentralized modes of doing research

245. Poverty and the complexity of agricultural systems pose special research challenges. The LFAs in which many of the poor live are characterized by a degree of heterogeneity that partly explains the failure of past approaches to doing research. More dispersed, decentralized, site-specific research is needed to deal with the high variability of ecological, social, cultural and economic factors.
246. Indeed, site-specific research engages the farmers, fishers, livestock raisers and forest dwellers directly in an effort to derive and influence the research priorities, agendas and approaches. Appropriate methods must be identified and developed to foster opportunities for such work. Multidisciplinary research is appropriate, and social scientists should be brought in early on to coordinate with biological scientists in design, technology development and evaluation. Logistical solutions and transaction costs must not be taken for granted, but must be viewed as essential, strategic investments. Participatory approaches are critical given the complexity, interdisciplinary nature and site-specificity of the sort of research required by the LFAs. Invariably, a menu of options should be developed for each agro-ecological niche. There is little or no role for supply-driven approaches to research in LFAs.

Participatory R&D and the implications for organizational change

247. Participatory research within agricultural research institutions started in the 1980s, but it has rarely been successfully institutionalized and often remains isolated and marginalized. The hierarchical management structures of most research institutions, a culture of individualism and a narrow conception of agricultural science as primarily a natural science have discouraged the advancement of the few participatory efforts.⁶² The commodity orientation of many research institutions limits the inclusion of the perspectives and needs of farmers in research.
248. A revival of interest in participatory approaches has been noted, however. Criticisms of international agricultural research focus on the lack of impact on rural poverty, and this, among other reasons, has led to a stagnation in funding. Donors are demanding visible evidence of impact and feel that farmer integration in research will generate more relevant results. A contributing factor in this change in donor attitudes has been the experiences with public administration reforms and trends towards greater accountability and stronger client orientation in a number of donor countries.⁶³
249. Because of the recognition that the supply-driven approaches of the past have not been effective in reaching the poor, more demand-driven approaches are being adopted. They feature a greater role for the end-users of the research and its outputs. A multifaceted approach will be needed in order to introduce participatory research within institutions. Some fundamental changes are required in the way agricultural research is conceptualized so as to achieve a better integration of the perspectives of

the social and natural sciences. A sharper focus and mandate for addressing poverty and NRM issues in LFAs will have significant structural, organizational, financial, human resource and behavioural implications (see elsewhere below).

250. The process of becoming participatory researchers entails a holistic change in knowledge, attitudes and practice. The core capacities required for participatory research are often incompatible with dominant research norms and practices. Unique challenges are posed in designing appropriate learning processes, setting up support mechanisms and facilitative environments, and mobilizing resources and expertise.⁶⁴
251. There are spinoffs from participatory research that go beyond the adoption of technologies, and they often have long-term implications for local communities. Studies by the International Center for Tropical Agriculture⁶⁵ on the impact of farmer participation in NRM research in three projects funded by the International Potato Center, the International Crops Research Institute for the Semi-Arid Tropics, and World Neighbours found that, while participatory methods do result in more suitable technologies and greater adoption by farmers, they also – and more importantly – give rise to learning and change. Among the benefits are new skills gained by individual farmers (human capital) and the emergence of organizational capacity for innovation and action at the community level.

Biotechnology and the rural poor

252. Critics of the green revolution, as well as those people who advocate for the need to address equity concerns, have expressed disappointment that the crops of poor people and marginal areas have not benefited from the technological breakthroughs, including new, higher yielding varieties. Conventional plant breeding has not focused on achieving tolerance to the adverse conditions (drought, salinity, etc.) that are faced mainly by the poor. These shortcomings are often explained by the “complexity of the trait-environment interaction and the variability of these stresses over time and space”.⁶⁶
253. Various combinations of participatory, conventional and biotechnological plant breeding could improve crop tolerance to adverse conditions. Biotechnological approaches do not have to rely on transgenic methods. Because they are controversial (and untested in the realities experienced by poor people), these methods will inevitably delay the dissemination of research outputs, which the poor cannot afford if they are to benefit from the second green revolution.

62 For a useful synthesis of issues related to institutionalization, see the IIRR and ETC Ecoculture (2002).

63 Becker (2000).

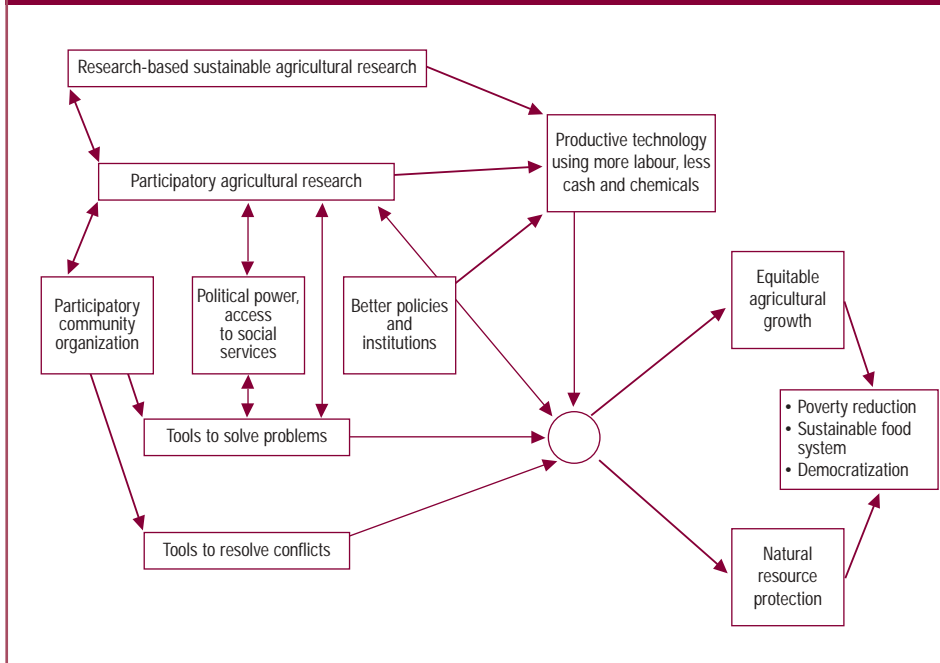
64 Campilan (2002).

65 CIAT (2002).

66 CGIAR (2002).

254. Biotechnology is often presented as a promising new phase of productivity growth, including new production systems that are less dependent on the chemical inputs now known to have negative environmental consequences.⁶⁷ Likewise, while it is claimed that biotechnology offers the potential for the development of crop varieties for rainfed, drought-prone and upland areas, biotechnology remains controversial. Many other claims and counterclaims are being made about the potential environmental, human-health, economic and social risks. There are also many social and ethical issues involved because of the near total monopoly of multinational corporations in biotechnology research. Will small farmers be able to afford to implement the research results? How big is the risk that the crops grown by the poor will continue to be neglected on the grounds of lack of profitability? Will biotechnology lead to fewer technology choices for poor farmers? What can be done to reduce the exclusivity of technologies controlled by a few global corporations?
255. There are barriers to be overcome with regard to intellectual property rights issues as well. “Currently, most established or promising plant genetic transformation strategies are covered by patents owned by private biotechnology companies. There are hence already commercial barriers to exploitation of these technologies.”⁶⁸ The private sector will continue to be motivated by the need for profits and to recover its investments in R&D. The following statement of the chair of the private-sector committee of CGIAR is unambiguous:
 “The private sector is willing to license important proprietary technology for the benefit of CGIAR genetic improvement goals, but only on a negotiated basis. As part of these negotiations, it is essential to understand that the private sector cannot and will not share competitive technologies for incorporation in products that will be disseminated in an uncontrolled manner. To do so threatens disequilibrium in the commercial markets where these companies compete using their proprietary technologies.”⁶⁹
256. Developments in biotechnology are opening up new opportunities for genetic enhancement. These serve to reduce the long research lags in conventional breeding and also raise the probability of research success. As both parameters play a big role in determining the economic benefits of agricultural research, biotechnology has the potential to boost substantially the rates of return on investments in crop breeding. However, realizing this potential is not without challenges. These include: (a) the potential risks to the environment and human health (biosafety); (b) policy and ethical issues; (c) the roles of the public and private sectors; (d) the dominance of highly concentrated private-sector firms, which some fear will lead to a new dependency; and (e) intellectual property rights issues.⁷⁰
257. Though the decline in the yields of staples must be urgently reversed, IFAD’s Regional Strategy for Asia and the Pacific envisages an open and democratically controlled science that can alter the biotechnology research establishment, which is currently dominated by a few big corporations rather than by national or international public institutions.

Figure 13: participatory community organization and agricultural research to reduce poverty and raise productivity



Source: Kerr and Kolavalli (1999)

A broader social and community context for agricultural research: a prerequisite for successful participatory research⁷¹

258. Pressures on research organizations to improve their effectiveness in addressing poverty imply a more prominent role for participatory research and, hence, for increased farmer collaboration. The objectives of participatory research may include improving the effectiveness of research, empowering farmers, or both. Success in reaching these objectives has been linked to achieving real progress in participatory community development. In fact, participatory research can contribute to strengthening the skills within local communities, and it should have a place in the broader context of community organization and development. Without a solid understanding of the communities with which they are working, researchers will have difficulty identifying and nurturing participation by less influential groups, including the poor. To have an effect on poverty, researchers must make a concerted effort to ensure that the poor are among those who participate.

67 This and the next paragraph are based on IFAD's 2002 Assessment of Rural Poverty: Asia and the Pacific.
 68 Ryan and Spencer (2001a) (2001b).
 69 Dryden (2000), cited in Ryan and Spencer (2001b).
 70 Ryan and Spencer (2001b).
 71 The source for the first part of this subsection is Kerr and Kolavalli (1999).

259. Even in participatory research, however, it is easy for dominant members of the community to monopolize the process. Researchers must therefore devise innovative approaches for reaching and working with the poorest people in order to address their highly specific needs. This implies that the research establishment should form partnerships with local organizations and support groups (such as NGOs or farmer networks) in order to capitalize on their respective contributions. Figure 13 has been developed by researchers who stress the importance of this broader community context, as well as of empowerment, in enhancing the results of participatory research. Within this framework, poor people would play a central role in identifying socio-economic and technical problems, setting R&D priorities, conducting agricultural research and promoting social and farmer empowerment.
260. Researchers engaged in participatory research undertaken within a broad context require mandates from their organizations that will not only allow, but actually encourage, the forging of partnerships with a range of stakeholders. Besides the strong collaborative dimensions of such work, an interdisciplinary, team orientation to managing and monitoring research will also be necessary. Flexibility in research protocols may also have to be emphasized. The implications of making such shifts are highlighted in the following statement.
- “If agricultural research wishes to move beyond this friendly terrain into the uncharted waters of marginalized regions, less developed countries and complex and confusing livelihood strategies, then it must adopt a fresh outlook, in which the borders of agricultural research ‘per se’ would have to become much more diffuse and interwoven with those of other actors and other institutions.”⁷²
261. The process of change is, indeed, not simple or straightforward.

Incorporating gender analysis in agricultural research

262. Research projects must be designed so that they are sensitive to the poverty, asset base and livelihoods of both women and men also because of recent trends towards feminization with regard to agriculture and poverty. This new awareness needs to be reflected in conceptual frameworks, research protocols, research briefs and outcomes. The tools for gender analysis are now widely known thanks to an array of training opportunities.
263. One of the challenges is moving beyond building awareness and skills in gender analysis to an emphasis on gender-oriented research methods. A more concerted and focused effort is required to build capacity within research institutions to mainstream gender analysis into research design and impact assessments. The current emphasis on entrusting the management of natural resources to local institutions should be expanded to include a role for monitoring women’s rights and status within legal, social and cultural institutions. Research in support of such broader questions calls for the inclusion of focused gender-research capacities within local, regional and national systems.

264. Small grant programmes could be used to foster country-specific and local action research aimed at adapting appropriate methods and tools originally developed in other countries or regions. Effective linkages must be established between these sources of information and the wider community of researchers capitalizing on new opportunities represented by information technologies. Social policy changes in favour of gender-equitable development should be nurtured. Research institutions can and should take the initiative in developing relevant gender policy briefs and organizing roundtable discussions involving the research community and policy-makers.
265. IFAD has prepared a plan for implementing the principles and objectives related to gender mainstreaming and women's empowerment in its strategic framework for 2002-06. This plan seeks to systematize and scale up ongoing efforts to mainstream a gender perspective in various aspects of IFAD's initiatives, thereby complying with the many commitments of the United Nations system. The Gender Plan of Action establishes a common framework within which regional and country-specific strategies are to be designed and implemented. In line with IFAD's emphasis on monitoring performance and impact, a set of time-bound, verifiable indicators is specified to monitor progress in implementing the plan.⁷³
266. Conventional use of the logical framework ("log frame") has also been criticized for being gender blind. This should be changed: guidance on how to generate log frames that identify and account for gender issues in the R&D project cycle can be obtained online.⁷⁴ Indeed, the Participatory Research and Gender Analysis initiative of CGIAR, as well as the work of IDRC, stand out among the few pioneering efforts to ensure that research, too, is gender sensitive. IDRC's methodology for gender analysis in biodiversity research is a useful model for building gender concerns into research designs rather than as separate components.⁷⁵

Broadening and deepening the role of the social sciences in national and international agricultural research systems

267. The mountain areas and uplands of Asia are inhabited by ethnic minorities that have generally been neglected and marginalized. Because cultural and ecological factors are closely linked in the decision-making of these peoples, social scientists should play a critical role in working with minorities in order to avoid repeating the negative experiences of the past.

72 Berdegue, Escobar and Carney (1999).

73 Details on IFAD's experience in Asia are available on the Fund's website, at <www.ifad.org/gender/progress/pi/index.htm> (Gender Mainstreaming: IFAD's Experience in the Asia and the Pacific Region and Lessons Learned). A checklist of generic questions specially designed for researchers is provided in Appendix I.

74 See <www.isnar.cgiar.org/gender/hambly.htm>.

75 See <www.idrc.ca/biodiversity/tools/gender2_e.cfm>.

268. This conclusion is in keeping with the growing recognition within the global research community of the need to adopt a greater focus on poverty and to accept that social science has a key role to play in the design and planning of research (and not merely in impact assessment). Awareness of the need to find ways to reduce inequalities and anticipate the consequences and impacts of interventions on local communities is resulting in more emphasis on social criteria. The reality is that research must deal with issues of degradation and the management of natural resources, and the research framework must be broadened to take account of livelihoods, asset-building and gender. Gender equity, for example, is being perceived both as an objective and as an effective instrument for poverty reduction because it enables women to gain access to and control over basic assets. Such considerations justify the central role of social scientists in agricultural research.
269. Major institutional changes and new human resource capacities are necessary so as to allow public-sector research institutions to make the desired shifts towards pro-poor research and more participatory, partnership-based approaches. Social science capacities should be strengthened or rebuilt, and organizational environments recrafted in order to nurture a change in the attitudes and behaviours within the research community. Without a substantially enhanced social science perspective within research institutions, the goal of reaching larger numbers of poor may be missed.

Capacity development in R&D organizations

270. Many international and national research institutions have reduced their financial and human resource commitments to capacity-building in response to the current declines in overall funding. This is unfortunate, especially because their mandates are evolving towards more knowledge-intensive dimensions such as poverty reduction, NRM, institutional and agro-ecological approaches. External pressures for public-sector institutions to be more accountable to the needs of poor and neglected groups are increasing, and research institutions should gear their internal capacities to respond to these pressures.
271. In the current environment of accelerating technological change and declining budget support, the strengthening of the capabilities of individuals, organizations and institutions is viewed as essential for ensuring sustainability, economic growth and, hence, the eradication of poverty in the poorer areas. The institutionalization of participatory research requires action at various levels within an organization. It cannot be approached in a narrow technical manner by providing training on participatory research methods or by simply involving researchers in client-oriented on-farm research. It is often necessary to sensitize and motivate senior management in order to win their support for participatory research. Changes in the criteria used to assess the performance of researchers are also likely to be required so as to provide incentives and recognition for participatory research.⁷⁶ Capacities must be developed and new attitudes fostered among researchers in order to enable them to transform

their findings into usable knowledge. This function simply cannot be relegated to extension because the researcher has a critical role in reviewing and synthesizing research findings so they can be made widely available in the form of research highlights, source books, training curricula and policy briefs.

272. The historical role of regional and international centres of excellence and other institutions of advanced learning in helping strengthen the capacities of NARS should be revitalized. The use of conventional methods such as in-service training and mentoring should be combined with new technologies featuring electronic and computer-enhanced systems. Networking, always considered an important element of a capacity-strengthening strategy, is greatly facilitated by the availability of information technologies. These and other capacity-strengthening processes should be built up, managed, utilized and sustained.

Nurturing reform in agricultural research institutions

273. Throughout this document, the case has been made that public-sector research institutions should focus on poor populations, especially in LFAs not currently served by the international agricultural research community. A broadening of institutional mandates will be required in order to address a wider range of issues through new research mechanisms and modalities. The new orientation has important implications in terms of organizational structure and environment, processes and staffing, and attitude and behavioural changes among research administrators and scientists.
274. Institutional reform should probably move beyond the basic issues of sound financing, management and governance to include more emphasis on demand-driven research, greater accountability, better performance and impact assessment, and different institutional cultures. Work environments should reward innovation and research focused on the more difficult themes and agro-ecological areas. Indeed, research on poverty and equity, on resource management and environmental impact, on the integration of small farmers into market economics are new areas for research administrators.
275. Some researchers⁷⁷ are of the opinion that the system of incentives, methods of evaluation and compensation mechanisms that predominate within the NARS have been a major cause of discrimination against small farmers in setting and implementing the research agenda. However, they also highlight the importance of the sort of motivation that does not depend exclusively on wages and evaluation systems. Performance, they emphasize, is dependent on the dedication of civil servants to their jobs and on the environment in which they operate. Governments can nurture a sense of dedication by publicizing the relevant programmes and by organizing work in a client and problem-oriented manner.

76 Horton (2002).

77 For example, see Berdegue, Escobar and Carney (1999).

276. However, institutional structures also influence research processes, particularly those that aim at different clientele in more complex environments. Many of the hierarchical institutional arrangements in centralized agricultural systems are unable to deal with the complexities associated with the needs of small farmers. Centralized scientific models of innovation separate scientists and farmers in a way that prevents the establishment of productive relations and affects the quality of R&D.⁷⁸ A link has to be made between the nature of institutional arrangements and the performance of R&D.
277. Some scientists⁷⁹ argue that this “methods bias” masks the fact that most of the successful participatory methods have arisen in specific institutional and political circumstances to deal with problems in those circumstances. This often occurs through coalition-building, i.e. by people brought together because of the necessity to deal with the problems and a shared belief in the approach to be adopted for solving them. These scientists also suggest that the participatory approaches are more closely associated with institutional innovation than new methods and that transferring the methods to new, often unreceptive institutions and organizational contexts stands little chance of success.⁸⁰
278. Today, innovation systems (rather than research) are employed as an organizing principle. The concept of innovation is understood in its broader sense of the activities and processes associated with the generation, production, distribution, adaptation and use of new technical, institutional, organizational and managerial knowledge. In viewing research as part of a wider process of innovation, the concept helps to identify the scope of the actors involved and the wider relationships within which the research is to be embedded. The attraction of the innovation systems framework is that it engages with the political, economic and social dimensions of the production and utilization of knowledge. More important than the knowledge created are the “linkages and relationships between different elements and mechanisms of the system underlying the production of knowledge and its use”.⁸¹
279. Research organizations were originally designed to deal exclusively with productivity-enhancing and commodity-oriented research. Simply changing their mandates and conceptual frameworks and adding a new interest in poverty issues may not suffice. Donors and international and regional research establishments have a major role to play in fostering the testing, development and scaling-up of approaches to institutional re-engineering approaches. Capacity-building is essential, and investments must be made in fostering and nurturing partnerships. Training will have to move beyond the mere provision of tools and methods. Training is undeniably important, but it cannot on its own ensure a successful shift towards pro-poor research in agriculture and NRM.

78 Biggs and Clay (1981).

79 Biggs and Smith (1998).

80 Quoted in Hall et al. (2001).

81 Hall et al. (2001); Hall and Yoganand (2002); Hall (2002).



VII. A CONCEPTUAL FOUNDATION FOR IFAD-SUPPORTED PRO-POOR RESEARCH: GUIDING PRINCIPLES

280. IFAD and its partners have agreed to pursue the following guiding principles:
- Poverty is recognized as the greatest cause of food insecurity, and it should be the prime determinant of agricultural and natural resource research agendas.
 - An analysis of the causes of poverty that affect local resources, including their differential impacts on men and women, is a precondition for developing successful adaptive or action-research approaches.
 - Agriculture is only one aspect of livelihoods, and agricultural research may only be relevant to one part of the household economic system.
 - Agriculture research must seek to reduce household vulnerability by enhancing (or regenerating) the resource and asset base.
 - Land, forests and water resources, as well as crop and livestock diversity, together with knowledge about their use and management, are among the few assets at the disposal of poor households in their efforts to cope with changing conditions.
 - Integrated research at the landscape and watershed levels is needed to help understand natural resource interactions and enhance synergism among the various components.
 - A broadening of institutional mandates is needed if research is to be effective in addressing poverty and equity issues, environmental impacts, gender equity and ways of integrating poor farmers into market economies. Social and economic complexities must be addressed alongside technical issues.
 - Research, not policy alone, must take into account the social, health and environmental costs associated with modern high-input agriculture.
 - Decentralized methodologies, longer time frames, interdisciplinary and participatory approaches are all critical for poverty-oriented research, particularly for LFAs.
 - Understanding and factoring property rights, tenure security and collective action into research designs are crucial in achieving a sustained positive impact on the poor.
 - To address the structural inequalities that prevent women from gaining access to resources, services and benefits, it is necessary to reflect gender differences in research frameworks and objectives and in data collection.
 - Mechanisms must be put in place for organizing stakeholders, facilitating collective action and resolving conflicts arising from competition in resource use.

- The involvement of committed and representative grass-roots organizations determines the relevance of the services delivered to the poor and the uptake of research results.
- Partnership-based collaborative research is essential in order to allow national and local research institutions, the local private sector, NGOs and farmer networks to trade complementary assets, build a collective pool of knowledge and ultimately strengthen their capacities.
- The agricultural sciences and NRM techniques must implement new strategies within new organizational and operational environments so as to ensure that pro-poor perspectives influence the choices. A fundamental change is needed in the way research is conceptualized in order to guarantee the meaningful integration of the perspectives of the social and natural sciences.

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APPENDIXES

APPENDIX I: Gender analysis: generic questions for researchers

Defining the research area

1. What is the proposed subject of research? Is the research area relevant to men and women in different ways? How?
2. Who has defined the research subject? Are both men and women involved in the definition and design of the research? Does the researcher or research team possess adequate knowledge about gender issues to incorporate these into the research? If not, how can this issue be addressed?
3. What are the anticipated outcomes of the research? Who are the expected beneficiaries? Will men and women benefit equally from the research?
4. Does the research subject appear to be gender neutral (i.e. the different experiences, status and resources of men and women are not a relevant factor)? Why? What do women's organizations and researchers with gender expertise have to say about the research subject?

Methodology

5. Are gender differences reflected in the conceptual frameworks, objectives, methodologies, expected outputs and anticipated impact of the research? How can attention to the different situations of men and women be incorporated into these aspects of the research design?
6. How will the design and implementation of the research address factors that often produce unequal opportunities for men and women? For example, where applicable, how will the research address the significance of the following issues:
 - differences between men and women in the access to basic resources (e.g. differential access to education, health, social security, money, capital, collateral, land, information, transportation and technology);
 - differences between men and women that are related to divisions of labour and responsibilities within the household (e.g. attention to limitations on time; gender-specific tasks and responsibilities, including childcare, etc.);
 - differences between men and women that are related to participation within the informal and formal labour markets (e.g. different types of occupations, sectoral distributions, wage and benefit levels and full or part-time work);

- differences between men and women that are related to legal status and entitlements (land ownership, inheritance law, marriage law, etc.);
- differences between men and women in terms of access to power and authority in political and policy arenas and at the local, regional and national levels; and
- social traditions, customs, obligations, entitlements that produce different expectations, opportunities and constraints for men and women.

7. Who will participate in the research? Is the research process designed to create equal opportunities for the participation of men and women? What steps can be taken to ensure that this is so?
8. How will the research methodologies address gender differences? Will methods of data collection and analysis be disaggregated by gender? Will relevant documents about the gender dimensions of the research area be identified and reviewed? Will attention be paid to qualitative and quantitative data?
9. Will there be a need for gender-specific expertise or training? At what stages in the research would such training be most important? What resources are required – budgetary or otherwise – to ensure access to such expertise or training?
10. What criteria or indicators will be required in order to evaluate the success of the research in meeting objectives and having a positive impact in relation to men and women?

Disseminating and applying research results

11. What information will be generated by the research? Will gender-specific findings and (policy) recommendations be identified?
12. How will the research results be disseminated? Will the results be equally accessible to men and women? To the relevant groups or institutions concerned about the issue?
13. What steps will be taken to ensure that gender-specific findings are included in policy discussions?
14. Will results be made available to relevant government agencies concerned with gender issues? To non-governmental women's organizations and networks?

Evaluating the research

15. Will gender issues be incorporated into the evaluation criteria (e.g. evaluations of methodologies, participatory strategies, impact, etc.)?
16. What indicators will be used to measure the significance or impact of the research on men and women?

What to do?: Some suggestions

Consider the research area and research project design systematically in light of the questions raised in the *generic gender analysis* above. Wherever possible, provide concrete answers to the questions and identify possible entry points for including attention to gender in the design of the research project.

Consider the ability of the principal researcher(s) or research team(s) to recognize and address relevant gender issues. Identify complementary expertise, as required.

Consult with individuals and organizations (e.g. women's organizations, policy-makers, researchers, international agencies and donors) with knowledge about the topic and its relevance for men and women.

Identify available literature, documents, and bibliographies meaningful to the subject area and its relevance for men and women.

Disaggregate data and research findings wherever possible.

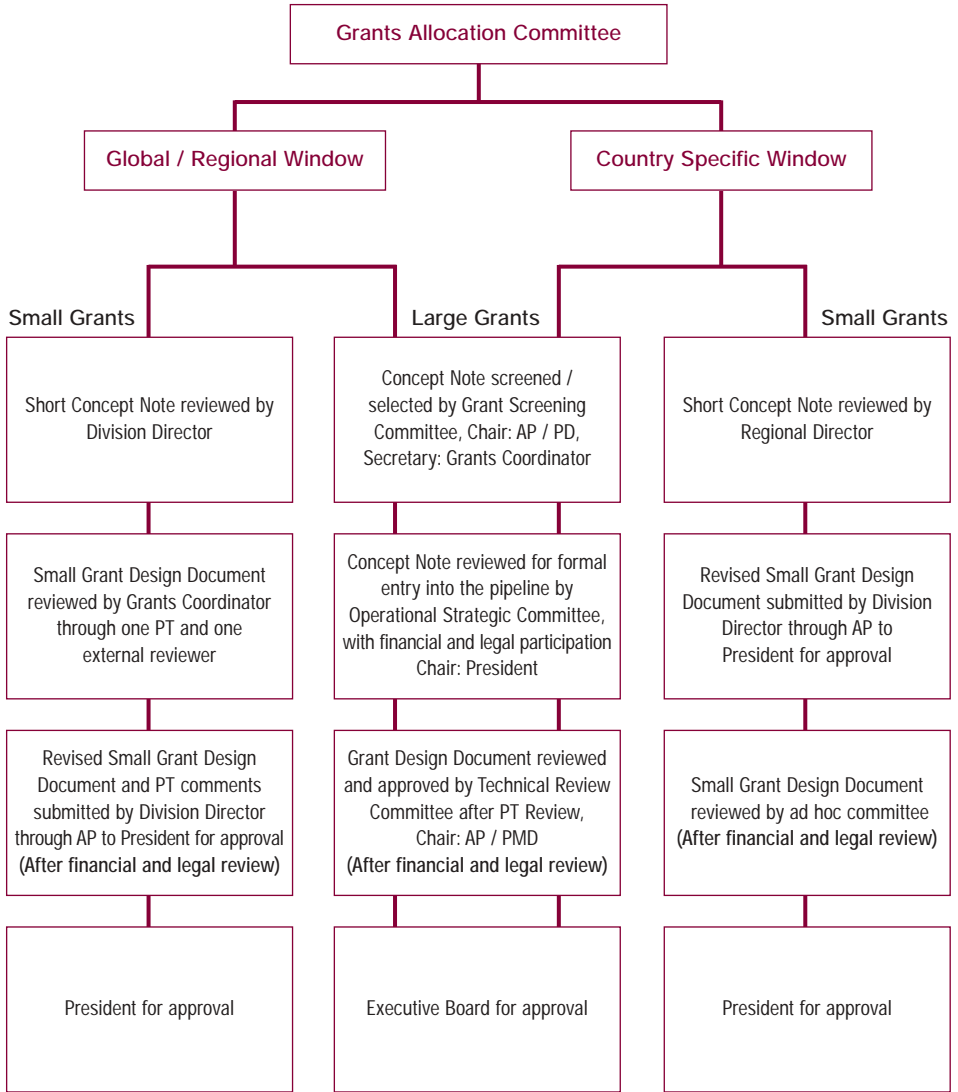
Challenge key concepts or terminology that might obscure differences between men and women (e.g. broad references to "communities", "groups", "households", "participants", "constituencies", etc.). Wherever possible, specify the participants in and the beneficiaries of the research.

Identify specific resources (e.g. human, financial) required to integrate gender into the design, implementation and evaluation of the research (methodological expertise, training requirements, budgetary resources, etc.).

Develop a strategy for disseminating the results of the research and maximizing the potential impact on policy. Discuss the research area and share the results with relevant stakeholders and constituencies (e.g. women's organizations, networks, academic communities, NGOs, ministries of women's affairs and women's divisions within sectoral ministries).

For further information and assistance, contact: IDRC, Assessment of Social Policy Reforms Programme Initiative, 250 Albert St., PO Box 8500, Ottawa, ON, Canada, K1G 3H9. Tel (613) 236-6163. Fax: (613) 567-7748. World Wide Web address: <www.idrc.ca/socdev>. Source: <www.idrc.ca/socdev/research/gender.html>.

APPENDIX II: Process for grant allocation and review



APPENDIX III: Guidelines for preparing technical advisory notes

Objective and purpose

1. The main purpose of technical advisory notes (TANs) is to help users identify candidate technologies for incorporation in development projects and to present the technical information related to these technologies in a form that will promote the wider dissemination and use of research outputs.

Target group and beneficiaries

2. The TAN target groups are:
 - (a) primary target groups: project designers, development planners, national and international development institutions and policy-makers;
 - (b) secondary target groups: project implementers, the relevant staff in national projects, extension agents and staff of NGOs; more specifically: project staff involved in introducing new technologies or practices.
3. The intended ultimate beneficiaries are smallholder farmers and rural small-scale entrepreneurs.

Criteria for preparing technology

4. A technology is ready for adoption if it has passed through the stages of adaptive research, farm trials and farmer assessment, undergone multidisciplinary scientific peer review and is supported by scientific documentation (published or unpublished), which should include an implementation manual, where necessary. Technologies and practices that have been fully researched, but have not gone through the adaptation and farm-trial stages may also be presented as TANs, but it must be specified that they must be put through these stages before wide dissemination. Such technologies may be the subject of a research and development (R&D) component within an investment project.

Scope and general content

5. TANs should contain information emerging from research (published or unpublished); they should be presented in a simplified manner and relate to the implementation environment so that they can be used directly as a basis for developing extension messages. A TAN should reflect new or improved production technologies or practices. In some cases, known, but not widely disseminated technologies or practices can be the subject of a TAN.

6. A TAN can refer to a component of a production process (such as maize varieties or weed control of maize) or a complete production process such as apiculture or aquaculture. In the latter case (so-called “macro-TANs”), the production process will be divided into components, and each component will constitute a separate TAN. The resulting group of TANs should define the process fully. In a TAN that simply describes a component of a production process, it is important to mention the degree of interaction among the components, as required (e.g. the relationship between weed control and land preparation).
7. TANs should provide clear, technical options for verification/adaptation and up-scaling by communities. TANs should facilitate decision-making – for example, TANs on improved fallow should indicate the different methods available and the various species of tree shrubs, or cover crops. The advantages and disadvantages of individual options should also be mentioned.
8. The following is a guideline as to the required format of a TAN:
Cover page: All TANs should have an illustrated cover page indicating the general and descriptive title of the TAN and acknowledging the partner institutions (financing institutions, lead research partner institution, other partner institutions, etc.) associated with the research documented in the TAN.

Introductory section: page 1

General title: All TANS should carry the general title: “Agricultural Technologies for Rural Poverty Reduction”.

Descriptive title: All TANs should have a specific title that is descriptive and reflects the objective of the TAN (for example, “Replacing Fallow with Grain Legumes, Forage, or Medic Pastures”).

Expected benefits: Indicate the benefits associated with the technology described.

Crops and enterprises: Indicate the cropping systems or enterprises that are served by the technology described.

Agro-ecological zones: Indicate the agro-ecological zones that offer potential for the application of the technology described.

Domain of potential application: Indicate the countries where the adoption by farmers has already been successful and the countries that offer potential for the adaptation of the technology.

Key words: Indicate key words to be used for reference purposes.

Main text: page 1-4

Summary introductory paragraph: Highlight the specific problem(s) addressed by the technology (or the new opportunities provided).

Technical summary: Provide a technical summary describing the technology (including the rationale, strategy, required inputs and institutional requirements) and explaining the change the new technology will bring about. This section may include graphic information (tables, photographs, functional illustrations).

Alternatives: Indicate the alternatives available to farmers, or alternative choices to the technology provided in the TAN (e.g. alternative resource management systems or crop varieties), and the costs and benefits of these alternatives in relation to the TAN technology being advocated.

Expected impact: State the expected social and economic impact on target groups (including women and the landless) and the environmental impact on the resource base. This section should be structured in relation to household impact, community impact and resource base impact.

Constraints to adoption: State the biophysical and socio-economic conditions and policies that enhance or constrain the adoption of the technology (risk analysis, if appropriate). Provide cautionary advice to development planners and project designers.

Validation status: Indicate the validation status, i.e. the extent to which the technology has been tested, the degree of farmer participation in the research and the scope of the work still required.

Concluding paragraph: Concluding statement on the TAN.

Additional text

Related TANs (if appropriate) for cross referencing

Date of TAN/date of last revision

Sources of useful additional information and resource persons on the technology

Request for feedback: Feedback should be requested and posted back to the lead institute to enable monitoring of the impact of the TAN.

9. TANs will range from two to four pages in length. TANs will normally be produced in English. In cases where the original TAN is produced in any other language, it will be translated into English for distribution. On a case-by-case basis, TANs may be produced and distributed in other languages in addition to English.

Process and responsibility for drafting, redrafting and refining TANs

10. The lead research centre involved in the development of the technology will be responsible for the research draft and for redrafting the relevant TAN based on consultations with relevant stakeholders, e.g. regional and national research centres. Where different aspects of technologies have been developed in different centres, the concerned centres should be advised to collaborate closely in producing research documentation that will form the basis of the TAN. The lead centre should ensure a multidisciplinary peer review of the TAN. Once the peer review has been completed, TANs should be forwarded to the Technical Advisory Division of IFAD, which will act as a focal point and clearing house for the TAN initiative. Prior to dissemination, the TANs should pass through the division's internal review process during which feedback should be obtained from project designers and planners (the ultimate target groups). Feedback should be requested from users of the TANs regarding the usefulness and their experience with the technologies or practices the TANs describe. This information should be sent to the lead centre and to the research donor(s).

Mechanisms for dissemination and obtaining feedback

11. Three methods are proposed:
 - (a) posting on the websites of IFAD, other donors and the lead centres and, if required, on the websites of other international research institutions and international development agencies, including the World Bank, regional banks, bilateral institutions and NGOs;
 - (b) the circulation of hard copies through existing distribution mechanisms (the Coordinating Commission on Andean Technology, the Association for Strengthening Agricultural Research in Eastern and Central Africa, the West and Central African Council for Agricultural Research and Development, the Centre for Information on Low External Input and Sustainable Agriculture, the Asia-Pacific Association of Agricultural Research Institutions, InterDev, the Association of South East Asian Nations, the South Asian Association for Regional Cooperation and the related Agricultural Information Centre) and relevant ministries, associations, networks, agricultural research forums, educational institutions, etc.;
 - (c) dissemination through newsletters published by regional R&D networks and organizations.

Financing of TANs

12. The production of TANs should be part of the technology development and dissemination process. Consequently, TANs should be financed within this process. Any new research funding should therefore include funding for the preparation of TANs and the provision of funds for the preparation and publication of research results, dissemination and implementation manuals, and extension guidelines, if required. Similar financing is foreseen as part of investment projects, including adaptive research, farm trials and farmer assessment of new and improved technologies or improved production practices.

APPENDIX IV: Relevant extracts from IFAD's lending policies and criteria¹

A. Introduction

- “1. According to Article 2 of the Agreement Establishing the International Fund for Agricultural Development (“the Agreement”), the “objective of the Fund shall be to mobilize additional resources to be made available on concessional terms for agricultural development in developing Member States. In fulfilling this objective, the Fund shall provide financing primarily for projects and programmes specifically designed to introduce, expand or improve food production systems and to strengthen related policies and institutions within the framework of national priorities and strategies, taking into consideration: the need to increase food production in the poorest food-deficit countries; the potential for increasing food production in other developing countries; and the importance of improving the nutritional level of the poorest populations in developing countries and the conditions of their lives”.

2. Article 7 of the Agreement requires that, “in allocating its resources, the Fund shall be guided by the following priorities:
 - (a) the need to increase food production and to improve the nutritional level of the poorest populations in the poorest food-deficit countries;
 - (b) the potential for increasing food production in other developing countries.Likewise, emphasis shall be placed on improving the nutritional level of the poorest populations in these countries and the conditions of their lives.

Within the framework of the above-mentioned priorities, eligibility for assistance shall be on the basis of objective economic and social criteria with special emphasis on the needs of the low income countries and their potential for increasing food production, as well as due regard to a fair geographic distribution in the use of such resources.”

- “4. In formulating its lending policies and practices, the Fund must be guided by the objectives contained in the above articles. There is need to call attention to four such provisions:
 - **First**, financing of projects and programmes specifically designed to introduce, expand or improve food production systems, including marketing, storage and distribution aspects, in developing countries with special emphasis on increasing the output of food in the poorest food-deficit countries;
 - **Second**, increasing the levels of nutrition among the poorest segments of the population in all developing countries by supporting projects and encouraging appropriate institutional and policy reforms;

1 The information in this section was extracted from IFAD's Lending Policies and Criteria. The original paragraph numbering from the Lending Policies and Criteria has been retained in this Appendix.

- **Third**, mobilizing additional resources to be made available for agricultural development in developing Member States; and
 - **Fourth**, adoption of a generally flexible approach to the question of lending priorities and appraisal techniques.
5. These interrelated aims of IFAD – to increase food production, reduce rural poverty and improve nutrition in developing countries – cannot be achieved unless the countries themselves are prepared to evolve and implement a development strategy geared to these objectives. IFAD will be ready to contribute to the evolution of development strategies for the benefit of the rural poor by providing financial resources for specific development projects and programmes, and by assisting interested governments in identifying and implementing policies and institutional changes that will help to achieve the broader economic and social objectives of rural development. IFAD will concentrate its resources upon activities that promise to achieve in a cost-effective way, a reduction of poverty in rural areas, where most poor people live and work. The Fund's major target groups, irrespective of the stage of economic development of the country, will be small and landless farmers. The rural poor comprise the developing world's great untapped resource of labour skills and enterprise. There is abundant evidence that small farmers, given access to reliable water supplies, purchased farm inputs, credit and extension services, can achieve productivity levels equal to or exceeding that of large farmers. A development strategy, involving low capital intensity, should thus generate adequate surpluses to ensure the cost-recovery of such investments. The Fund's aim will thus be to advance, at one and the same time, economic efficiency and the attack on poverty and malnutrition. The promotion of the role of women in food production would also receive attention.
6. IFAD recognizes that it is one of many sources of finance, that its activities are a small part of a much larger total effort and that external finance is only one of the elements in agricultural development. IFAD will, therefore, attempt to play a catalytic role in raising the proportion of national and international funding directed at improving the well-being and self-reliance of the rural poor. That role requires IFAD to take initiatives, and to cooperate with other multilateral and bilateral agencies, in order to promote and finance activities essential to the attainment of IFAD's objectives. The Fund would thus attempt to multiply the impact of its own limited resources by undertaking projects jointly with other multilateral and bilateral agencies, while ensuring the realization of the Fund's own objectives and establishing its own independent identity in the process. In all projects, cofinanced or independently financed, there would be systematic concentration upon the central objective – increased food production and reduction of rural poverty and hunger. While recognizing the difficulties of measurement, the Fund would generally attempt to ensure that its own financing efforts result in an additionality, and not a mere substitution of resources, both external and domestic channelled towards its central objective.

B. Objectives

7. Implicit in the Fund's objective of concentrating on the food and nutritional problems of developing countries is the assumption that supply shortfalls in these countries cannot be met adequately by increased output in the developed parts of the world. While the developing and developed countries' food systems are interrelated in many ways, the deficits in the developing world can be met only by emphasis on accelerated growth in the production of the low-cost foods (particularly grain and root crops) most demanded and consumed by low-income people. Concurrently, there must be larger opportunities for productive employment and higher incomes for low-income people so that they may obtain the additional food from their own production or have the income to purchase it. In addition to the growing interrelationships in the food systems of different parts of the world, the objectives of increasing food output and improving nutritional standards in developing countries are thus closely interlinked.
8. The production aspect of the Fund's objective will be pursued, initially, by overcoming the specific obstacles that slowed productivity gains experienced by several countries during the late sixties. These include shortages of inputs, such as fertilizers, pesticides, or reliable water from existing wells and canals; institutional or other barriers to the dissemination of new technologies; and possibly limits to the effectiveness of new high-yielding seed varieties. As the developing countries restore the agricultural growth rates of the late 1960s, activities to maintain and increase these rates in the future must be taken up. Thus, IFAD must rapidly prepare for longer-range projects, programmes and policy initiatives.
9. The attainment of these objectives, both short-run and long-run, will require different approaches. First, it will require efforts to increase productivity and hence output on the lands already cropped. Since many of the poorest developing countries have very little uncropped, but potentially cultivable land, this emphasis on the land already in use assumes great importance. This involves additional supporting services to farmers, as well as the provision of funds to expand and improve existing irrigation and flood-control systems. In some areas, lending for groundwater development, together with the complementary inputs, will have a high priority. Under rainfed conditions, support for improved varieties and better tillage practices is critically important. IFAD will pay special attention to improving the performance and utilization of existing systems of soil management.
10. The Fund, while initially stressing quickly maturing projects, will also consider cooperation with other agencies to support long-term major investments in land and water development to achieve large increments in agricultural production, possibly bringing into cultivation unexploited lands. Support for such schemes may be justified even though the returns will not be readily realized for some time, provided that they accrue mainly to the rural poor. The Fund will have a special interest in downstream activities, including on-farm development and support services in larger

irrigation and water management projects. Projects that seek to bring land under cultivation will be scrutinized with special attention to the social aspects of settlement; to environmental impact; to the reduction of costs per family settled and per ton of extra food grown; and to the possibilities of replication.

11. The third approach with both short and long-term implications concerns improvements in institutions such as land tenure and relevant policies concerning such matters as pricing, credit, marketing, subsidies and cost recovery. Deficiencies here can generate constraints both of a short-term and long-term nature, in realizing the full impact of physical investments. The Fund would encourage governments to review and adjust these policies to strengthen incentives for increased production by the Fund's target groups. There is need to develop a wide variety of basic institutions of agricultural development, supported by a package of economic policies and incentives. The implementation of institutional reforms and policies should take account of probable time-lags between price and production changes and of the need to cushion transitional difficulties for low-income groups."
- "13. The Fund emphasizes reduction in poverty and improvement in nutrition. Adding the poverty and the nutrition dimension to the production objective brings into focus several additional criteria.
14. The improvement of the diet and income of low-income people must be pursued within the overall agricultural production strategy outlined above by including the very small farmers (identified not only by a quantitative measure such as number of hectares cultivated, but also by their position in the scale of distribution of landholdings) in the process of production and technological change. Such a policy requires the recognition of a vital link. There exist opportunities for some low-income people to earn income by raising their food output, though this requires careful specification of the production processes, with particular regard to the impact on technology and labour utilization. At the same time, the purchasing power of poor people as a whole must rise, so that demand for the basic food sources increases alongside with supply; otherwise, falling food prices will discourage future output, unless the government introduces costly subsidies.
15. Most poor rural households can be treated as target groups by a strategy orientated towards small farmer development. Such a strategy, however, may continue to exclude landless farmers. Since approximately one third of the agricultural population in developing countries now belongs to this category, the Fund has to formulate programmes and projects for increasing their incomes. This aspect of the Fund's activities may increase in importance as population pressure on cultivable land grows."
- "17. Successful application of policies, programmes and projects aimed at increasing the incomes of the rural poor requires complementary programmes of agrarian reform, training for rural leaders and other personnel, and adaptive research of particular

relevance to small farmers or the landless. The Fund will support such efforts. It will support, as part of its longer-term operations, land reform programmes primarily through financing the development and utilization of lands to be distributed to smallholders and the landless, and through assistance to appropriate new institutions that might be created as part of the agrarian reform policy.”

- “29. The Fund will accord high priority to activities that strengthen the technical and institutional capacity essential for agricultural and rural development. In this context, the Fund will, mainly as a part of its lending operations, and after taking into account the technical assistance operations of other agencies, finance technical assistance for the following main purposes:
- (a) to assist countries to undertake feasibility studies in agricultural projects related to IFAD’s activities and priorities, although the Fund will encourage the development of local capabilities and skills in respect of project and programme design and planning for agricultural development, so as to progressively reduce dependence on foreign assistance and expertise;
 - (b) to assist countries in expanding the supply of trained personnel and their integration into sound institutional structures that permit effective responses to local conditions and problems;
 - (c) to assist local institutions in the design and implementation of monitoring systems appropriate to the special objectives of Fund-financed projects;
 - (d) to undertake special studies or pre-investment projects in problem areas, e.g. in rainfed agriculture areas or drought-prone areas that hold prospects for future investment;
 - (e) to assist countries more intensively at the project implementation stage, through special training for project management staff;
 - (f) to provide support to countries for research and extension activities. In particular, the development of technology appropriate to small farms would be supported. Small-scale but innovative projects with a strong exploratory element, leading to future larger scale investment decisions, would receive special attention.”

C. Additional extracts from the annex of the lending policies and criteria

- “3. IFAD should continue to focus on well-identified rural poverty groups: the landless and the near-landless; marginal farmers; small-scale and artisanal fishermen; indigenous populations (particularly in Latin America); and displaced nomadic groups, and help all of them to increase domestic food production, especially traditional and minor food crops, and diversify income sources. IFAD will continue to ensure that an increasing share of its loan proceeds is channelled directly to these target groups. It is noted with satisfaction that most IFAD-financed projects, particularly those approved by the Executive Board in recent years, satisfy this condition, as more than 70% of total costs accrue to the beneficiaries themselves and

are not usurped by avoidable intermediaries. Therefore, the socio-economic conditions of each group and the constraints under which they produce need to be analysed carefully in order to identify cost-effective ways for alleviating their poverty and reducing undernutrition.

4. Within IFAD's policy and programmatic focus on poverty targeting, the poverty group deserving more particular attention is poor rural women, who are the most significant suppliers of family labour and efficient managers of household food security. IFAD, working closely with other agencies, should pursue its policy dialogue with Member Governments on the issues related to the economic participation of poor rural women, in the light of its field experiences and in accordance with the Declaration for the Economic Advancement of Rural Women, which was adopted by the Geneva Summit on the Economic Advancement of Rural Women. IFAD should strengthen its focus on poor rural women by developing and sharpening specific instruments of intervention through the exchange of experiences with others working in the field and through further deepening the conceptual understanding of the complex issues involved.
5. IFAD's investment priorities should be guided by the consideration of sharing know-how with other international financial institutions (IFIs), so as to stimulate them to invest in rural development with a view to alleviating mass poverty. IFAD's sectoral/sub-sectoral focus should open the door for the development of modules that can be replicated and applied on a larger scale, if need be, by the recipients themselves or with support from other donors."
- "8. As the promotion of household food security and nutrition is a central feature of the activities of the three Rome-based food agencies, the Food and Agriculture Organization of the United Nations (FAO), IFAD and the World Food Programme (WFP), IFAD should collaborate closely with these agencies in project design, implementation and financing.
9. Using agricultural development primarily through increased food production as its core global objective, and reducing undernutrition and household food insecurity as its specific objectives, IFAD should further build on its evolving participatory conservation-oriented development strategy. The basis of this strategy is to assist people in preserving the intrinsic productive value of the environment. The rapid degradation of the natural resource base of the rural poor is significantly worsening their poverty. While degradation of the environment is a global phenomenon, it is the damage to the natural resources of developing countries that has the most immediate impact on their rural poverty. Unless the soil, water and forestry resources of the poor countries are maintained and enhanced, the number of those who suffer from poverty, malnutrition and hunger will grow."

“15. IFAD is an institution whose activities are to be centred around people, rather than an infrastructure per se. Therefore, continued attention will have to be devoted to the development of participatory institutions at the grass roots. This should continue to constitute a particularly strong focus of IFAD’s work in Africa, in the absence of efficient service institutions. Through its projects and programmes, IFAD has played an important catalytic role in operationalizing the concept of participation in concrete terms, and it should continue to do so. Over time IFAD has developed an approach, in which producer/service delivery, particularly at the retail level, is being managed by grass-roots organizations and groups of beneficiaries, especially in cases where established service suppliers had outreach and financial viability problems. IFAD needs to consolidate this approach, and establish sustainable linkages with service suppliers in the private sector.”

APPENDIX V: Fostering grant-loan linkages in IFAD-funded projects²**A. Premise**

1. Developing close linkages among research programmes, farmers' practices and investment projects is the key to enhancing the effectiveness of all three domains of activity. In order to understand these linkages, we need to consider the purpose of IFAD's investment projects and the way through which research can support the achievement of their objectives by developing synergy with them. IFAD investment projects are concerned with the improvement of the livelihoods of rural smallholders through the provision of material or non-material goods and services. The tendency is more and more to take into account local dynamics in terms of local knowledge, social organizations, values, representation, political and administrative settings, etc. In this endeavour, projects strive to link up with civil society organizations in order to ground their activity and their strategy deep within local realities, from the identification of the project components onwards. In an investment context, the challenge facing this attempt is the inadequacy of implementation flexibility and the time frame allowed for the local dynamics to emerge, coupled with the absence of a sound experimental base providing the key, tested elements of a methodological pathway.

2. The capacity of research to cast itself in the project environment, and the capacity of the project to draw inspiration from research results to critically review its action and reorient its course, are fundamental features of fruitful linkages between research and development. More generally, close connections between research and development agents enhance the processes of interaction among actors that is at the heart of innovation conceived as a social process rather than simply as the discovery and dissemination of new technical possibilities by individuals. The challenge is to learn to create the conditions needed for such innovation to occur, conditions that enable people not only to develop new ideas, but also to learn and make use of each other's ideas.

3. Grant-loan linkages are viewed as the principal opportunities for contextualization and the widespread validation and diffusion of research outcomes. IFAD experience in forging such grant-loan linkages indicates that they do not develop spontaneously, but need to be facilitated (through significant investment of time and human resources) and nurtured in their specific institutional settings. Thus, a selective approach to loan and grants linkages should be adopted that is based, inter alia, on the principles and conditions outlined below:
 - Collaboration between loans and grants should not follow any directive and prescriptive approach. Instead, opportunities for meeting, identifying common interests and negotiating joint ventures should be created at the early stages of the loan-project and research-grant design processes, and the corresponding incentive structure for partnership-building should be put in place.

² The source for this section is Meschinelli (undated).

- The creation of “partnership-building opportunities” for linkages between loans and grants should, in itself, become a specific portfolio planning and development target that would trigger the deployment of adequate time and resources for this purpose.
- A shared framework should be identified and developed for poverty analysis (e.g. the sustainable livelihoods approach), using common concepts that facilitate the joint diagnosis and the identification of entry points for cooperation and collaboration, based on comparative advantages and the complementary division of roles.
- Community and individual practices, local knowledge and the dynamics of rural innovation: these should be built upon and taken as the common ground for interaction between research and development so as to guide the identification of complementarities and coordinated actions.
- Priority should be assigned to location specificity in order to respond to area-based loan-project demands; the solutions sought by participatory research should be site specific, whereas prototypes, methods and principles can be part of the extrapolation domain, i.e. for the purpose of scaling-up and replicability under similar conditions.
- Where appropriate prototypes, participatory technology development methods and principles are available through past research financed through IFAD grants, they could provide the technical basis for new loans (the forward-looking grant-loan linkage strategy, which is the more direct, straightforward approach currently adopted). These principles continue to apply.
- The R&D linkage is a dual-purpose collaboration; research is not only targeted at the achievement of results and the delivery of products, but also aims to foster improved capacity (through complementary skills and attitudes and related competency enhancement) to produce the required results and impacts.
- Loans should not be considered as mere instruments and platforms for the diffusion of research results; they are process-oriented operations that provide a conducive environment for research collaboration so as to foster the continuous generation of knowledge and new lessons to be applied in a rolling programming mode.
- The communication of research results should involve the sharing of relevant knowledge on a timely basis (moving swiftly from the applied to the adaptive – where opportunities unfold – and accounting for potential obsolescence) in specific circumstances, i.e. targeted, strategic communication, but no blanket-coverage approach.
- The monitoring and evaluation system for loans and grants should be articulated and mutually reinforcing.



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