

# SUMMARY

## Farming Systems and Poverty

IMPROVING FARMERS' LIVELIHOODS  
IN A CHANGING WORLD



Food  
and  
Agriculture  
Organization  
of  
the  
United  
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The World Bank

# S U M M A R Y

## Farming Systems and Poverty

### IMPROVING FARMERS' LIVELIHOODS IN A CHANGING WORLD

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Principal Editor: Malcolm Hall

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## PREFACE

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Small farmers produce much of the developing world's food. Yet they are generally much poorer than the rest of the population in these countries, and are less food secure than even the urban poor. Furthermore, although the majority of the world's population will live in urban areas by 2030, farming populations will not be much smaller than they are today. For the foreseeable future, therefore, dealing with poverty and hunger in much of the world means confronting the problems that small farmers and their families face in their daily struggle for survival.

Investment priorities and policies must take into account the immense diversity of opportunities and problems facing small farmers. The resources on which they draw, their choice of activities, indeed the entire structure of their lives, are linked inseparably to the biological, physical, economic and cultural environment in which they find themselves and over which they only have limited control. While every farmer is unique, those who share similar conditions also often share common problems and priorities that transcend administrative or political borders.

These broad patterns of similar production systems, practices and external conditions are used in this book as a basis for defining more than 70 major farming systems throughout the six developing regions of the world. While recognizing the heterogeneity that inevitably exists within such broad systems, it is a central tenet of this book that the Farming Systems Approach, as used here, offers a useful framework for understanding the needs of those living within a system, the likely challenges and opportunities that they will face over the next 30 years, and the relative importance of different strategies for escaping from poverty and hunger.

To offer a basis for comparative analysis, this book looks in detail at some 20 farming systems that are judged to have the greatest potential for poverty and hunger reduction and economic growth in the next few decades. They are considered in the light of five possible broad household strategies for escape from poverty and hunger: (a) intensification of production; (b) diversification of agricultural activities for increased output value; (c) increased farm size; (d) expansion in off-farm income; and (e) complete exit or departure from the farming system. The book asks the crucial question: What are likely to be the most successful strategies for small farmers in each system, and what sort of initiatives can best help farmers to realize them?

The material for this book is derived from a study originally undertaken at the request of the World Bank in order to provide a specifically agricultural perspective to the revision of the Bank's Rural Development Strategy. It has drawn on many years of specialized work within FAO and the World Bank, as well as in a number of other national and international institutions. Findings were supported by more than 20 case studies from around the world which analyzed innovative approaches to small farm or pastoral development. This book is intended for a wider audience than the original study, and it is hoped that policy makers, researchers, NGOs and the agribusiness sector will all find its conclusions and recommendations interesting and thought provoking; and that they will carry the analysis further by applying the approach at national level to assist in the formulation of rural development strategies.

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This Summary document is derived from the full book of the same name published jointly in English by FAO and the World Bank.\* A work of this nature necessarily draws on the contributions and knowledge of a great number of people. Brief mention must be made of at least some of those who have played an important role in making this study a reality. The work was carried out under the overall direction of S. Funes (at the time Director, Rural Development Division). Invaluable technical support was provided by A. MacMillan (Principal Advisor, Investment Centre Division), D. Baker (Chief, Farm Management and Production Economics Service, Agricultural Support Systems Division), and E. Kueneman (Chief, Crop and Grassland Service, Plant Production and Protection Division). The study was originally conducted at the request of the World Bank as a major input to the revision of the Bank's Rural Development Strategy, and C. Csaki (Senior Advisor/Team Leader-Rural Strategy) and S. Barghouti (Research Advisor) of the Rural Development Department were instrumental in shaping the structure and scope of the work. Finally, the regional chapters of this study are derived from separate documents, whose preparation was led by A. Carloni (sub-Saharan Africa); D. Gibbon (North Africa and Middle East); S. Tanic and F. Dauphin (East Europe and Central Asia); J. Dixon (South Asia); D. Ivory (East Asia and the Pacific); and A. Gulliver (Latin America and the Caribbean). We gratefully acknowledge the contributions of professional and support staff from all technical Departments of FAO, whose assistance is listed in the Acknowledgements in the full book from which this Summary is drawn.

\* Dixon, J. and A. Gulliver with D. Gibbon. (2001) *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World*. FAO & World Bank, Rome, Italy & Washington, DC, USA.

# TABLE OF CONTENTS



<b>1. INTRODUCTION</b>	<b>1</b>
HUNGER, POVERTY AND AGRICULTURE	1
FARMING SYSTEMS AND THEIR CHARACTERISTICS	2
ASPECTS OF THE EVOLUTION OF FARMING SYSTEMS	3
Natural resources and climate	4
Science and technology	5
Trade liberalization and market development	5
Policies, institutions and public goods	6
Information and human capital	6
READER'S GUIDE	7
<b>2. SUB-SAHARAN AFRICA</b>	<b>8</b>
THE REGION AND ITS FARMING SYSTEMS	8
STRATEGIC PRIORITIES FOR SUB-SAHARAN AFRICA	10
<b>3. MIDDLE EAST AND NORTH AFRICA</b>	<b>12</b>
THE REGION AND ITS FARMING SYSTEMS	12
STRATEGIC PRIORITIES FOR MIDDLE EAST AND NORTH AFRICA	13
<b>4. EASTERN EUROPE AND CENTRAL ASIA</b>	<b>15</b>
THE REGION AND ITS FARMING SYSTEMS	15
STRATEGIC PRIORITIES FOR EASTERN EUROPE AND CENTRAL ASIA	17
<b>5. SOUTH ASIA</b>	<b>18</b>
THE REGION AND ITS FARMING SYSTEMS	18
STRATEGIC PRIORITIES FOR SOUTH ASIA	19
<b>6. EAST ASIA AND PACIFIC</b>	<b>21</b>
THE REGION AND ITS FARMING SYSTEMS	21
STRATEGIC PRIORITIES FOR EAST ASIA AND PACIFIC	23
<b>7. LATIN AMERICA AND CARIBBEAN</b>	<b>24</b>
THE REGION AND ITS FARMING SYSTEMS	24
STRATEGIC PRIORITIES FOR LATIN AMERICA AND CARIBBEAN	26

<b>8. GLOBAL CHALLENGES, POTENTIALS AND PRIORITIES</b>	<b>28</b>
SYSTEM CATEGORIES AND HOUSEHOLD STRATEGIES	28
Categorizing farming systems on a global basis	28
Relative importance of poverty reduction strategies by system category	28
Implications of system resource endowments on poverty reduction strategies	30
Implications of system intensification on poverty reduction strategies	30
A GLOBAL STRATEGY FOR HUNGER AND POVERTY REDUCTION	31
Policies, institutions and public goods	32
Trade liberalization and market development	32
Agricultural information and human capital	33
Science and technology	34
Natural resources and climate	34
<b>9. CONCLUSIONS AND WAYS FORWARD</b>	<b>36</b>
REFOCUSING STAKEHOLDER CONTRIBUTIONS	36
Unlock the potential of farmers and their communities	36
Support the engagement of civil society partners	37
Foster competitive agribusiness and commerce as tools for poverty reduction	37
Increase effectiveness of local and national government actions for poverty reduction	37
Expand the role of international public goods	38
WAYS FORWARD: BUILDING ON THIS ANALYSIS	38
CLOSING NOTE	39
<b>ANNEX</b>	
Classification of Countries by Developing Region	41
<b>FARMING SYSTEM MAPS:</b>	
Sub-Saharan Africa	43
Middle East and North Africa	44
Eastern Europe and Central Asia	45
South Asia	47
East Asia and Pacific	48
Latin America and Caribbean	49

# INTRODUCTION



The book from which this Summary derives<sup>1</sup> is underpinned by a vision of a world without hunger and poverty. As most poor people live in rural areas of developing countries and are dependent on agriculture for their livelihood, the key to eradicating current suffering must lie in the creation of dynamic rural communities founded upon prosperous farming. Analysis of the farming systems within which the rural poor live and work can provide powerful insights into strategic priorities for the reduction of the poverty and hunger now affecting so many of their lives. A Farming Systems Approach recognizes the diversity of the livelihoods of poor farmers, pastoralists and fishing families, and provides a framework to explore various pathways that may offer an escape from poverty in a changing world.

Rural development ultimately depends on the outcome of the daily decisions of millions of individual men and women. The challenge for governments, civil society organizations and the private sector is to provide the institutional environment and incentives that will enable farm households themselves to achieve agricultural growth and poverty reduction. Unfortunately, the best available existing projections<sup>2</sup> suggest only a slow decline in hunger and poverty in developing regions. Accordingly, this Summary outlines key strategic priorities for action to accelerate this process – for different farming systems, for each developing region and for the developing world as a whole.

## HUNGER, POVERTY AND AGRICULTURE

In the last four decades of the twentieth century, the population of the developing regions of the world<sup>3</sup> has approximately doubled – to 5.1 billion in 1999. At present, about 60 percent of these people are classed as rural; of whom around 85 percent are agricultural. Over the next 30 years, it is estimated that the population of developing regions will continue to grow, albeit at a slower rate. However, as a result of increasing urbanization, the total rural population is actually projected to decline after 2020. Based on these projections, the agricultural population of developing countries in 2030 will probably be little changed from its present level. Among the factors causing uncertainty over future population trends, two are particularly noteworthy. First, the prognosis for the HIV/AIDS pandemic is uncertain, and the possibility still exists that it could significantly reduce rural populations in many farming systems in Africa and elsewhere. The second area of uncertainty concerns the migration of people engaged in agriculture to urban areas. Migration rates reflect, inter alia, relative poverty rates in urban and rural areas, and hence are affected by factors such as international commodity prices, urban employment growth, and real exchange rates.

Hunger is still prevalent in many developing countries, but the overall total has fallen since the late 1960s – from 959 million (m) in 1969-1971 to 790m in 1995-1997. Since total population has

<sup>1</sup> Dixon, J. and A. Gulliver with D. Gibbon (2001) *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World*. FAO & World Bank, Rome, Italy & Washington, DC, USA.

<sup>2</sup> Comprehensive projections to 2015 and to 2030 are summarized in FAO (2000) *Agriculture Towards 2015/30. Technical Interim Report*. Global Perspectives Unit. FAO, Rome, Italy. These projections by FAO are referred to extensively throughout the study.

<sup>3</sup> The World Bank classifies developing countries into six developing regions, and this classification was adapted for the analysis. Annex I lists the country membership of each region.

grown substantially, this represents a halving of the actual proportion of undernourished people – from 37 to 18 percent. Projections indicate a further fall in the incidence of undernourishment, to around 576m people in 2015 and 400m in 2030; but this decline could be accelerated if additional measures are taken to reduce hunger, as envisaged during the 1996 World Food Summit.

It is estimated that across the developing world, a total of 1.2 billion people live in poverty – as defined by the international poverty line of average consumption equivalent to US\$1/day/capita. Although the relative importance of rural poverty varies substantially from one country to another, in developing countries as a whole more than 70 percent of total poverty is found in rural areas. Following major declines in East Asia in recent decades, poverty is today concentrated primarily in South Asia – where it has been increasing gradually during the 1990s – and sub-Saharan Africa, where it has been growing at an alarming rate.

The evidence is clear that broad-based agricultural development provides an effective means of both reducing poverty and accelerating economic growth. This arises not only from the increasing incomes of producers and farm workers, but also from the associated demand in rural areas for non-tradable goods – particularly services and local products. It is this indirect effect on demand, and the associated employment creation in the non-farm sector of rural areas and market towns, that appears to be a main contributing factor to the reduction of rural poverty.

## FARMING SYSTEMS AND THEIR CHARACTERISTICS

Each individual farm has its own specific characteristics, which arise from variations in resource endowments and family circumstances. The household, its resources, and the resource flows and interactions at this individual farm level are together referred to as a farm system. A farming system is defined as a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate.

In attempting to combat hunger and poverty, developing countries face the challenges of

identifying specific agricultural and rural development needs and opportunities, and focusing investment in those areas where the greatest impact on food insecurity and poverty could be achieved. The delineation of farming systems provides a useful framework within which appropriate agricultural development strategies and interventions can be determined, as by definition, they group farm households with similar characteristics and constraints. Only a limited number of systems are delineated within each region (and in this Summary, only the most important of these systems are discussed), leading inevitably to a considerable degree of heterogeneity within any single system. However, the alternative of identifying numerous, discrete, micro-level farming systems in each developing region would detract from the overall impact of the analysis.

The classification of the farming systems, as specified herein, has been based on a number of key factors, including: (i) the available natural resource base; (ii) the dominant pattern of farm activities and household livelihoods, including relationship to markets; and (iii) the intensity of production activities. These criteria were applied to each of the six main regions of the developing world. The exercise resulted in the identification of 72 farming systems with an average agricultural population of about 40m inhabitants. Based on these criteria, eight broad categories of farming system have been distinguished:

- **Irrigated farming systems**, embracing a broad range of food and cash crop production;
- **Wetland rice based farming systems**, dependent upon seasonal rains supplemented by irrigation;
- **Rainfed farming systems in humid areas**, characterized by specific dominant crops or mixed crop-livestock systems;
- **Rainfed farming systems in steep and highland areas**, which are often mixed crop-livestock systems;
- **Rainfed farming systems in dry or cold low potential areas**, with mixed crop-livestock and pastoral systems merging into systems with very low current productivity or potential because of extreme aridity or cold;
- **Dualistic (mixed large commercial and small holders) farming systems**, across a variety of ecologies and with diverse production patterns;
- **Coastal artisanal fishing systems**, which often incorporate mixed farming elements; and
- **Urban based farming systems**, typically focused on horticultural and livestock production.

Except for the dualistic systems, the systems within each category are dominated by smallholder agriculture. The names chosen for individual farming systems reflect the eight categories outlined above. They also reflect key distinguishing attributes, notably: (i) water resource availability, e.g. irrigated, rainfed, moist, dry; (ii) climate, e.g. tropical, temperate, cold; (iii) landscape relief/altitude, e.g. highland, lowland; (iv) farm size, e.g. large scale; (v) production intensity, e.g. intensive, extensive, sparse; (vi) dominant livelihood source, e.g. root crop, maize, tree crop, artisanal fishing, pastoral; (vii) dual crop livelihoods, e.g. cereal-root, rice-wheat (note that crop-livestock integration is denoted by the term mixed); and (viii) location, e.g. forest based, coastal, urban based.

Of the 72 identified farming systems, from three to five systems were selected within each region for in-depth analysis. Although the selection includes some farming systems with only limited opportunities for agriculturally based growth, a majority possess the potential for achieving significant hunger and poverty reduction if appropriate support is made available. Factors determining a system's apparent growth potential include: (i) suitable resource endowments, including underlying agro-climatic and soil conditions, a relatively high ratio of land and other resources (water, forest) to human population, and a currently low intensity of exploitation; (ii) favourable access to infrastructure and services, including markets; and (iii) the identification of broader development constraints whose removal is considered to be feasible.

In broad terms, five main farm household strategies were defined that could contribute to improved farm household livelihoods and escape from poverty. These strategic options are not mutually exclusive, even at the individual household level; any particular household will often pursue a mixed set of strategies. The options can be summarized as:

- intensification of existing production patterns;
- diversification of agricultural activities;
- expanded operated farm or herd size;
- increased off-farm income, both agricultural and non-agricultural; and
- complete exit from the agricultural sector within a particular farming system.

Intensification is defined, for the purpose of this discussion, as increased physical or financial productivity of existing patterns of production; including food and cash crops, livestock and other

productive activities. Diversification is defined as changes to existing farm enterprise patterns in order to increase farm income, or to reduce income variability. Diversification will often take the form of completely new enterprises, but may also simply involve the expansion of existing, high value, enterprises, and will be driven by market opportunities. The addition or expansion of enterprises refers not only to production, but also to on-farm processing and other farm-based, income generating activity.

Some households escape poverty by expanding farm size – in this context size refers to managed rather than to owned resources. Beneficiaries of land reform are the most obvious examples of this source of poverty reduction. Increased farm size may also arise through incursion into previously non-agricultural areas, such as forest – often termed expansion of the agricultural frontier. Although this option is not available within many systems, it is of particular relevance in parts of Latin America and sub-Saharan Africa. Increasingly, however, such 'new' lands are marginal for agricultural purposes, and may not offer sustainable pathways to poverty reduction.

Off-farm income represents an important source of livelihood for many poor farmers. Seasonal migration has been one traditional household strategy for escaping poverty and remittances are often invested in land or livestock purchases. In locations where there is a vigorous non-farm economy, many poor households augment their incomes with part-time or full-time off-farm employment by some household members. Where few opportunities exist for improved rural livelihoods, farm households may abandon their land altogether, and move to other farming systems, or into non-farming occupations in rural or urban locations. This means of escaping agricultural poverty is referred to in the following chapters as exit from agriculture.

## ASPECTS OF THE EVOLUTION OF FARMING SYSTEMS

In order to present the analysis of farming systems and their future development within a framework that is broadly comparable between systems and across different regions, key biophysical and socio-economic determinants of system evolution have been grouped into five categories:

- natural resources and climate;
- science and technology;
- trade liberalization and market development;
- policies, institutions and public goods; and
- information and human capital.

**Natural resources and climate**

The interaction of natural resources, climate and population determines the physical basis for farming systems. During the early stages of development, increased population generally leads to an expansion in cultivated area and, in many cases, conflict between the different users of land and water resources. Once most good quality land is already exploited, further population increases tend to lead to the intensification of farming systems. As forests and woodlands come under greater pressure, biodiversity is threatened and there may be growing tension between development and conservation goals. In recent decades there has been a considerable reduction in the number of varieties cultivated, which has affected in particular the main cereal crops – wheat, maize and rice. A similar loss of biodiversity has occurred among domestic animals.

Rapid population growth has meant that the availability of cultivated land (annual and perennial) per capita in developing countries has declined by almost half since the 1960s, reaching an average of 2.3 persons/hectares (ha) among agricultural populations in the mid 1990s (see Box 1.1). At the same time, pasture and grazing land has expanded by a total of 15 percent in developing regions, to

**Box 1.1 Population Pressure on Annual and Permanent Cropland by Region – 1995-1997 (persons/ha)<sup>4</sup>**

Region	Agric.	Total
Sub-Saharan Africa	2.2	3.6
Middle East & North Africa	3.1	4.5
Eastern Europe & Central Asia	0.3	1.6
South Asia	3.5	6.3
East Asia & Pacific	4.9	7.9
Latin America & Caribbean	0.7	3.2
Average	2.3	4.5

<sup>4</sup> FAO 2000, op cit.

<sup>5</sup> FAO 2000, op cit. Data for the Eastern Europe and Central Asia region and many of the Pacific Island states are not available.

around 2.2 billion ha in 1994. Annual growth rates in cultivated area vary considerably between the regions, as shown in Box 1.2. Growth in output has resulted mainly from yield increases and area expansion rather than from higher cropping intensity.

**Box 1.2 Average Annual Expansion in Cultivated Land 1961-1997<sup>5</sup>**

Region	% per annum
Sub-Saharan Africa	0.73
Middle East & North Africa	0.42
South Asia	0.18
East Asia	0.91
Latin America & Caribbean	1.26
Average	0.67

More than 90 percent of the remaining land available for cultivation is in Latin America and sub-Saharan Africa, which means that further expansion is simply not an option for most of the developing world. Even in those areas where potential for expansion does appear to exist, over 70 percent of available land is estimated to suffer from one or more soil or terrain constraints. As a result of these factors, the projected expansion in cultivated area in developing regions to 2030 is only half the historic rate. Strikingly, however, by the year 2030, and despite the addition of well over 2 billion people to the population of developing countries, the average amount of cultivated land available for each person engaged in agriculture may actually increase due to the stabilization of agricultural populations.

There is little doubt that both agriculture and food security will be affected by climate change. Among the impacts predicted is a reduction in potential crop yields in most tropical and sub-tropical regions. Water resource availability is expected to diminish while, simultaneously, a widespread increase in the risk of flooding is anticipated, as a result of rises in sea level and increased severity of precipitation. Other catastrophic climatic events, including hurricanes, typhoons and drought, are also expected to increase dramatically in frequency, as climatic change results in greater variability in climatic conditions.

## Science and technology

The historical focus by international and national agricultural research centres on food crop production technologies, with an emphasis on improved yields, has undeniably been successful. Nearly three-quarters of production growth since 1961 have been due to yield increases (see Box 1.3). Increased yields have contributed to greater food security within developing regions and to declining real prices for food grains.

Box 1.3 Average Cereal Yield (1961-1997) in Developing Countries (t/ha)<sup>6</sup>

	1961/63	1995/97
Wheat	0.9	2.5
Rice (paddy)	1.8	3.5
Maize	1.2	2.6
All cereals	1.2	2.5

However, many poor smallholder farmers in marginal areas have not benefited from these cereal yield increases, and investments in technology development for non-cereal crops have usually received a low priority. Although the private sector and large farmers' organizations have invested heavily in research for commercially important cash crops – examples include coffee, tea, sugar cane and bananas – many tropical staples and minor cash crops have received relatively little attention. Similarly, investment in livestock research has generally not been commensurate with the contribution of the sub-sector to household income or Gross Agricultural Domestic Product (GADP). A much greater range of new technologies is available for production systems and crops of interest to developed countries than for smallholder production systems in developing countries.

Overall, research has been focused principally upon production intensification, usually requiring purchased inputs. There has been far less research on increasing labour productivity or on integrated technologies for diversifying the livelihoods of small farmers and increasing the sustainability of land use. Similarly, there has been limited research in Integrated Pest Management (IPM) or in weed control. These are topics of little interest to the

private sector, but also ones, which are in danger of neglect by public research institutions. The use of genetically modified crops appears to offer considerable potential for reduced input use and higher levels of production, but their development and introduction have been severely constrained by industrialized country concerns over food safety.

Despite these gaps, the global research agenda is gradually moving from a focus on individual crop performance to a growing acceptance of the importance of increased system productivity. This is viewed largely in terms of better-managed interactions among diversified farm enterprises, sustainable resource management, and improved targeting of technologies towards women farmers and poorer households. Perhaps even more importantly in the long-term, more emphasis is now being given to public-private partnerships driven mainly by the demands of clients. These changes are being accompanied by a growing understanding of farmers' problems and opportunities and a greater willingness to blend indigenous knowledge and modern information.

## Trade liberalization and market development

Of the broad and all-encompassing processes included under the term globalization, the emphasis in this document is placed on economic reform and trade liberalization. By the end of the 1970s, the economies of many developing countries had become highly distorted as a result of excessive government intervention and control. Most were in serious economic difficulties, with GDP growth rates that were negative or failing to match the rate of population increase. To address these problems, international institutions initiated lending programmes focusing upon structural reform. These structural adjustment programmes (SAPs) have resulted in liberalized trade and exchange rate regimes and radically reduced subsidies in many developing countries.

Although structural adjustment has generally failed to eliminate urban bias in developing country policies, many SAPs have embodied reforms specific to the agricultural sector. These include measures to: (i) end marketing monopolies; (ii) reduce parastatal involvement in the supply of inputs, marketing and processing; (iii) reduce or remove subsidies, price controls and impediments to private sector

<sup>6</sup> FAO 2000, op cit.

activities; (iv) remove restraints on foreign trade; and (v) promote the participation of the private sector. More recently, international agreements and the establishment of the World Trade Organization have further boosted trade liberalization. Not only is market development accelerating, but patterns of production and natural resource usage are also changing profoundly in response to market forces. The changes engendered by this transition have, however, had important negative effects for many small producers. Poverty increased in many farming systems during the 1980s and early 1990s, as a result of reductions in government support and declining prices for major smallholder products.

In the longer run, developing countries will be able to expand the production of products where they enjoy competitive advantages, including such products as sugar, fibres, fruits and vegetables and many tropical products. Nevertheless, progress to date has been slow, at least partially as a result of continuing protection by many industrialized countries for domestic agricultural producers. Broad social, economic and cultural trends will also contribute to a profound reshaping of market demand, as increased urbanization, rising incomes, improved communications and the diffusion of cultural preferences exert their effect. The availability of new production, post-harvest and transport technologies will also change demand patterns, by making possible the delivery of new products – or established products in new forms – to markets where they have been previously unattainable.

### **Policies, institutions and public goods**

The development of dynamic farming systems requires a conducive policy environment. The greatest change in this environment during the past 30 years has been structural adjustment (see above), which accelerated the widespread decline of national food self-sufficiency as a dominant element in the shaping of policies for rural areas. Although national food self-sufficiency is no longer an overriding policy aim, household food security remains a key policy issue for developing countries and indeed for the whole world. This was particularly emphasized in the World Food Summit held during 1996.

More recently, policy makers have increasingly shifted their attention to the efficiency of service delivery through the restructuring of institutions. This has led to the transfer of many traditional public

sector roles to civil society and the private sector; the decentralization of remaining government services; and reductions in government investment in the provision of public services. The first two trends fit well within the growing tendency to encourage more local participation in decision making and resource allocation. The third is largely an outcome of the shedding of many previous governmental responsibilities to the private sector. However, while offering significant benefits in terms of mobilization of non-governmental resources and a better alignment of public activities to local needs, these trends have also created difficulties. There has been a generally slow or only partial supply response from the private sector, which in many cases has lacked the incentives to replace public services in finance, research, extension, education, health and even in infrastructure development and maintenance. Smaller farmers and female-headed households have suffered disproportionately. Despite this critical omission, the strengthening of local institutions – involving decentralization and democratization at local levels – is noticeable in many countries. These trends have exposed rifts between central and local authorities in setting development priorities and budgetary allocations, as well as in developing oversight mechanisms.

A further policy area that is growing in importance is that of access to, and control of, natural resources – particularly land and water. As populations continue to grow and marginal lands suffer increasing levels of degradation, the demands of poorer, minority and indigenous populations for more equitable access to resources will continue to intensify. Although accelerating rates of urbanization will relieve some of the pressure, governments that are unable to develop and implement effective policies on land ownership, water management and taxation reform, will face the risk of serious social conflict.

### **Information and human capital**

The need for better information and enhanced human capital has increased as production systems have become more intensified and integrated into market systems. Lack of education, information and training is frequently a key limiting factor to smallholder development. Many observers anticipate an information revolution that will provide large volumes of technological, market and institutional information to small farmers. However, it is unlikely

that much of this information will reach the majority of poor producers in low-income countries in the near future; although commercial operations could benefit. Inevitably, issues of equitable access will arise as marginalized populations are bypassed.

Armed conflict, migration of men in search of paid employment and rising mortality rates attributed to HIV/AIDS, have led to a rise in the number of female-headed households and placed a considerable burden on women's capacity to produce, provide and prepare food. Despite their increasingly prominent role in agriculture, women remain severely disadvantaged in terms of their access to education, training, advice and commercial services. Throughout the developing world women are still frequently denied the full legal status necessary to give them access to loans. This lack of access to key support services hampers women's efforts to improve their farm activities.

One of the major achievements in many developing countries during the past three decades, however, has been the extension of literacy training and primary education to the majority of the rural population. Given the high returns to primary education that have been repeatedly demonstrated, it is considered likely that rural education will expand considerably in those countries where gender discrimination is minimal, civil conflict is absent and economic stability can be maintained. Whilst in the past many development efforts failed women – because planners had a poor understanding of the role women play in farming and household food security – greater efforts are now being made to take account of their actual situation. A gradual improvement is also expected to result from improved primary education, as an increasing

proportion of women farmers are able to communicate directly in the same language as extension advisors, bankers or agribusiness managers. These developments may leave the next generation better equipped to participate in knowledge-based agriculture and to utilize the expanding information base.

## READER'S GUIDE

This Summary document provides an outline of future challenges, opportunities and proposed agricultural development strategies for the developing world. The relevance of farming systems analysis has been discussed in this chapter, and particular attention paid to describing the key trends that are expected to influence farming system evolution over the next 30 years. Drawing on FAO projections, and utilizing a range of databases, the study delineates and analyzes the main farming systems of the six major developing regions of the world in Chapters 2 to 7. As a single region may contain as many as 16 identified farming systems, from 3 to 5 systems have been selected for brief description in each region. The regional analyzes each conclude with a discussion of overall strategic priorities for the region. Commonalities, challenges and crosscutting priorities emerging from these analyzes are presented in Chapter 8. Conclusions and Ways Forward are presented in Chapter 9. This document comprises a considerably abbreviated extract from the book of the same name, jointly published by the World Bank and FAO, in which the arguments presented here are developed in much greater detail and with considerably more supporting data.

## SUB-SAHARAN AFRICA



### THE REGION AND ITS FARMING SYSTEMS

The region<sup>7</sup> (see Map) contains 626m people of whom 61 percent (384m) are directly involved in agriculture. Total land area is 2 455m ha, of which 173m ha are under cultivation (annual and perennial crops) – about one quarter of the potential area. Arid and semiarid agro-ecological zones encompass 43 percent of the land area. In West Africa, 70 percent of the total population lives in the moist subhumid and humid zones, whereas in East and Southern Africa only about half the population occupies these areas.

Despite an abundance of natural resources, the regional GDP per capita was lower at the end of the 1990s than in 1970. Nineteen of the 25 poorest countries in the world are found in sub-Saharan Africa and income inequality is high. In East and Southern Africa, it is estimated that rural poverty accounts for as much as 90 percent of total poverty. During the past 30 years the number of undernourished people in the region has increased substantially, to an estimated 180m people in 1995-1997.

Fifteen farming systems have been identified and are summarized in Table 2.1 (see Map for their location). Given the number of farm households that may be encompassed by a single farming system, it is inevitable that significant heterogeneity exists within the broader systems and important subsystems can be identified in many cases. The five most important of these systems from the perspective of population, poverty and potential for growth are briefly described below.

**Irrigated Farming System.** This comprises large-scale irrigation schemes covering 35m ha with an agricultural population of 7m. Irrigated production is supplemented by rainfed cropping or animal husbandry. Water control may be full or partial. Holdings vary in size from 22 ha per household in the Gezira scheme, to less than 1.0 ha. Crop failure is generally not a problem, but livelihoods are vulnerable to water shortages, scheme breakdowns and deteriorating input/output price ratios. Many schemes are currently in crisis, but if institutional problems can be solved future agricultural growth potential is good. The incidence of poverty is lower than in other farming systems and absolute numbers of poor are small.

**Tree Crop Farming System.** This is found largely in the humid zone of West and Central Africa and occupies 73m ha with an agricultural population of 25m. Cultivated area is 10m ha, of which only 0.1m are irrigated. It is dominated by the production of industrial tree crops; notably cocoa, coffee, oil palm and rubber. Food crops are inter-planted between tree crops and are grown mainly for subsistence; few cattle are raised. There are also commercial tree crop estates (particularly for oil palm and rubber) in these areas, providing services to smallholder tree crop farmers through nucleus estate and outgrower schemes. The incidence of poverty is limited to moderate, and tends to be concentrated among very small farmers and agricultural workers.

**Cereal-Root Crop Mixed Farming System.** This extends through the dry subhumid zone of West Africa, and parts of Central and Southern Africa. Total area is

<sup>7</sup> See Annex for a list of countries included in the region.

Table 2.1 Major Farming Systems of sub-Saharan Africa

Farming Systems	Land Area (% of region)	Agric. Popn. (% of region)	Principal Livelihoods
Irrigated	1	2	Rice, cotton, vegetables, rainfed crops, cattle, poultry
Tree Crop	3	6	Cocoa, coffee, oil palm, rubber, yams, maize, off-farm work
Forest Based	11	7	Cassava, maize, beans, cocoyams
Rice-Tree Crop	1	2	Rice, banana, coffee, maize, cassava, legumes, livestock, off-farm work
Highland Perennial	1	8	Banana, plantain, enset, coffee, cassava, sweet potato, beans, cereals, livestock, poultry, off-farm work
Highland Temperate Mixed	2	7	Wheat barley, tef, peas, lentils, broadbeans, rape, potatoes, sheep, goats, livestock, poultry, off-farm work
Root Crop	11	11	Yams, cassava, legumes, off-farm work
Cereal-Root Crop Mixed	13	15	Maize, sorghum, millet, cassava, yams, legumes, cattle
Maize Mixed	10	15	Maize, tobacco, cotton, cattle, goats, poultry, off-farm work
Large Commercial and Smallholder	5	4	Maize, pulses, sunflower, cattle, sheep, goats, remittances
Agro-Pastoral Millet/Sorghum	8	8	Sorghum, pearl millet, pulses, sesame, cattle, sheep, goats, poultry, off-farm work
Pastoral	14	7	Cattle, camels, sheep, goats, remittances
Sparse (Arid)	17	1	Irrigated maize, vegetables, date palms, cattle, off-farm work
Coastal Artisanal Fishing	2	3	Marine fish, coconuts, cashew, banana, yams, fruit, goats, poultry, off-farm work
Urban Based	<1	3	Fruit, vegetables, dairy, cattle, goats, poultry, off-farm work

Source: FAO data and expert knowledge.

312m ha with an agricultural population of 59m. Cultivated area is 31m ha of which only 0.4m are irrigated. Cattle are numerous – some 42m head. Although maize, sorghum and millet are widespread, root crops such as yams and cassava are more important. Intercropping is common, and a wide range of crops is grown and marketed. The main source of vulnerability is drought. Poverty incidence is limited and agricultural growth prospects are excellent. This system could become the breadbasket of Africa and an important source of export earnings.

**Maize Mixed Farming System.** This is the most important food production system in East and Southern Africa, extending across plateau and

highland areas at altitudes between 800m and 1500m. Total area is 246m ha with an agricultural population of 60m. Cultivated area is 32m ha of which only 0.4m are irrigated. The main staple is maize and the main cash sources are migrant remittances, cattle, small ruminants, tobacco, coffee and cotton, plus the sale of food crops such as maize and pulses. About 36m cattle are kept. The system is currently in crisis as input use has fallen sharply due to shortage of seed, fertilizer and agro-chemicals, plus the high price of fertilizer relative to the maize price. The main sources of vulnerability are drought and market volatility. There is a moderate incidence of chronic poverty. In spite of current problems, long-term agricultural growth prospects are

relatively good and the potential for reduction of poverty is high.

**Agro-Pastoral Millet/Sorghum Farming System.** This occupies the semiarid zone of West Africa and substantial areas of East and Southern Africa. Total area is 198m ha with an agricultural population of 33m. Cultivated area is 22m ha and pressure is very high on the limited amount of cultivated land available. Crops and livestock are of similar importance. Rainfed sorghum and pearl millet are the main sources of food, while sesame and pulses are sometimes sold. The system contains nearly 25m head of cattle as well as sheep and goats. The main source of vulnerability is drought, while poverty is extensive and often severe. The potential for poverty reduction is only moderate.

#### Key region-wide trends

HIV/AIDS has already depressed population growth rates, but total numbers are still expected to increase by 78 percent in the coming three decades, although rural population will rise by only 30 percent due to rapid urbanization. Total annual and permanent cropped area is expected to expand slowly in the years up to 2030, and with an average rise in crop yields of 60 percent and a slow rise in irrigated area and fertilizer use, production of all crops is forecast to more than double. Livestock production is projected to grow at a moderate rate due to expansion of urban consumer demand for meat, milk and eggs. Most agricultural production will continue to come from smallholder dominated rainfed farming.

### STRATEGIC PRIORITIES FOR SUB-SAHARAN AFRICA

Despite the fact that sub-Saharan Africa is relatively well endowed with natural resources, the incidence of hunger and poverty is greater than in other developing regions, while the population growth rate is higher and the number of poor is increasing at an alarming rate. Nevertheless, the policy, economic and institutional environment still does not create the necessary incentives for agricultural production. There is a continuing urban bias in development programmes and the supply of rural public goods is low. Efforts must be directed to support the intensification of productivity on the farms of poor households, as well as the diversification of

production towards high return activities, especially in the high potential areas where a majority of the poor are found. The development of alternative livelihoods – both local off-farm employment and exit from agriculture – will be an important component of poverty reduction programmes, especially in the low potential areas.

Substantial benefits would be derived from a renewed focus on improved agricultural sector policies. Two major priority areas stand out in this respect: (i) resource user rights and (ii) long-term investments in public goods. Examples of the latter include: good land husbandry; sustainable natural resource management; soil and water conservation; environmental protection; maintenance of biodiversity; tsetse eradication; and, carbon sequestration. Farming systems with high growth potential are strongly constrained by a lack of services, including transportation and education. The challenge is to provide such public goods in a sustainable fashion, by ensuring that local authorities and communities contribute to their maintenance. It is necessary to develop productive partnerships between public, private sector and civil society, notably farmers' organizations.

In general terms, not only should non-traditional exports be promoted but there is also a need for a general focus on higher value products. Partial solutions include: diversification into non-traditional export crops; upgrading of existing export products to obtain the highest possible price (rehabilitation, improved processing); and a search for niche markets such as biologically produced items and African ethnic foods.

The abundance of natural resources in the region provides the basis for pro-poor agricultural development if the appropriate incentives are created. The analysis of major farming systems indicates the relative importance of household strategies to escape poverty – in order of importance: diversification; intensification; increase in farm size; exit from agriculture; and increase in off-farm income. In order to halve hunger and poverty by the year 2015, massive efforts are required to stimulate broad-based, inclusive growth, which ultimately depends on the initiative and effort of individual farm families within each farming system. Although it is impossible, based on the foregoing regional analysis, to prescribe specific national actions, the overall challenge of reducing hunger and poverty in the region demands five strategic, inter-linked, initiatives:

**Sustainable resource management.** Sustainable resource management must address widespread land degradation, declining soil fertility and low crop yields; it should result in soil recapitalization and improved resource productivity. Components include: farmer-centred agricultural knowledge and information systems to document and share successes; resource enhancements such as small-scale irrigation and water harvesting; participatory applied research focused on integrated technologies blending indigenous and scientists' knowledge, related to conservation agriculture, agroforestry, IPM and crop-livestock integration; and strengthening resource user groups.

**Improved resource access.** Access to agricultural resources by poor farmers is intended to create a viable resource base for small family farms. Components include: market-based land reform; adjustment of land legislation; strengthened public land administration; and functional community land tenure.

**Increased small farm competitiveness.** Increasing competitiveness of small and poor farmers will build capacity to exploit market opportunities.

Components include: improved production technology; diversification; processing; upgrading product quality; linking production to niche markets; and strengthening support services, including market institutions based on public-private partnerships.

**Reduced household vulnerability.** Household risk management will reduce the vulnerability of farm households to natural and economic shocks, both of which are prevalent in African agriculture. Components include: drought-resistant and early varieties and hardy breeds; improved production practices for moisture retention; insurance mechanisms; and strengthening traditional and other risk spreading mechanisms.

**Responding to HIV/AIDS.** Immediate action is required to halt the spread and impact of HIV/AIDS. Components include: information campaigns; a cheap supply of condoms; affordable treatment; land tenure reform to prevent widows losing access to, and control over, land and household property when their husbands die; agricultural training for AIDS orphans; and, safety nets to reinforce the efforts of rural communities to support AIDS orphans.

## MIDDLE EAST AND NORTH AFRICA



### THE REGION AND ITS FARMING SYSTEMS

The region<sup>8</sup> comprises low and middle-income countries stretching from Iran to Morocco (see Map). The region supports a population of 296m people, over 120m of whom live in rural areas. Of these, about 84m are dependent on agriculture – including fishing and livestock. The region covers an area of 1100m ha and includes a diversity of environments. However, arid and semiarid areas with low and variable rainfall predominate. Moderately humid zones account for less than 10 percent of the land area but nearly half of the agricultural population, while the drier areas account for nearly 90 percent of the land area but less than 30 percent of the population. Rainfed crops are grown during the wetter winter period, while irrigated areas are cultivated year round. The main rainfed crops are wheat, barley, legumes, olives, grapes, fruit and vegetables. Livestock, mainly sheep and goats, are an important feature of many farming systems. A high proportion of poor households consists of farmers or pastoralists who depend on agriculture as a primary food and livelihood source.

Eight major farming systems have been identified and broadly delimited, based on a range of criteria discussed in the first Chapter. They are listed in Table 3.1 and their geographical location is indicated in the Map. The most important of these systems from the perspective of population, poverty and potential for growth are briefly described below.

**Irrigated Farming System.** The system contains both large and small-scale irrigation schemes. The

large-scale subsystem contains a total population of 80m and an agricultural population of 16m. It encompasses 8.1m ha of cultivated land that is almost totally irrigated and schemes are found across all zones. They include high-value cash and export cropping and intensive vegetable and fruit cropping. The small-scale irrigation subsystem also occurs widely across the region and although not as important in terms of population, it is a significant element in the survival of many people in arid and remote mountain areas. Owner-occupiers or tenants typically farm very small units – from 0.02 to 1 ha – often within an area of larger, rainfed systems. Major crops are mixed cereals, fodder and vegetables. The prevalence of poverty within both subsystems is moderate.

**Highland Mixed Farming System.** This system is the most important in the region in terms of population – with 27m engaged in agriculture – but contains only 7 percent of the land area. Out of a total area of 74m ha, cultivated area covers 22m ha, with nearly 5m ha irrigated. There are two subsystems; one dominated by rainfed cereal and legumes plus tree crops (fruits and olives) on terraces, while the second is based on livestock (mostly sheep) on communally managed lands. Poverty is extensive, as markets are often distant, infrastructure is poorly developed and the degradation of natural resources is a serious problem.

**Rainfed Mixed Farming System.** The system has an agricultural population of 16m, but occupies only 2 percent of the regional land area, resulting in high population densities. Cultivated area is 14m ha,

<sup>8</sup> See Annex for a list of countries in the region. Turkey is not considered to be part of this system, being included within the Eastern Europe and Central Asia Region.

Table 3.1 Major Farming Systems of Middle East and North Africa

Farming Systems	Land Area (% of region)	Agric. Popn. (% of region)	Principal Livelihoods
Irrigated	2	17	Fruits, vegetables, cash crops
Highland Mixed	7	30	Cereals, legumes, sheep, off-farm work
Rainfed Mixed	2	18	Tree crops, cereals, legumes, off-farm work
Dryland Mixed	4	14	Cereals, sheep, off-farm work
Pastoral	23	9	Sheep, goats, barley, off-farm work
Sparse (Arid)	62	5	Camels, sheep, off-farm work
Coastal Artisanal Fishing	1	1	Fishing, off-farm work
Urban Based	<1	6	Horticulture, poultry, off-farm work

Source: FAO data and knowledge.

including tree crops and vines, with 8m cattle. Supplementary winter irrigation is now used on 0.6m ha of wheat and on summer cash crops. More humid areas are characterized by tree crops (olives and fruit), melons and grapes. There is some dry-season grazing of sheep migrating from the steppe areas. Poverty is moderate, but would be higher without extensive off-farm income from seasonal labour migration.

**Dryland Mixed Farming System.** The system is found in dry subhumid areas and contains an agricultural population of 13m people with 17m ha of cultivated land. Population density tends to be lower than in the other main cultivated systems and average farm sizes are larger. The main rainfed cereals are barley and wheat, grown in a rotation involving an annual or two-year fallow. The risk of drought is high and considerable food insecurity exists. Livestock, including 6m cattle and a greater number of small ruminants, interact strongly with the cropping and fodder system. Poverty is extensive among small farmers.

#### Key region-wide trends

The most significant trend over the past 30 years has been accelerating urbanization and the consequent growth of cities. This trend is likely to continue, resulting in rapidly rising demand for water and food – particularly cereals and livestock products. During the period 2000-2030, the population of the region is projected to almost double from its present 296m. This could have a considerable negative impact in

areas with fragile or vulnerable soils and sloping land, and will certainly be of importance for water resources everywhere. Although there is limited scope for further expansion, cultivated land use will increase to 82 percent of total potential. However, the newly cultivated land will often be seriously constrained by climate, slope or poor soils. During 2000-2030, the total irrigated area is forecast to grow by 20 percent. This will bring total irrigated area to a level equal to 77 percent of all land with irrigation potential. Overall irrigation water requirements are expected to grow by 14 percent and efficiency of water use is estimated to reach 65 percent. The overall total of 6 percent projected growth in calorie consumption is low, but the region will still achieve an average daily intake of 3170 kcal by 2030; comfortably exceeding the developing world average of 3020 kcal.

#### STRATEGIC PRIORITIES FOR MIDDLE EAST AND NORTH AFRICA

The priority roles of the State are to develop vital infrastructure (roads, water supplies, services, power systems) and to regulate resource use and foster markets for increasingly scarce resources – notably water. Greater devolution and subregional disbursement of resources appear to be essential, together with greater participation in the development of collective stakeholder responsibility for management and protection of land, water and grazing resources. This requires the strengthening of local institutions and community empowerment, plus the

development of more constructive partnerships between the private sector, major donors and the State. Legislation and regulation is needed to control the grazing pressure on drylands and uplands. These actions should be linked to: the elimination of import subsidies, particularly for grains used for intensive livestock production; the establishment of producer marketing groups; and the formation of action research groups.

Irrigated systems, unlike many others, offer the possibility for greater diversification, intercropping and tree or crop intensification. A further area for investment is the diversification and shift to water-saving cropping patterns. This requires rapid development and access by farmers to micro-water distribution systems that are currently used only by a relatively small group of commercial farmers. New systems of cropping sequences, intercropping and in-season management need to be explored by proactive farmer-researcher groups. The introduction of conservation agriculture techniques, equipment and strategies that make better use of labour, soil and water resources are also of the highest importance in the region.

Despite the oil-based wealth of some countries of the region, agricultural production and water resources are still vital to the livelihoods of many farming families. Prospects for reducing agricultural poverty and adhering to the current international goals in this respect are fairly good. For the region as a whole, exit from agriculture is the most important of the available household strategies for reducing poverty and food insecurity, followed by increased off-farm income. Among on-farm household improvement strategies, diversification and intensification are of equal importance, following closely behind off-farm income in the overall ranking. Increased farm size appears to be of minor importance overall.

Two major groups continue to be excluded from most development initiatives: poorer farmers in dryland areas and pastoralists. There are many threats to the stability and sustainability of natural resource based systems and additional pressure has resulted from weak or inappropriate food policies, which have supported low urban prices at the expense of poorer farmers and livestock herders. Nonetheless, lessons have been learned and there has been a gradual acceptance of the need to re-orientate

development towards the elimination of poverty, based upon sustainable resource use. Five broad strategic initiatives are proposed:

**Sustainable resource management.** Natural resources need to be conserved, through improved watershed management in hill and mountain areas, soil conservation in sloping lands and improved range management in pastoral areas. Components include: strengthening local resource-user groups; better management practices; and improved long-term policies.

**Improved irrigation management.** Increased efficiency in irrigation water management is essential to support the intensification and diversification of production and to reduce resource depletion. Components include: schemes based on both surface and underground water technology; and adjustments to water charges and other regulatory measures.

**Re-oriented agricultural services.** The re-orientation of agricultural research systems to fully involve farmers will underpin intensification in the Irrigated and Rainfed Mixed Systems and enterprise diversification in all systems. Components include: extension services based on a variety of public and private service providers; and greater support for rural agribusinesses to create off-farm employment for farmers.

**Revitalized agricultural education systems.** New approaches to science and higher education learning systems are particularly important in the training of agriculturalists who will work in both the public and private sectors. Components include: the adoption of the significant advances in interdisciplinary learning and systemic thinking which have played such an important role in agricultural education elsewhere in the world.

**Rationalized agricultural policies.** Policies need to re-orientate development towards the elimination of poverty based upon sustainable resource use. Components include: eliminating subsidies for the importation of cheap grains, as well as other forms of support for low urban prices at the expense of poorer farmers and pastoralists.

## EASTERN EUROPE AND CENTRAL ASIA

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### THE REGION AND ITS FARMING SYSTEMS

The region<sup>9</sup> encompasses 28 countries (see Map), most of which have experienced major economic reforms during the recent past. There are two sub-regions with significant differences in the progress and outcome of these reforms: (i) Central and Southeastern Europe (CSEE); and (ii) the Commonwealth of Independent States (CIS). The first includes the Baltic States, Poland, Central and Southern European countries and Turkey and covers an area of 210m ha with a rural population of 67m, of whom 38m are active in agriculture. The most productive area lies in the moist subhumid agro-ecological zone. Mountain and hilly areas with more than 30 percent slope are widespread in the southern part of the sub-region. The CIS includes all former Soviet Union countries except the Baltic States, and covers a total area of 2 180m ha with a population of 284m, of whom 33 percent are rural. Huge areas, covering more than half of the region, lie in the arid or dry subhumid north where permafrost and lack of moisture render them unsuitable for crop production, and where population density is less than three inhabitants/km<sup>2</sup>. The sub-region's most productive farming systems lie in the moist subhumid agro-ecological zone, in the west. The major part of the sub-region lies in the arid and semiarid zone and has only limited production potential, unless irrigated. Both sub-regions have experienced dramatic falls in output, a rise in inequality and an increase in the number of people in poverty.

Altogether eleven major farming systems have been identified and are summarized in Table 4.1.

The three most important of these from the perspective of population, extent of poverty and potential for growth and poverty reduction are briefly described below.

**Mixed Farming System.** This system has an area of 85m ha, lying within intermontane lowland plains in a moist subhumid zone and the cultivated area of 35m ha is largely dedicated to wheat, maize, oil crops and barley, combined with smaller areas of fruit and vegetables. Agricultural population is 16m. Livestock production is dominated by dairy and beef, plus pork. Associated hill and mountain areas are used for grazing and forestry. It is characterized by two dominant subsystems: small- to medium-scale private family farms and medium to large corporate or co-operative farms. Poverty is moderate and concentrated among the most vulnerable groups; such as ethnic minorities, unemployed and unskilled workers, and those farming in marginal areas.

**Large-scale Cereal-Vegetable Farming System.** This system, typical of Ukraine, the Southwest part of the Russian Federation and the Republic of Moldova, covers 100m ha with 38m ha cultivated, principally in the moist subhumid agro-ecological zone. The agricultural population is 15m, and the main crops are wheat, barley, maize, sunflower, sugar beets and vegetables. Most of the farms are still large – ranging from 500 to 4 000 ha – and the dominant ownership is co-operative or corporate. They generate little or no cash income and co-operative members or farm labourers depend on production from their household plot to sustain their families. Poverty is moderate to extensive.

<sup>9</sup> See Annex for a list of countries included in the region, which for the purpose of this analysis includes Turkey.

Table 4.1 Major Farming Systems of Eastern Europe and Central Asia

Farming Systems	Land Area (% of region)	Agric. Popn. (% of region)	Principal Livelihoods
Irrigated	1	4	Cotton, rice, other cereals, tobacco, fruit, vegetables, off-farm
Mixed	4	18	Wheat, maize, oilcrops, barley, livestock
Forest Based Livestock	3	5	Fodder, hay, cereals, industrial crops, potatoes
Horticulture Mixed	3	11	Wheat, maize, oilcrops, fruit, intensive vegetables, livestock, off-farm income
Large-scale Cereal-Vegetable	4	16	Wheat, barley, maize, sunflower, sugarbeet, vegetables
Small-scale Cereal-Livestock	1	4	Wheat, barley, sheep and goats
Extensive Cereal-Livestock	18	15	Wheat, hay, fodder, cattle, sheep
Pastoral	3	10	Sheep, cattle, cereals, fodder crops, potatoes
Sparse (Cold)	52	2	Rye, oats, reindeer, potatoes, pigs, forestry
Sparse (Arid)	6	8	Barley, sheep
Urban Based	<1	7	Vegetables, poultry, pigs

Source: FAO data and expert knowledge.

Extensive Cereal-Livestock Farming System. This system is found throughout the semiarid agro-ecological zone of the Russian Federation and Northern Kazakhstan, but also covers substantial areas in Southern Kazakhstan, Turkmenistan and Uzbekistan. It occupies a total of 425m ha, of which about 106m ha are cultivated, and has an agricultural population of 14m. This is the domain of the steppe, traditionally used by transhumant herders, until converted to cropping over the last few decades. The major outputs are wheat, hay and other fodder crops, combined with cattle and sheep. In the drier parts, with an annual rainfall of only 200 to 300 mm, the land is fallowed every two years. Ownership patterns are in transition, from collective and state farms to co-operative or corporate ownership, with an increasing number of smaller family farms. Poverty is increasing among old people, young families and former co-operative members, as well as in urban areas.

#### Key region-wide trends

Unlike other low and middle-income regions, total populations are stagnant at present, and agricultural populations are ageing in many countries. In part, this lack of population growth may reflect the steep

decline in living standards experienced within the region since the collapse of the centrally planned economic system in the late 1980s. Per capita calorie consumption, which in the mid-1980s was higher than in the industrialized countries, had fallen by nearly 15 percent a decade later. Poverty levels have increased even faster than hunger – with the estimated number of people in poverty (as defined nationally) rising from 14m in 1987-1988 to 147m in 1993-1995.

Past trends indicate a decrease in cultivated land use during the 1990s, following decades of large-scale expansion of ploughed land to the detriment of marshes, forests and steppes – often in areas unsuitable for sustainable agriculture. It is likely that cropping in some of the more marginal areas will be abandoned. Cropping patterns have changed to accommodate an increased share of food crops at the expense of forage and industrial crops. Crop yields have fallen and one reason for decreased productivity has been lower fertilizer use. Yields are expected to increase in future, but only very slowly, catalyzed by farm recapitalization, availability of improved technologies, and increasing experience in crop management in a non-subsidized low external input setting. Market-led changes in cropping pattern are expected, with a trend away from

staple cereals towards higher value crops. During the last 10 years, livestock production has also been decreasing. Forecasts up to 2030 indicate slow recovery and growth of animal numbers at annual rates below one percent.

## STRATEGIC PRIORITIES FOR EASTERN EUROPE AND CENTRAL ASIA

Future development will be driven by further privatization, structural adjustments and market liberalization, plus the gradual spread of farming systems characterized by small size and private or family ownership. After almost ten years of reforms and the adoption of more comprehensive transition policies, the transformation of agriculture is most advanced in CSEE countries where agricultural production has started to rise and labour productivity is increasing. In contrast, CIS countries still need to transform their large-scale farm units and eliminate distortions in production, pricing and marketing of 'strategic' products. Two main ways could be envisaged; one leading to small private farms serviced by a medium-sized corporate farm, leasing its land from ex-members and providing contractual services. The alternative would lead to fully independent small farms; services being provided by individuals among them (e.g. tractor owners for machinery services) or by various co-operation mechanisms. Land tenure arrangements would preferably ensure freehold and free transferability of titles, at least for the cultivated land.

In most CIS countries, economic reform has meant the collapse of the previous system – based on state-controlled allocation of raw and processed products – and the subsequent specialization of certain regions or republics in the production of agricultural products. Price and trade policies need rapid improvement, while addressing legal impediments to market development and eliminating informal barriers to trade are equally important. Improving quality by promotion of standards, and fostering the emergence of new types of private small-scale processing industries are also essential. Strengthening local institutions will also be of the utmost importance in trying to encourage and support the development of new marketing structures.

There is substantial scope for both agricultural growth and poverty reduction in the region. With

regard to the strategies of poor households for escaping poverty, production intensification holds the greatest promise on a regional scale, followed by enterprise diversification. The overall challenge of reducing hunger and poverty demands three major strategic initiatives. These are all concerned with building the capacities of local institutions – both in the public and private sectors – in order to take advantage of farm restructuring and economic liberalization. In the public sector, this implies acquiring the capacity to switch from a planning role in a command economy system to a supporting and guiding role. In the private sector, it means acquiring the knowledge and skills to operate within an open economy. The proposed inter-linked initiatives are:

**Improved resource access.** Improved land tenure systems are needed in order to encourage the efficient use of land and the emergence of viable private farm units. Components include: completing land distribution processes; continuing support and broader development of land administration systems; encouraging formal transfer of land, through renting, leasing or sale and through appropriate valuation; and developing real estate management skills.

**Expanded market development.** Functional markets for agricultural products, inputs and labour are essential. Components include: supporting efficient organizations of producers, traders and processors; investing in market infrastructure (including market and price information systems); improving the quality of food products in order to comply with international norms; and addressing legal impediments to efficient marketing.

**Re-oriented and strengthened agricultural services.** Viable farming systems require new types of post-privatization services. Components include: the provision of mixed public/private sector advisory services; training; and the dissemination of information in order to improve technical, managerial and marketing skills of privatized farms.

Other measures, such as the rehabilitation of viable irrigation schemes and the establishment of rural finance mechanisms, also merit regional priority. However, they will not operate effectively unless local capacities are first enhanced.

## SOUTH ASIA



### THE REGION AND ITS FARMING SYSTEMS

The region<sup>10</sup> (see Map) contains a population of 1344m people – more than one quarter of the population of the developing world – of whom 751m can be classed as agricultural. It has a greater number of undernourished and poor than any other developing region and more than two-thirds of these reside in rural areas. Despite improvements in national food security over the last three decades, around 284m people are still undernourished, while 43 percent of the world population living in dollar poverty are located here. The rural population density – at 1.89 persons/ha – is also higher than in any other developing region, and the concentration of most of the population on less than half of the land area, has resulted in severe pressure on natural resources. Nineteen percent is densely populated, humid or moist subhumid lowland containing the bulk (43 percent) of the region's people; while 29 percent is dry subhumid and still heavily populated, as it contains 33 percent of the population. The remaining 32 percent is semiarid and arid lowland supporting only 19 percent of the region's inhabitants.

The eleven farming systems defined within the region are summarized in Table 5.1 (see Map for their location).

The four most important of these systems from the perspective of population, extent of poverty and potential for growth and poverty reduction are briefly described below.

**Rice Farming System.** This is dominated by intensive wetland rice cultivation in fragmented plots,

with or without irrigation. Total area is 36m ha and cultivated area is 22m ha, of which 10m ha (43 percent) are irrigated. Agricultural population is 263m. The system is concentrated in Bangladesh and West Bengal, India, and it contains 51m bovines and a considerable number of small ruminants. Poor farmers operate extremely small areas, and often rely on off-farm income for survival. Poverty is extensive and also quite severe.

**Rice-Wheat Farming System.** This system is characterized by a summer paddy crop followed by an irrigated winter wheat crop (and sometimes also a short spring vegetable crop) and forms a broad swathe from Northern Pakistan through the Indo-Gangetic plain to Northwest Bangladesh. Total area is 97m ha with an estimated 62m under cultivation, of which around 78 percent is irrigated. Within this system, 254m people are classified as agricultural. There is a significant level of crop-livestock integration, with an estimated 119m bovines and 73m small ruminants. Poverty is extensive and also quite severe.

**Highland Mixed Farming System.** This mixed crop-livestock farming system, generally intermediate between the rice-wheat plains of the lowlands and the sparsely populated high mountain areas above, extends along the length of the Himalayan range, as well as in pockets in Afghanistan, Southern India and Sri Lanka. Major products include cereals, legumes, vegetables, fodder trees, orchards and livestock. Total area is 65m ha with an estimated 19m ha under cultivation, of which around 14 percent is irrigated. Nearly 53m people are classified as agricultural, and

<sup>10</sup> See Annex for a list of countries included in the region.

Table 5.1 Major Farming Systems of South Asia

Farming Systems	Land Area (% of region)	Agric. Popn. (% of region)	Principal Livelihoods
Rice	7	17	Wetland rice (both seasons), vegetables, legumes, off-farm activities
Coastal Artisanal Fishing	1	2	Fishing, coconuts, rice, legumes, livestock
Rice-Wheat	19	33	Irrigated Rice, wheat, vegetables, livestock including dairy, off-farm activities
Highland Mixed	12	7	Cereals, livestock, horticulture, seasonal migration
Rainfed Mixed	29	30	Cereals, legumes, fodder crops, livestock, off-farm activities
Dry Rainfed	4	4	Coarse cereals, irrigated cereals, legumes, off-farm activities
Pastoral	11	3	Livestock, irrigated cropping, migration
Sparse (Arid)	11	1	Livestock where seasonal moisture permits
Sparse (Mountain)	7	<1	Summer grazing of livestock
Tree Crop	dispersed	1	Export or agro-industrial crops, cereals, wage labour
Urban Based	<1	1	Horticulture, dairying, poultry, other activities

Source: FAO data and expert knowledge.

there are about 45m bovines and 66m small ruminants. Poverty is aggravated by remoteness and the lack of social services, and is rated between moderate and extensive.

**Rainfed Mixed Farming System.** This rainfed cropping and livestock farming system occupies the largest area within the sub-continent and is confined almost entirely to India. Total system area is 147m ha with an estimated 87m ha under cultivation, of which around 16 percent are irrigated. Rice and some wheat are grown, as well as pearl millet and sorghum, a variety of pulses and oilseeds, sugarcane, vegetables and fruit. Of the human population a total of 226m are classified as agricultural. There are an estimated 126m bovines and 64m small ruminants. Vulnerability stems from the substantial climatic and economic variability. Poverty is extensive and its severity increases markedly after droughts.

#### Key region-wide trends

The region's 1999 population of about 1344m is expected to reach 1920m by 2030, and the proportion living in cities will rise to 53 percent. The proportion in dollar poverty is projected to decline

from 40 percent to approximately 20 percent. Area cultivated is expected to show only a marginal increase while irrigated land area will continue to grow slowly. Rice yields have increased by an average of almost 2 percent per annum over the last 30 years. Wheat production increased by more than 250 percent to almost 100m tons in 2000 and the growth rate of both crops is expected to be maintained in the period to 2030. Use of inorganic fertilizers has expanded rapidly in recent decades; from 3 kg of plant nutrients per ha in 1970 to 79 kg/ha in the mid-1990s, and is expected to continue to increase, albeit more slowly. With higher incomes, meat consumption (particularly poultry meat and eggs, sheep and goat meat) and demand for dairy products are expected to continue their significant expansion. However, the large ruminant population is likely to stabilize, or even decline, as tractors replace both draught buffalo and oxen.

#### STRATEGIC PRIORITIES FOR SOUTH ASIA

Given their importance for poverty reduction across many different systems, strong support will be needed both for small farm diversification and for

growth in employment opportunities in the off-farm rural economy. Measures that assist farm households to leave agriculture will be an important secondary priority, and would need to include improved rural education and vocational skills training. There is also some potential for poverty reduction by means of intensification of existing production patterns, largely through improved water management and adoption of improved technologies. Because of the pressure on land, there is less opportunity than elsewhere for poverty reduction through the expansion of the farms of poor small farmers. Thus, sustainable utilization of the land and water resource base represents a key strategic priority.

Decentralization and the strengthened performance of local institutions will be essential for the development of most farming systems. Investments in roads and educational services should be an essential ingredient of any strategy for accelerating agricultural production and rural development. Priority should also be given to the integration of better on-farm nutrient management (INM) – combining inorganic and organic nutrient sources – and to economic incentives for balanced fertilizer use. Conservation agriculture should be introduced; including the greater integration of livestock and trees into the system.

Significant improvement in water management will only be possible if functioning markets for water are established and realistic water charges are introduced. A double benefit, to growth and to poverty reduction, could result from an overhaul of obsolete land tenure policies and regulations. Considerable investment is needed in local commodity markets and price information systems, especially in the more remote farming systems, as well as further development of rural financial services including micro-finance and linkages to mainstream banking. A high priority for investment in the coming 30 years would be empowering small farmers to access improved information on markets, services and technologies. Increases of human capital are required in order to underpin

diversification towards high value skill-intensive enterprises as well as the development of small-scale local rural industry.

Four broad, inter-linked, strategic initiatives are proposed:

**Improved water resource management.** Improved water management is essential to support the intensification and diversification of production and to reduce resource depletion, for both surface and underground water schemes. Components include: technology; conjunctive use; water charges and other regulatory measures; strengthened water users' associations; and watershed protection.

**Strengthened resource user groups.** Strengthening resource user groups is one way to redress the extensive land and water degradation in plains and hills, and protect watershed resources. Components include: resource management groups for watershed management in hill and mountain areas; range management groups in pastoral areas; and policies to encourage effective common property resource management.

**Improved rural infrastructure.** Returns to transport and health investments are high and beneficial to the poor, especially in low potential and highland areas in the region. Components include: roads; drinking water; schools; health facilities; and effective models for private sector participation.

**Re-oriented agricultural services.** The re-orientation of agricultural research, education, information and extension systems to involve farmers fully will underpin the drives for intensification and enterprise diversification and promote sustainable resource management. Components include: models for joint public-private service provision; pluralistic advisory services; Internet based delivery of service, market and technical information to small farmers; and the incorporation in higher education learning systems of interdisciplinary learning and approaches.

## EAST ASIA AND PACIFIC



### THE REGION AND ITS FARMING SYSTEMS

The region<sup>11</sup> (see Map) contains 1 836m people (just over one-third of all the inhabitants of developing countries), 1 124m (62 percent) of whom are directly involved in agriculture. Considerable variation exists among countries in terms of size and density of population. Most people are concentrated in just two countries: China (with 1 278m inhabitants or 68 percent of the region) and Indonesia (205m or 12 percent of the region) – respectively the first and fourth most populous countries in the world.

Total land area is 1.6 billion ha, of which forest accounts for over 20 percent and cultivated land 15 percent. Grasslands, wastelands, desert, mountains, urban areas and waterbodies make up the rest of the area. An estimated 15 percent of the population live in poverty, a quarter of them in China. Rural poverty is on average twice as prevalent as in urban areas, but its level varies widely – from under 5 percent of rural inhabitants in China to over 57 percent in Vietnam. With the exception of China and the Republic of Korea, the economies of the region are strongly agrarian. The average contribution of the agricultural sector to total GDP is 13 percent, but reaches over 50 percent in Laos, Myanmar and Cambodia.

The eleven farming systems defined within the region are summarized in Table 6.1 (see Map for their location). The most important of these systems from the perspective of population, extent of poverty and potential for growth and poverty reduction are briefly described below.

**Lowland Rice Farming System.** This intensive wetland rice system is found in lowland humid and moist subhumid tropical areas and covers a total area of 197m ha. It is the most important farming system in the world in terms of its agricultural population, estimated at 474m people. Cultivated area is 71m ha, of which about 45 percent are irrigated. Large areas are found in Thailand, Vietnam, Myanmar, South and Central China, Philippines and Indonesia. The cropping intensity of the rice is dependent on rainfall distribution, length of growing season and the availability of irrigation. Important subsidiary crops include oilseeds, maize, root crops, soybeans, sugarcane, cotton, vegetables and fruits in all areas, while wheat is significant in Central China. Although China has made a great deal of progress in recent years, poverty in most other countries of the region is extensive and generally severe.

**Tree Crop Mixed Farming System.** This system is found in flat to undulating humid tropical areas with poor soils. Total area is 85m ha, with an agricultural population of 30m. Cultivated area is estimated at 18m ha of which some 12 percent are irrigated. Significant areas are found in Malaysia, Indonesia, Thailand, Cambodia, Philippines, Vietnam, Southern China and Papua New Guinea. Major industrial crops include rubber, oil palm, coconut, coffee, tea and cocoa, with associated crops such as pepper and other spices. They are found on both large private estates and smallholdings. Small non-tree crop farms are also found within the system, growing food, cash crops and livestock. Coconut plantations are widespread throughout most East Asia and Pacific countries. Poverty is moderate.

<sup>11</sup> See Annex for a list of regional countries. Hong Kong, Australia, Japan, New Zealand, Singapore and Taiwan are excluded.

Table 6.1 Major Farming Systems of East Asia and Pacific

Farming Systems	Land Area (% of region)	Agric. Popn. (% of region)	Principal Livelihoods
Lowland Rice	12	42	Rice, maize, pulses, sugarcane, oil seeds, vegetables, livestock, aquaculture
Tree Crop Mixed	5	3	Rubber, oil palm, coconuts, coffee, tea, cocoa, spices, rice, livestock
Root-Tuber	2	<1	Root crops (yam, taro, sweet potato), vegetables, fruits, livestock (pigs and cattle)
Upland Intensive Mixed	19	27	Rice, pulses, maize, sugarcane, oil seeds, fruits, vegetables, livestock
Highland Extensive Mixed	5	4	Upland rice, pulses, maize, oil seeds, fruits, forest products, livestock
Temperate Mixed	6	14	Wheat, maize, pulses, oil crops, livestock
Pastoral	20	4	Livestock with irrigated crops in local suitable areas
Sparse (Forest)	10	1	Hunting, gathering
Sparse (Arid)	20	2	Local grazing where water available
Coastal Artisanal Fishing	1	2	Fishing, coconut, mixed cropping
Urban Based	<1	1	Horticulture, livestock, off-farm income

Source: FAO data and expert knowledge.

**Upland Intensive Mixed Farming System.** This system is found in a wide range of climates in sloping upland and hill areas. Total area is 310m ha, with an agricultural population of 314m. Cultivated area is 75m ha, of which about a quarter is irrigated. This is the most widespread and most heterogeneous farming system in the region, with major areas located in all countries of East and Southeast Asia. A wide range of mostly permanent crops is cultivated, varying according to local conditions. A significant crop area (mainly rice) is irrigated from local streams and rivers. Livestock production (with 52m head of bovines within the system) is an important component of most farm livelihoods and contributes draught power, meat, cash income and savings. Poverty is extensive, varying from moderate to severe.

**Temperate Mixed Farming System.** This farming system is found in dryer and cooler areas of the region in Eastern and Northeastern China and restricted areas of Mongolia. Total area is 99m ha, with an agricultural population of 162m. Cultivated area is 31m ha, of which about 40 percent is irrigated. Major crops are wheat and maize with smaller areas of rice, cotton, soybeans, sweet potato and rape – depending

on local temperature and water conditions – as well as citrus and some temperate fruits. Livestock are important, particularly cattle (11m head), pigs and poultry. Poverty is moderate.

#### Key region-wide trends

Although total population will reach 2.3 billion by 2030, agricultural populations will be marginally lower, as a result of increased urbanization. Cultivated land area will also remain largely unchanged regionwide, but irrigation will expand by almost 20 percent and forest areas diminish still further. Smallholder-based production will still be the norm in 2030, despite an increase in commercial operations. Average crop yields will rise by 1.2 percent per annum to 2030, but the rate for rice will be only 0.7 percent per annum. Growing urban demand will drive growth in vegetables, fruits and animal products. Numbers of almost all forms of livestock, except buffalo, are projected to increase strongly over the next 30 years, averaging more than 1 percent per annum and demand for animal feeds will grow accordingly. Fertilizer use will expand moderately (0.4 percent per annum).

## STRATEGIC PRIORITIES FOR EAST ASIA AND PACIFIC

The strong economic growth and steady reduction in poverty in China and other regional countries during recent decades is noteworthy. Nevertheless, poor socio-economic indicators in many countries continue to reflect the results of widespread quasi-subsistence agriculture and small farm size; exacerbated by poor access to financial resources, lack of opportunities for intensification and diversification, and insufficient opportunities for off-farm employment. This situation is dictated by underlying factors that include overpopulation, land fragmentation, absence of land security, and deterioration of natural resources. Further substantial reduction of poverty can, however, occur if rural communities and households are provided with adequate incentives and opportunities to invest their labour, capital and resources.

In broad terms, lower potential systems within the region are expected to achieve significant poverty reduction through migration to cities, while higher potential systems will benefit more from diversification of agricultural activities and increased productivity. Bearing in mind the fact that any comment on the region is heavily weighted by the situation in China, it is evident that expanded off-farm employment and income is an important pathway for poverty reduction in all systems, with approximately 40 percent of rural poverty reduction expected to derive from this strategy. Diversification of agricultural activities on-farm is the second most important strategy overall and, together with off-farm income, accounts for nearly two thirds of the development potential for poverty reduction.

While many policies that emphasize social issues are extremely important, the resolution of these issues in rural areas depends critically on agricultural growth. Poor members of rural communities require opportunities to increase their labour productivity in farming and to utilize surplus labour in the non-farm sector. Agricultural growth, if equitable, will create beneficial opportunities for all – including opportunities for disadvantaged rural households to

become involved as suppliers of goods and services, or as primary processors of raw products. Within this overall framework, specific actions directed at poverty-stricken, food insecure and disadvantaged families are necessary. Four broad, inter-linked, strategic initiatives are proposed:

**Increased small farm competitiveness.** Increasing the competitiveness of small and poor farmers provides a basis for successful diversification into new, higher-value agricultural activities. Components include: improved marketing and processing; strengthened product standards; expanded availability of financing; and integrated technologies for sustainable productivity increases in high value enterprises as well as traditional staple crops.

**Improved resource access.** Greater production efficiency depends on reduction of fragmentation and the expansion of operated area for marginal holdings. Components include: improved land policies; land titling; land leasing arrangements; and financing for land purchase.

**Enabling environment for the creation of off-farm income.** Off-farm employment opportunities provide the most important potential for escape from rural poverty in the region. Components include: the creation of a favourable environment for off-farm employment; the enactment of appropriate policies, with particular emphasis on processing assembly and tourism; and attention to infrastructure improvement in many systems.

**Enhanced human resource development.** If gains in recent decades are to be carried forward into the future, it is vital that members of small farm households increase their knowledge base and capacity to respond to both changing agricultural requirements and off-farm employment opportunities. Components include: the development of information and knowledge networks; farmer capacity building; support to entrepreneurship; and training to the younger segments of the population in vocational skills.

## LATIN AMERICA AND CARIBBEAN

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### THE REGION AND ITS FARMING SYSTEMS

The region<sup>12</sup> (see Map) has 505m inhabitants of whom 111m (22 percent) are directly involved in agriculture. Total land area is 2050m ha. It encompasses 42 countries, and contains some of the richest countries in the world in terms of biodiversity, plus the world's largest unfragmented tropical forest – found in the Amazon basin. Some 90 percent of the land area is humid and subhumid. The region contains 160m ha of cultivated land including 18m ha equipped for irrigation. With an average per capita GNP of US\$3 940 in 1998, it is the wealthiest of the developing regions and also the least dependent on agriculture. Serious problems of equity exist, however, as not only do the wealthy control one of the highest proportions of resources of any region in the world, but there is also a strong urban bias. As of 1997, 54 percent of rural households were classified as poor, against only 30 percent from urban areas. Extreme poverty affected 31 percent of rural households but only 10 percent of urban ones. In total, 47m rural inhabitants were classified as being in extreme poverty, and a further 78m are in poverty. Equity problems are particularly evident in respect of land distribution.

Due to its enormous latitudinal range, varied topography and rich biodiversity, the region has one of the most diverse and complex range of farming systems in the world. The sixteen major systems defined for the region are summarized in Table 7.1 (see Map for their location).

The four most important of these systems from the perspective of population, extent of poverty and

potential for growth and poverty reduction are briefly described below.

**Extensive Mixed (Cerrados and Llanos) Farming System** Covering over 230m ha of wooded and open savannah areas in Central-western Brazil (Cerrados) and Eastern Colombia, Venezuela and Guyana (Llanos), this system has an agricultural population of only 10m. Due to its historic isolation from markets and to soil constraints, the system has traditionally been dedicated to extensive livestock ranching (60m head of cattle are found within the system) and only recently has cropping started to assume a significant role. An early emphasis on upland rice – still predominant in the Llanos – has now given way to soybeans, maize and even coffee in the Cerrados. Although there are still only 32m ha under cultivation, and poorly managed intensification has resulted in severe land degradation in some areas, this frontier system offers enormous potential for future agricultural growth. Poverty is relatively low, although higher among landless immigrants entering the system.

**Dryland Mixed Farming System.** The system is located in Northeast Brazil and in the Yucatan peninsula of Mexico. Total land area is 130m ha with an agricultural population of over 10m. Despite frequent droughts, little more than 2 percent of the 18m ha of cultivated land is irrigated and agriculture is mainly semi-subsistence based livestock (24m head with the system), maize, beans and vegetable production. There is extensive and severe poverty among small-scale producers, who exist alongside a small number of large-scale extensive ranches that

<sup>12</sup> See Annex for a list of countries included in the region.

Table 7.1 Major Farming Systems of Latin America and the Caribbean

Farming Systems	Land Area (% of region)	Agric. Popn. (% of region)	Principal Livelihoods
Irrigated	10	9	Horticulture, fruit, cattle
Forest Based	30	9	Subsistence production//cattle ranching
Coastal Plantation and Mixed	9	17	Export crops // tree crops, fishing, tubers, tourism
Intensive Mixed	4	8	Coffee, horticulture, fruit, off-farm work
Cereal-Livestock (Campos)	5	6	Rice & livestock
Moist Temperate Mixed-Forest	2	1	Livestock, cereals, forestry, tourism
Maize-Beans (Mesoamerican)	3	10	Maize, beans, coffee, horticulture, off-farm work
Intensive Highlands Mixed (Northern Andes)	2	3	Vegetables, maize, coffee, cattle // pigs, cereals, potatoes, off-farm work
Extensive Mixed (Cerrados & Llanos)	11	9	Livestock, oilseeds, grains, some coffee
Temperate Mixed (Pampas)	5	6	livestock, wheat, soybean
Dryland mixed	6	9	Livestock, maize, cassava, wage labour, seasonal migration
Extensive Dryland Mixed (Gran Chaco)	3	2	Livestock, cotton, subsistence crops
High Altitude Mixed (Central Andes)	6	7	Tubers, sheep, grains, llamas, vegetables, off-farm work
Pastoral	3	1	Sheep, cattle
Sparse (Forest)	1	<1	Livestock, forestry, tourism
Urban Based	<1	3	Horticulture, dairy, poultry

Source: FAO data and expert knowledge.

Note: // - within the livelihoods column separates distinguishable subsystems.

control most of the land. With productivity low, and most land rented or sharecropped, smaller producers often depend on seasonal migration and wage labour for survival. Land degradation is a serious problem.

**Maize-Beans (Mesoamerican) Farming System.** Stretching from Central Mexico to Panama with an agricultural population of 11m – including a substantial indigenous population – this system covers 65m ha and is historically and culturally based upon the production of maize and beans for subsistence, although coffee and vegetables are important sources of cash income. There are 6m ha of cultivated land, of which one third are irrigated. The loss of better valley lands to non-indigenous settlers and commercial operations has led to high levels of population pressure on hillsides and other marginal areas, resulting in extensive and severe poverty and serious land degradation in many areas.

**High Altitude Mixed (Central Andes) Farming System.** The system covers 120m ha with an agricultural population of over 7m. Less than 3 percent of the land area is cultivated, but more than a third of this area is irrigated. Throughout most of Peru the system occupies the steep valleys of the high Sierra, while from Southern Peru through Western Bolivia into Northern Chile and Argentina, the altiplano is the predominant landform. The key characteristics are: production at an altitude of more than 3 200 metres; dependence on indigenous grains, potatoes, sheep and llamas; and a very strong indigenous culture. Poverty is extensive and often very severe in this system and there are few large producers.

#### Key region-wide trends

Population will reach 725m by 2030, but the proportion living in rural areas will decline from 25 percent to 17 percent over the next 30 years,

leaving rural populations marginally lower than at present. During 2000-2030, cultivated land will expand at least a further 20 percent, irrigated area remaining constant in relative terms at 14 percent of cultivated land. The major cereals have all grown strongly in the last 30 years – almost entirely due to yield increases – and output is expected to continue to expand, albeit at a slower rate. Fruits and vegetables have also exhibited strong growth; the area dedicated to fruit has expanded faster than for any other crop category over this period. Production of oilcrops, particularly soybean and sunflower, has increased at almost 6 percent per annum since 1961, and rapid growth is expected to continue.

### STRATEGIC PRIORITIES FOR LATIN AMERICA AND CARIBBEAN

Three key strategic areas are likely to dominate governmental and institutional roles within farming systems over the next 30 years: (i) improving access to land and water in farming systems with extensive poverty and among the poor in other systems; (ii) promoting alternative occupations for the agricultural poor who do not have access to sufficient land and water to escape poverty; and, (iii) strengthening public goods in rural areas. In all these areas, Government will inevitably play a major role, although this must occur in co-operation with civil society and private sector groups. Across all systems except the most remote, it is expected that diversification will be a significant source of agricultural poverty reduction, and would include a shift into higher value non-traditional crops as well as added-value activities, such as grading, packaging, and on-farm processing.

Despite these opportunities, the majority of marginal and sub-marginal farmers will lack the human, financial, locational and natural resource assets to participate in market-based diversification. Two broad alternatives exist: local off-farm employment and outmigration. The creation and sustainability of rural off-farm employment will depend heavily upon the growth of private sector activity, in such areas as agroindustry, tourism and assembly operations. Support is needed for both large-scale employers and small enterprise development. Larger enterprises may be encouraged through support for training of staff and suppliers, the creation of effective dispute arbitration mechanisms, targeted infrastructure development

and tax incentives. Small enterprise promotion would largely focus on removing legal and bureaucratic barriers to business establishment, improved small-scale investment formulation and financing, business management training, and encouragement for the formation of small-enterprise support organizations. In those systems with existing high levels of poverty and limited natural resource potential, high levels of exit are inevitable, given the lower poverty levels and increased availability of services in urban areas. The social and human cost of such outmigration can be reduced, however, through support measures for outmigrants, including training in non-agricultural skills, the purchase of legal and even traditional land rights, and incentives to move to intermediate, rather than capital, cities.

One key area of public goods is infrastructure and such areas as rural roads, electrification and water capture for irrigation are critical for diversification and intensification activities in many areas. However, infrastructure provision must occur in the context of growth opportunities if it is to be effective. Other public goods, such as extension and information services will almost certainly have to be provided through partnerships with the private sector, due to constraints on recurrent expenditure in government budgets.

Overall, the region offers a sharp contrast between extensive frontier areas with low population densities and a high future growth potential, and established densely populated systems – many with extensive poverty. Yet these two extremes share a number of common challenges over the next 30 years and, although it is impossible based solely on the foregoing regional analysis, to prescribe specific national actions, the overall situation demands a clear strategic focus for agricultural development based on three broad, inter-linked, regional initiatives:

**Sustainable resource management.** Sustainable management of natural resources and the reversal of resource degradation are of prime importance, both in established high population systems and in rapidly growing frontier areas. However, a clear positive impact on producer incomes is essential if widespread adoption is to occur. Components include: dissemination of proven technologies for small-holders, including: green mulching, small-scale no-till, vegetative barriers, terracing and zero grazing; expanded attention to the selection, testing and dissemination of varieties appropriate for small producers, with an emphasis on permanent and tree

crops; financing producer out-migration from unsustainable lands to permit reforestation; promotion of off-farm employment opportunities, so as to reduce pressure on densely populated areas; and, improving knowledge of frontier area lands and their fragile soils.

**Improved resource access.** A fundamental precondition for development in the region is improved access to – and control over – land by poorer rural populations. Components include: strengthened cadastral, titling and registration services; dispute resolution services; land banks financing consolidation of smallholdings, as well as purchase, break-up and resale of larger holdings; improved management measures for communally owned lands, including protection from invasion and colonization; and, taxation policies that provide incentives for sustainable land use.

**Increase small farm competitiveness.** It is essential to increase the capacity of the smaller producers within farming systems, to respond adequately to trade liberalization and market development. Components include: training of farmer groups in commercial management and administration techniques; improved technologies for high value production; reduced barriers to entry for small enterprises, as well as the strengthening of enterprise associations; the facilitation or part financing of the development of rural market-related infrastructure such as roads, communications and market facilities; and provision of incentives for relocation of agro-processing and other enterprises to rural areas – including training of personnel, infrastructure provision and technical support to contracted producers.

## GLOBAL CHALLENGES, POTENTIALS AND PRIORITIES

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Widespread and severe household food insecurity occurs in many farming systems and is expected to remain a major concern during coming decades. Indeed, available projections point to a probable failure to meet the commitments made by the international community to halve hunger and poverty by 2015. In all regions, poverty and household food insecurity are more prevalent and more severe in rural areas. There is thus an urgent need for a rapid reduction in rural poverty. In many cases, this will involve transitory measures to safeguard minimum nutritional and livelihood standards. However, programmes for immediate poverty alleviation need to be complemented by longer-term improvements based upon a process of pro-poor economic growth and development.

The objective of this Chapter is to examine and define possible ways of achieving the international commitment to halve hunger and poverty by 2015. Consideration is given to the relative importance of different household strategies for escaping from poverty, both in relation to the broad categories of farming systems defined previously, as well as with respect to the agricultural potential and degree of intensification of different systems. The conclusions of these analyzes provide the basis for the definition of a global strategy for hunger and poverty reduction, focusing on five main areas: (i) the reform of the policy and institutional environment; (ii) measures related to efficient markets; (iii) improving the availability of information and human capital; (iv) effective technology deployment; and (v) application of sustainable natural resource management. In each case, the three or four most important initiatives for poverty reduction are highlighted and discussed.

### SYSTEM CATEGORIES AND HOUSEHOLD STRATEGIES

#### Categorizing farming systems on a global basis

The 72 farming systems identified in the six developing regions can be grouped into eight major categories (see Chapter 1), based on the characteristics described in the previous chapters, in order to facilitate comparison and integration of development lessons into an overall global strategy for poverty reduction (see Table 8.1). The eight system categories, are: (i) smallholder irrigated farming systems; (ii) wetland rice based farming systems; (iii) rainfed farming systems in humid areas; (iv) rainfed farming systems in steep and highland areas; (v) rainfed farming systems in dry or cold areas; (vi) dualistic farming systems with both large-scale commercial and smallholder farms; (vii) coastal artisanal fishing mixed farming systems; and (viii) urban based farming systems. Except in the case of the dualistic category, smallholder producers dominate these system types.

Although the largest single category is that of the wetland rice based systems (of South and East Asia) with an agricultural population of 860 million, the rainfed humid, highland and dry/cold systems together account for over 1400 million people and a much greater area of cultivated land (over 6 billion ha). Interestingly, the three farming system categories with high levels of marketable surplus account for an agricultural population of only 130 million in total.

#### Relative importance of poverty reduction strategies by system category

The improvement of farm household livelihoods that would be necessary to meet international goals of

Table 8.1 Comparison of Farming Systems by Category

Category characteristic	Smallholder irrigated schemes	Wetland rice based	Rainfed humid	Rainfed highland	Rainfed dry/cold	Dualistic (large/small)	Coastal artisanal fishing	Urban based
Number of Systems	3	3	11	10	19	16	4	6
Total Land (m ha)	219	330	2 013	842	3 478	3 116	70	n.a.
Cultivated Area (m ha)	15	155	160	150	231	414	11	n.a.
Cultivated/Total (%)	7	47	8	18	7	13	16	n.a.
Irrigated Area (m ha)	15	90	17	30	41	36	2	n.a.
Irrigated/Cultivated (%)	99	58	11	20	18	9	19	n.a.
Agricultural Pop. (m)	30	860	400	520	490	190	60	40
Agric. Persons/ Cultivated ha	2.1	5.5	2.5	3.5	2.1	0.4	5.5	n.a.
Market Surplus	high	medium	medium	low	low	medium	high	high

Source: FAO data and expert knowledge.

n.a. Not available.

halving hunger and poverty by 2015 could be derived from five main sources, defined in Chapter 1, which correspond to the principal farm household strategies for escaping from hunger and poverty. These are:

- intensification of existing patterns of farm production;
- diversification of production, including the development of market-oriented production and increased value added post-harvest activities such as processing;
- increased operated farm or herd size, either through consolidation of existing holdings or the extension of farming onto new agricultural land;
- increased off-farm income to supplement farming activities; and
- exit from agriculture, often involving migration to urban areas.

The relative importance of these poverty reduction strategies differs between system categories. In order to facilitate policy and programme formulation, the three most important poverty reduction strategies for each farming system category are shown in Table 8.2. In aggregate terms, a larger proportion of poverty reduction is expected from improvements on the farm (intensification, diversification and increased farm size) than from off-farm sources (increased off-farm income and exit from agriculture). In the context of farm improvement, diversification is a key strategy for poverty reduction in all eight system categories (and, in fact, is the most important source of poverty reduction in many of these systems). Intensification is key in four system categories, notably those with higher potential such as irrigated, wetland rice and dualistic systems,

Table 8.2 Key Strategies for Poverty Reduction by Farming System Category

Poverty Reduction Strategies	Smallholder irrigated schemes	Wetland rice based	Rainfed humid	Rainfed highland	Rainfed dry/cold	Dualistic (large/small)	Coastal artisanal fishing	Urban based
Intensification	■	■	■			■		
Diversification	■	■	■	■	■	■	■	■
Increased farm size						■		■
Increased off-farm income	■	■	■	■	■		■	■
Exit from agriculture				■	■		■	

Note: Key strategies are those which rank first, second or third for each system category.

while increased farm, herd or business size is key only in dualistic and urban based systems.

Millions of farmers are expected to escape poverty by increasing off-farm income, which is second only to diversification as a key strategy for poverty reduction, and is of importance in all systems except the dualistic. The exit of farmers from agriculture within a particular farming system is expected to be an increasingly common phenomenon, and of particular importance among smallholders in rainfed highland and dryland areas, and in coastal artisanal fishing systems.

As indicated above, there are important complementarities between the poverty reduction strategies. In fact, farmers will often intensify and diversify their production simultaneously. Furthermore, these on farm processes create the conditions for the development of the non-farm economy, which in turn stimulates further agricultural growth. On the other hand, poor farm households unable to participate effectively in diversification and intensification processes may well progressively increase the emphasis on off-farm income over time, until they finally abandon agriculture altogether.

#### Implications of system resource endowments on poverty reduction strategies

Although significant gains have been made in agricultural production and economic growth in many areas as a result of the green revolution and subsequent efforts, considerable concern exists as to whether the poverty reduction strategies promoted in these areas are of relevance for farm households facing different circumstances. To evaluate this issue, the study compared the relative importance of different household poverty reduction strategies in high and low potential systems.

Both existing livelihood levels and the potential for future improvement depend upon the quality and availability of natural resources. Resource potential can be viewed as a continuum running from systems situated in cold or arid areas to those located in fertile, irrigated conditions. Examples of farming systems in low potential areas are the Agro-Pastoral Millet/Sorghum System in Africa and the High Altitude Mixed (Central Andes) System in Latin America. Although low potential systems account for 25 of the 51 systems which could be classified, their agricultural population is very small; only 290m or 17 percent of the developing world total. By contrast, farming systems in high potential areas contain an

estimated agricultural population of 1450m and include: all Irrigated Systems; the Cereal-Root Crop Mixed System in the moist savannah of West and Central Africa; the Extensive Mixed (Cerrados and Llanos) System in Latin America; the Large-scale Cereal-Vegetable Farming System in Eastern Europe and Central Asia; and the Tree Crop Mixed System in East Asia and Pacific.

Farming systems in high potential areas, with relatively fertile soils and favourable climate, typically place much greater importance on agricultural intensification and diversification strategies than those farming in areas of low potential. For low potential systems, taken as a group, these strategies were relatively unimportant. Instead a single strategy, exit from agriculture, accounted for almost half the total weight of poverty reduction strategies – a perhaps understandable response to poor conditions and low levels of production and social services. However, the two strategies of increased off-farm income and increased farm or herd size appeared unaffected by the agricultural potential of the systems examined, and were of moderate importance in both groups.

#### Implications of system intensification on poverty reduction strategies

Within the range of farming systems there is also a gradation in the level of production intensity. Although it might be thought that production intensity is a function of agricultural potential (above), in fact it appears more closely correlated to access to, and availability of, agricultural support services. Even relatively low potential systems in areas with high population densities and well-developed services can generate high intensities of production, while high-potential systems with low levels of service availability (e.g. the moist savannah areas of West Africa and the extensive Cerrados and Llanos zones of South America) can remain at low intensity.

Farming systems can be classified generally in four levels of intensity: low; medium (food-oriented); medium (market-oriented); and high. The 27 systems defined as low intensity, including agro-pastoral, pastoral, high altitude and sparse agriculture systems, support 350 million people but have scattered populations, extensive land use practices, low levels of input use and little market surplus.

Medium intensity (food-oriented) systems have evolved where population growth pressure on

resources has been overwhelming and the 20 systems defined include an estimated agricultural population of 950m in many systems most associated with rural poverty, such as: the Maize Mixed and Cereal-Root Crop Mixed Systems of Africa; the Highland Mixed Systems of the Middle East and North Africa, and of South Asia; the Large-scale Cereal-Vegetable System of East Europe and Central Asia; and the Maize-Beans and Rice-Livestock Systems of Latin America. Medium intensity (market-oriented) systems, in contrast, comprise only 6 systems with a total population of only 100 million, and their development has been driven principally by the existence of readily accessible market opportunities. They are less important in terms of poverty reduction than they are in terms of export earnings, but include: the Tree Crop Systems of Africa and East Asia; the Horticulture Mixed System of East Europe and Central Asia; and a number of systems in Latin America and the Caribbean including the Coastal Plantation and Mixed System.

Systems which possess, or can evolve, well-developed agricultural services, will be key to increasing global food production and security in the future. These include in particular most irrigated and wetland rice systems (where more than 50 percent of the cultivated land is irrigated). These systems generally have an advanced level of market

development with significant external input use and a substantial amount of irrigation – allowing them to generate a surplus for sale to urban areas and export markets.

Although exit from agriculture is more significant for low intensity systems, the assessments presented in the regional analyzes suggest that other household strategies are less affected by the level of intensity of the farming system. Intensification, diversification, increase in farm size and off-farm income are all classified as having somewhat similar degrees of importance at all four levels of intensification.

### A GLOBAL STRATEGY FOR HUNGER AND POVERTY REDUCTION

Key regional initiatives highlighted as a result of the analysis of farming systems and presented in the preceding chapters, are summarized in Table 8.3. It is clear that some key initiatives are of importance worldwide, particularly improved resource management and more equitable and secure access to resources. Other initiatives, such as increased small farm competitiveness and re-oriented agricultural services are common, but not universal. Nevertheless, it should be borne in mind that a similar general area of initiative (e.g. sustainable resource management) might have quite distinct components

Table 8.3 Key Regional Initiatives for Poverty Reduction

Sub-Saharan Africa	Middle East and North Africa	Eastern Europe and Central Asia	South Asia	East Asia and Pacific	Latin America and Caribbean
Sustainable resource management	Sustainable resource management	Improved resource access	Improved water resource management	Increased small farm competitiveness	Sustainable resource management
Improved resource access	Improved irrigation management	Reoriented agricultural services	Strengthened resource user groups	Improved resource access	Improved resource access
Increased small farm competitiveness	Reoriented agricultural services	Expanded market development	Reoriented agricultural services	Enabling environment for off-farm employment	Increased small farm competitiveness
Reduced household vulnerability	Enhanced human resource development		Improved rural infrastructure	Enhanced human resources	
Responding to HIV/AIDS	Rationalized agricultural policies				

Source: Expert judgement.

in different regions, in accordance with local needs and priorities.

These initiatives can all be related to the five broad areas of focus employed throughout the book: (i) policies, institutions and public goods; (ii) trade liberalization and market development; (iii) information and human capital; (iv) science and technology; and (v) natural resources and climate. These are explored further below.

### **Policies, institutions and public goods**

A key challenge in relation to the reduction of hunger and poverty among farm households is the creation and effective delivery of reliable and pro-poor international, national and local public goods, within an environment of secure law and order and enabling policies and institutions. The five most important priority thrusts in this area are seen as:

- Establish equitable, secure, transferable and flexible resource user rights;
- Provide sustainable infrastructure to poorly serviced farming systems;
- Reform agricultural policies and strengthen meso-level institutions;
- Prioritize support for small-scale farmer managed irrigation schemes; and
- Establish and strengthen targeted safety nets.

Most reviews of policies and institutions suggest that governments should complete the withdrawal of direct public support from viable commercial farming and privatize associated services such as seed production and marketing of some crops. Nevertheless, it is clearly in the public interest that governments should continue to ensure reliable access to relevant public goods by the small farmer sector, as well as promoting the sustainable use of natural resources. Government efforts should be devoted to clear cases of public benefit, including education, public health, and research and extension services addressed to the needs of poor farmers and marginal areas. They should also concentrate on the enforcement of regulations, with a particular emphasis on avoiding barriers to entry for small enterprises. In addition, small farmers require equitable, secure, transferable, yet flexible, resource user rights and sustainable infrastructure – including roads and the structures to support small-scale farmer managed irrigation. Policies and institutions must, therefore, underpin smallholder development, as well as expanding the capacity of private sector

service suppliers – this is particularly relevant in Africa and Eastern Europe and Central Asia.

In order for farmers to manage their resources sustainably whilst simultaneously benefiting from economic liberalization, stronger local and meso-level institutions that involve multiple stakeholders are necessary. Some success has been achieved with the outsourcing of public service and infrastructure provision to private firms, NGOs and universities, thereby achieving efficiency gains. However, local participation is critical for monitoring the private provision of goods and services. Farmers' organizations and the private sector can play a key role in many areas, such as seed multiplication and varietal development. Exporters' associations can often implement phytosanitary inspection. Research priorities and budgets can be managed through competitive bidding and public-private cost-sharing arrangement.

Targeted safety nets for the poor will continue to be necessary to overcome natural disasters; and may become even more important for farmers who are unable to adjust quickly enough as the transformation of agriculture to market-oriented production accelerates over the coming decades.

### **Trade liberalization and market development**

At present, the movement towards reduced barriers to international trade appears irreversible, although the pace of change is uncertain. This process will affect all but the most isolated producers in farming systems throughout the developing world. Based on the analysis of farming systems in each of the developing regions, the five most important global priority thrusts concerned with maximizing benefits from trade liberalization and market development in order to reduce hunger and poverty, are seen as:

- Support the role of the private sector – particularly small enterprises;
- Create an enabling environment for market development;
- Ensure that trade liberalization is a two-way street;
- Focus small-scale producers on labour-intensive or niche cash crops; and
- Satisfy household food security needs during transition.

An enabling environment for market development is vital, and must include measures to foster the development of small-scale rural enterprises, as these are often key market and employment sources for

smallholder households. It must also contribute to promoting competition in the marketplace. From the perspective of small producers who have very limited market power, a competitive market environment in which a number of buyers are active, is crucial. Mechanisms are required to overcome market failure, especially in respect of externalities; for instance through creating opportunities for farmers to earn income for the supply of environmental services. Helping to develop a favourable marketing environment for small producers often entails support to small-scale entrepreneurs by facilitating such areas as financing, information, and compliance with bureaucratic procedures (often feasible only for larger enterprises). It also involves the improved provision of public goods (see previous section). Associations of small traders, processors and exporters can also provide support to small entrepreneurs; reducing barriers to entry and ensuring that their needs are taken into consideration when developing or reviewing sectoral policies.

At the international level, there is a widespread belief within developing countries that trade liberalization has not been a symmetrical process, as many key agricultural and non-agricultural markets in industrialized countries remain protected by a wide range of subsidies and other barriers. At the same time, large commercial farmers in Europe, North America and elsewhere are using their greater access to modern technologies – often in conjunction with generous subsidies – to compete effectively in the developing world. Although trade liberalization has benefited urban consumers in developing countries, it has often negatively affected rural producers. A failure by the international community to address this imbalance could have serious consequences in the long term and threaten the entire liberalization process.

Through a focus on products and services in which they possess a comparative advantage – often labour intensive activities – a significant proportion of poor farmers have an opportunity to benefit from changing world market conditions and escape poverty. However, even farmers unable to make this transition may benefit through the employment creation engendered by more progressive farmers (in such areas as farm labour, packaging, processing, transport, and services). Evidence from a number of systems (Maize-Beans Farming System in Mesoamerica, Maize Mixed Farming System in Eastern Africa in the 1980s, and Rice Farming

System in East Asia) demonstrates that smallholder farmers can participate successfully in market-driven growth and significantly increase household income.

As demand for specialist foods grows, and new post-harvest technologies improve product quality and extend the life and durability of perishable items, small producers will have increasing opportunities to achieve attractive cash incomes through the production of specialized products where diseconomies of scale exist (labour intensive and niche horticultural products, fruits, spices, ornamentals, organics etc). Small farm size is not an impediment to accessing these types of markets, which are expected to grow rapidly in importance – especially if farmers can combine forces through voluntary associations. Even producers who are geographically isolated have the potential to participate in these opportunities, through a focus on very high value-to-weight products (colorants, extracts, essential oils, etc.). Nonetheless, a focus on safeguarding household food security during the adjustment process will be crucial.

#### **Agricultural information and human capital**

Three important global priority thrusts, concerned with enhancing the benefits of agricultural information dissemination and use and developing human capacity, have been identified to reduce hunger and poverty:

- Create sustainable systems for generation and dissemination of agricultural information;
- Introduce broad, systems-oriented agricultural training; and
- Support vocational training for off-farm and urban employment.

Globalization, urbanization, and the accelerating pace of technological change, are all increasing knowledge requirements within farming systems. New approaches must be developed to support information flows between farmers and formal knowledge, as well as horizontally among farmers themselves. More thought must also be given to the long-term sustainability and relevance of agricultural information systems. There is little evidence that users are willing to pay enough to make such services self-supporting, while pressure on government recurrent budgets often means that services descend to ‘least-cost’ solutions once external financing is withdrawn. Private sector participation

in information collection and distribution is often essential if services are to be sustainable.

Training and capacity building involve the empowerment of community members – men and women, youths, poor and non-poor – in order to enable them to identify their problems in a systems context, to analyze causes and effects, to assess options and arrive at well-informed decision in order to prepare for a better future. This implies that extension services must reorient their operations by basing them on facilitative rather than prescriptive approaches, with community participation forming the keystone in determining priorities and testing possible solutions. Implementation is likely to involve partnerships between governments, private sector or NGO service providers, civil society organizations and community-based groups.

Educational and training programmes in rural areas have generally failed to recognize the reality that many rural inhabitants, especially the young; will derive part or all of their future incomes from off-farm or urban employment. Greater emphasis must be given to imparting the vocational skills that will assist migrants and those needing to augment agricultural incomes to obtain skilled and semi-skilled employment.

### Science and technology

Four important global priority thrusts, concerned with targeting science and technology, have been identified to reduce hunger and poverty:

- Focus technology through participatory research and development;
- Introduce technologies to increase labour productivity in low potential areas;
- Promote technologies to increase land and labour productivity in areas of high potential; and
- Enhance the development and use of biotechnology with appropriate safeguards.

Most of the growth in food production during the past three decades has resulted from the adoption of productivity-boosting technology by farmers in areas of high agricultural potential, particularly those with relatively high and reliable rainfall or equipped with irrigation. A major challenge in the coming decades will be to generate technologies that contribute to increases in agricultural production and improvements in livelihoods in those areas where the agricultural potential is lower.

For the longer term, there must be concerns about the heavy reliance of intensive agriculture on technologies that have inherently limited sustainability. The increasing emphasis in recent decades on input-based yield gains has left many small farmers at a tremendous disadvantage with respect to larger commercial operations, which can finance these costs, and inappropriate nitrogen fertilizer application is leading to pollution of surface and groundwater resources. The uncontrolled use of pesticides is also creating enormous health and environmental hazards. Equally worrying is the progressive narrowing of the genetic breadth of farm crop and animal species, which, apart from increasing their vulnerability is also leading to a rapid erosion of the genetic resources on which future breeding programmes can be based.

The implication is that the technical foundations for 'modern' agriculture can no longer be taken for granted and that there is a need to search for more sustainable strategies towards intensification. This task is urgent, given the limited extent to which thinking has been focused on alternative and more sustainable technologies for high-intensity farming, and the very long gestation period required to develop and disseminate new technologies. The analyzes of farming systems in this document suggest a number of important characteristics of technologies that are suitable for poor farmers.

### Natural resources and climate

Increasing pressure on the use of scarce land and water resources, environmental degradation, and the possibility of climatic change are challenging the sustainability of farming systems in all regions, even those with low population densities. There is now a heightened awareness, among both farmers and the public in general, of the need to better conserve and productively manage natural resources. It is anticipated that increasing public pressure and support will be focused on sustainable natural resource management and environmental protection in future. Improved land management can be stimulated by the promotion of practices that not only generate environmental benefits but also rapidly yield tangible returns. Four important global priority thrusts have been identified, concerned with achieving more sustainable and productive use of natural resources and minimizing adverse climatic effects:

- Focus on improvements in the sustainability of natural resource use;

- Recapitalize soil resources;
- Improve water resources management; and
- Increase public and private capacity to respond to climatic changes.

In many situations, conservation agriculture, involving reduced tillage, offers promising possibilities for increasing labour productivity and the efficiency of input use while simultaneously reducing moisture stress. Conservation agriculture has been promoted in a number of farming systems, and its performance on small-scale holdings in Latin America, and more recently in Africa, has been promising.

The loss of soil fertility cuts across most farming systems in all regions, but is particularly acute in most irrigated wheat and rice-based farming systems, some rainfed farming systems (e.g. the Maize Mixed Farming System in Africa) and highland farming systems (e.g. the High Altitude Mixed (Central Andes) Farming System). Because of declining commodity prices, exchange rate adjustments and reduced subsidies, application of mineral fertilizer on staple crops has become unprofitable for many smallholders and its utilization has fallen sharply. Priority initiatives to rectify the situation include: (i) greater use of green manures, enriched fallows and other sources of organic materials, including composting; (ii) expanded use of biological nitrogen fixation; (iii) better integration of crops and livestock; (iv) wider adoption of inter-cropping systems; (v) expansion of silvo-pastoral systems, especially on steeper slopes; and (vi) improvement of fertilizer import and distribution facilities and services with a view to reducing the farmgate price of imported fertilizers.

Water supply constraints are important in specific farming systems in all parts of the developing world, e.g. the marginal drylands of Latin America or the agropastoral systems of sub-Saharan Africa. In many cases, the rising demand for water for domestic and industrial purposes associated with urbanization, will intensify the competition for available fresh water. Where farming systems are rainfed, strategies must focus on improving the capture of rainfall and the utilization of soil moisture. Poor water use efficiency is often the result of water being considered a low value or free public good. For irrigated farming systems, changes are needed in the key areas of water and rural energy pricing policy and strengthening local management of irrigation infrastructure; both of which are important elements in increasing the technical efficiency of water use.

Changes in the frequency of extreme climatic events are likely to alter farming practices fundamentally in some vulnerable areas, such as coastal areas, semiarid zones and steep lands. Droughts, floods and hurricanes or typhoons are all expected to become much more frequent. A better understanding of the probable nature and impact of climatic changes is urgently needed, and appropriate adjustments of agricultural policies and projects are required to mitigate adverse effects. The development of watershed protection and anti-desertification measures is likely to take on a greater urgency. It is also necessary to establish a greater capacity, both nationally and internationally, to respond effectively to damaging weather events, such as floods and droughts, to minimize their long-term impact on resource management and rural livelihoods.

## CONCLUSIONS AND WAYS FORWARD

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This Summary has examined the trends and challenges facing farming systems over the next 30 years in the six developing regions of the world and has proposed a series of strategic priorities for poverty reduction, increased food security and agricultural growth. Since half the total population of developing regions – and a majority of the hungry and the poor – are farmers and their families, the successful implementation of these recommendations would represent a substantial contribution towards the achievement of the international development goal of halving hunger and poverty by 2015.

This concluding Chapter considers the implications of the proposed priorities for the roles of key stakeholders; including farmers and farm communities, NGOs, private sector, local and national governments and international organizations. Ways forward at global and national levels are then discussed.

### REFOCUSING STAKEHOLDER CONTRIBUTIONS

The halving of agricultural hunger and poverty in the developing world depends ultimately on the decisions and actions of approximately 500m farm households. However, the effectiveness of their efforts depends on the presence of a vigorous private sector, a fact increasingly recognized in efforts to promote agricultural growth. In addition, and despite all that has been written about the benefits of reducing the influence of government on the process of rural development, a central tenet of this analysis has been that the provision of appropriate public goods and services is also an essential element of the development process. Effective development, in fact,

requires the participation of a range of participants or stakeholders; from the farmers themselves, their associations, communities and local governments, through the private sector and NGOs, to national governments and international agencies. The following sections discuss the contribution of each of these groups towards a new approach to the reduction of poverty and hunger

#### Unlock the potential of farmers and their communities

The role and contribution of farmers and their communities is central to any successful poverty reduction efforts. However, their relationship to other actors depends greatly on their existing level of development. Systems with extensive commercial focus rely primarily on the private sector to supply most goods and services, although government is still important in terms of policies, the regulatory environment and basic research and development. On the other hand, communities with limited resources and market development will still be heavily dependent upon NGOs and the public sector for many public goods and services. Thus public intervention will strongly influence the development process in these cases.

In more advantaged communities, communities may place considerable importance on environmental and natural resource management. In disadvantaged communities, however, the focus is likely to be more on the development of basic social infrastructure. A major challenge is to initiate functioning community-based planning and development committees, on which local stakeholders – including government and private sectors – are represented, as well as to provide them

with the necessary tools for the identification, formulation and implementation of development actions.

A major neglected capacity of farmers and farming communities is that of innovation and technology dissemination. The potential for investment in this area is enormous and well documented, and should be central to technology development efforts. The capacity of farmers to accumulate savings and to finance development is also frequently under-rated. This is true both at individual and community level, even in areas of severe poverty. Savings-based microfinance has a well-established track record and should be promoted wherever possible.

#### **Support the engagement of civil society partners**

A key aspect of poverty is lack of voice, and in many developing countries, NGOs have traditionally played an important role in articulating the needs of poor farmers and other vulnerable groups. Building the capacity of NGOs for service provision, such as in the work of IFAD and FAO in Southern Africa, is a high priority.

The second core role of NGOs and farmers' organizations in relation to poverty reduction is likely to focus on building social capital (e.g. farmers' groups, farmers' organizations and networking) and public information (e.g. analyzes of the causes and status of poverty, policy impact assessments, and advocacy for vulnerable groups).

#### **Foster competitive agribusiness and commerce as tools for poverty reduction**

Even though acting from motives of self-interest, the private sector can contribute significantly to rural development through its role in a wide variety of areas, including marketing, adding value to raw products, job creation, financing, and helping producers meet market requirements. Experience in recent decades has also shown that the private sector, particularly when acting through trade and sector associations, is capable of undertaking roles such as phytosanitary inspection, market information dissemination and extension, that were previously considered to be only possible through the public sector. Only where the benefits of investment are truly difficult to capture, as in the case of rural roads, education and true-breeding seed varieties, is the private sector unable to participate effectively.

Nevertheless, for all of their versatility, private initiatives must depend on the public sector for the establishment and maintenance of the basic legislative, political and fiscal environment in which they operate (see below). Where no norms and standards exist – for example for weights, measures and quality standards – where they are unenforced, or where established players are permitted to erect barriers to the entry of newcomers, the role of the private sector can become destructive and act to increase poverty among small farmers.

#### **Increase effectiveness of local and national government actions for poverty reduction**

Notwithstanding the greater role that farmers, civil society and the private sector will play in poverty reduction, the contributions of local and national governments are critical, particularly in the provision of public goods. The term 'public goods' is often associated with physical structures such as roads, hospitals and ports. However, there is an important set of 'soft' public goods related to the creation of a conducive development environment and adequate capacity for the provision of effective public services. These include: (i) ensuring public security; (ii) regulations such as quarantine and food safety; (iii) effective mechanisms for fostering competition, contract enforcement and the resolution of conflicts; (iv) education and training; (v) research and information dissemination; and (vi) social safety nets.

Although many traditional public services, such as phytosanitary controls and certification, can be largely contracted to private operators, the framework within which the system operates must remain under public control. In addition, an efficient public land administration system is critical to secure usufruct for poor farmers; ensure functioning land markets; and to facilitate land consolidation.

Perhaps the single most important public good that can be provided by governments is effective primary and secondary education in rural areas. In combination with participatory processes, education empowers farmers to become dynamic partners in development, rather than passive beneficiaries. Most studies show that level of schooling is strongly correlated with the adoption of technology, the local development of alternative livelihoods and out-migration to more remunerative employment. There is a need for rural education to recognize more explicitly the reality that many rural children and youths will earn their livelihoods beyond the

agricultural sector, and thus to strengthen the provision of vocational training for off-farm employment.

The analyzes of farming systems have shown that poverty reduction depends not only on the adequate funding of public goods but also on an appropriate mode of delivery to poor and vulnerable farm households. Successful poverty reduction and agricultural growth are often the result of integrated approaches to agricultural development. This is not only true of intensive and complex farming systems in high potential areas, but also applies to risk-prone systems in lower potential environments. Whilst the integrated rural development projects (IRDPs), implemented during the 1970s and 1980s, proved institutionally unwieldy and yielded poor long-term results, recent successful experiences with participatory and multi-stakeholder approaches suggest experimentation with a new generation of integrated models would be worthwhile.

Decentralization is an appropriate option for achieving improved local-level control over resource allocation and priorities. Under a decentralized system, planning and implementation can be better tailored to the diverse needs of local farming systems. All too often, however, decentralization has been associated with a decrease in resources and expertise at the local level as responsibilities are passed to regional, local and community governments without corresponding budgetary adjustments. The capture of resources and services by local elites has also sometimes been observed. Associations or groups of smaller participants within the agricultural and marketing system can greatly increase their economic power, especially when confronted with powerful players such as large traders or agribusiness firms, and reduce barriers to entry.

#### **Expand the role of international public goods**

Regional and global public institutions have a crucial role to play in sustainable development and poverty reduction. Globalization has increased the need for internationally agreed modes of behaviour and for standards that contribute to fairness, transparency and safety in international commercial relations. Progress has been made in establishing international codes of conduct in such areas as fisheries, and in obtaining prior informed consent agreements covering trade in genetically modified organisms and in pesticides. The Codex Alimentarius Commission's work on food standards is also of major importance

in safeguarding food safety and providing standards, which can be applied, to traded goods – thereby reducing transaction costs. Over the coming years, the need for extending the scope and depth of such agreements is expected to rise quite rapidly.

One of the major challenges in the near future will be to develop practical means of mediating transnational and global mechanisms for resource management. This could include agreements on the utilization of water resources, desertification, the sequestration of greenhouse gases through adjustments to tillage methods, and programmes aimed at bio-diversity and forestation. Measures at an international level to reduce the vulnerability of rural populations to disasters include steps to reduce the risk of conflict. They also include: (i) improvements in early warning systems relating to adverse climatic events; (ii) timely interventions to prevent the spread of transboundary livestock and crop pests and diseases; and, (iii) brokering of measures to ensure the sustainable productivity of shared agro- and marine ecosystems.

The creation of the Global Environment Facility (GEF) is an acknowledgement of the need to mobilize resources internationally in order to encourage individual countries to undertake actions which would generate environmental benefits beyond their borders, and to compensate them for the marginal costs of securing such actions. The reach of the facility remains small, however, in relation to the scale of the threats.

International research efforts may create the opportunity for a sustainable (or 'doubly green') revolution in agricultural development. New partnerships in technology development are being created to share development costs and experience. The international community also has a role to play in facilitating the flows of capital to agricultural development. International financial institutions have, potentially, an important future role in encouraging further foreign capital flows to least developed countries and into investments that will benefit poor farmers.

#### **WAYS FORWARD: BUILDING ON THIS ANALYSIS**

This analysis is based on wide-ranging expert judgement, selected secondary data and the latest available spatial data. The analytical frame is consistent with recent global trends, which are

generally widely recognized. However, present trends could be radically modified by unanticipated world events. The most significant of these factors emerging in recent years have been climate change, HIV/AIDS and globalization.

While there was a remarkable consistency in the qualitative judgements of the wide range of experts who participated, quantitative data proved far more difficult to assemble. FAO agro-ecological zone and statistical databases provided an excellent point of departure for the analysis, but could not be applied to individual farming systems. In recent years a range of satellite-based imagery and associated databases have become available, and data on natural resources, population, agroclimatic indicators and irrigation have largely been derived from these sources. For the farming systems that were examined in detail, information was extracted from local studies and administrative areas, and then extrapolated across the system. However, the quality of local data available varied widely from one region to another, and proved almost impossible to access for countries of the former Soviet Union.

Remarkably, it proved impossible to consistently identify either local statistical data or spatially referenced databases that adequately map the sub-national extent of poverty or hunger<sup>13</sup>, and this probably constituted the largest data gap faced by the authors. In the face of this shortcoming, expert judgement, framed within available national and regional data, was relied upon for specific poverty estimates. Spatial data of livestock populations were also only available for some regions.

It is expected that, within two to three years, spatially accurate databases of hunger, poverty, human and animal populations, and crop areas will become available. At this point, the updating of this analysis on a global scale would generate a more detailed picture of emerging trends and issues, and of strategic priorities. These analyzes could be further enriched by the dynamic modeling of selected farming systems, permitting planners to understand the likely impact on hunger, poverty and rates of economic growth of changes in key parameters (e.g. household incomes, or yields and prices for key agricultural products). Even with existing data, a number of useful supplementary analyzes could be conducted. These concern the impact on food security and poverty of global climatic changes, of different levels of carbon sequestration,

of research prioritization, or of the strengthening of local institutions.

The focus of the analysis has been at regional and global level. Applications of the farming systems framework and analytical approach at the national and sub-national levels would represent a powerful extension of this work. Not only can the framework of objectives be articulated more precisely at the national level, but much more biophysical and socio-economic data are also available. In particular, the authors of this study acknowledge the limitations imposed by the use of a relatively small number of farming systems to characterize the diversity of agricultural activity in the developing world. These limitations have been explicitly recognized by the definition of subsystems in a number of cases, but these are still broadly defined at regional level. Individual countries might wish to define further subsystems within their national boundaries (preferably in consultation with neighbouring countries, so as to avoid duplication and conflicting definitions), which can then be used to refine priorities within specific areas.

Other, non-national, refinements of the farming systems defined here might also prove valuable. In recent decades an increasing number of rural development investments have crossed national boundaries; an implicit recognition of the importance of farming systems in determining patterns of resource use and economic growth. Nowhere is this more important than in relation to water use among countries heavily dependent upon seasonal river flooding or aquifer recharging. Some of the most contentious issues in the Middle East and South Asia concern these transnational resources. Pastoralists also constitute a transnational problem for a number of countries – especially in Africa. Finally, some of the key areas where agricultural growth is anticipated in the coming decades are transnational in scope; including the moist savannahs of West Africa, the Llanos of North-west South America, and the fertile chernozem plains of the former Soviet Union.

## CLOSING NOTE

Probably the most important message that can be drawn from this study is the great potential for reducing both hunger and poverty that resides in the

<sup>13</sup> A recent World Bank-sponsored Poverty Atlas of South Africa, providing fully spatially referenced poverty data, is the first of its kind developed.

improvement of smallholder farming systems. Not only is there a higher incidence of poverty and hunger in rural as opposed to urban areas, but the study revealed that there are many more poor people in high potential areas than in those farming systems with poor resource levels and weak market links. In view of this widespread potential, the international goals of halving hunger and poverty are achievable given necessary political will and adequate resources to finance key strategies and investments.

The analysis of individual farming systems has revealed the great diversity of development challenges. Furthermore, household livelihood patterns vary not only between farming systems, but also between areas within the same system and even between different households. However, this diversity can be viewed as a great potential strength which governments can exploit during the implementation of agricultural development programmes. If governments can create appropriate policy and institutional environments backed up by the effective provision of key public goods, farm women and men will take the necessary decisions to foster agricultural growth, the sustainable use of natural resources and a rapid reduction in hunger and poverty. This implies handing over the leadership of agricultural development to poor farmers and their communities, and ensuring the highest quality of local participatory and systems based support from public-private stakeholder partnerships. This, in turn, will require adequate funding of national and international public goods.

The rapid reduction of hunger and poverty, although essential, is no more than a first step towards ensuring the sustainable development of

agriculture and of rural societies in general. Not only must rural hunger and poverty be eradicated, but farming communities also need secure access to food, water, income and information. In such an ideal future, farmers would be well educated, and be able to enjoy the same basic services as urban populations. As a result of diversification of livelihoods and the existence of effective social safety nets, their current vulnerability to climatic and economic shocks would be much lower.

Within most developing countries holdings will continue to be mostly of small to medium size. Farmers would, however, have access to a far greater range of technologies for sustainable resource management and production, and would be continuously adding to these options through active learning and innovation and farmer-to-farmer exchanges. They would receive compensation for the production of environmental services and other public goods – as is already starting to happen in the industrialized world – while improved infrastructure and mechanization would minimize the drudgery of women's work. Rural communities would possess effective and equitable mechanisms for sustainable common property management, and households would participate actively in public decision making and democratic processes, as well as negotiating with institutions and businesses on more equal terms. Moreover, farming communities would take the lead in the planning, implementation and evaluation of local development activities.

This vision of sustainable farming systems without poverty, and of farmers with secure household livelihoods, should drive the formulation of rural development strategies at all levels.

## ANNEX

### Classification of Countries by Developing Region

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The following classification is based on the regional groups defined in the World Development Report (WDR), issued annually by the World Bank, but excludes high-income countries and minor dependencies (large dependent territories are, however, included). The WDR identifies six regions, compared with five regions in the FAO AT2015/30 Interim Report (the latter excludes ECA). Note also that as defined in this publication, South Africa is included AFR, Turkey is included in ECA and Afghanistan is included in SAS.

#### **Sub-Saharan Africa (AFR)**

Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Congo Democratic Republic, Côte d'Ivoire, Djibouti, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of South Africa, Reunión, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

#### **Middle East and North Africa (MNA)**

Algeria, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Morocco, Oman, Saudi Arabia, Syria, Tunisia, Yemen, West Bank and Gaza.

#### **Eastern Europe and Central Asia (ECA)**

Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic,

Estonia, Georgia, Hungary, Kazakhstan, Kyrgyz Republic, Latvia, Lithuania, Macedonia (former Yugoslav Republic of), Moldova, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Tajikistan, Turkey, Turkmenistan, Ukraine, Uzbekistan, Yugoslavia Federal Republic.

#### **South Asia (SAS)**

Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka.

#### **East Asia and Pacific (EAP)**

Cambodia, China, Indonesia, Korea DPR, Korea Rep., Laos, Macao, Malaysia, Mongolia, Myanmar, Philippines, Thailand, Vietnam. Plus 22 Pacific Island nations: American Samoa, Cook Islands, Fiji Islands, French Polynesia, Guam, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, New Caledonia, Niue, North Mariana Islands, Palau, Papua New Guinea, Pitcairn Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis & Futuna Islands.

#### **Latin America and Caribbean (LAC)**

Antigua, Argentina, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Saints Kitts and Nevis, Saint Lucia, Saint Vincent and Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela.

An estimated 500 million small farmers – men and women – produce most of the developing world's food. Yet their families suffer more hunger than even the urban poor; have higher rates of poverty and enjoy less access to basic social services. Meeting international commitments to halve hunger and poverty in the developing world by 2015 means reaching these farm households. However, traditional approaches have not worked. In order to provide the conditions that will permit poor farm households to improve their own lives, governments, non-governmental organizations and international agencies must understand more clearly the agro-ecological, physical, economic and cultural environment within which farmers and their families live – their farming systems. Only in this way can realistic policies, investments and technical assistance programmes be developed and implemented, and the latent capacity of the farming population fully released.

Through an examination of a wide variety of farming systems across the developing world, this book shows how the farming systems approach can be used to identify key local, regional and international priorities for the reduction of hunger and poverty. It examines the various strategies open to poor farm families seeking better lives, and shows how such strategies differ in relative importance from one farming system to another. Finally, the book discusses how an effective response to these priorities and strategies will require a rethinking of the roles of key stakeholders in the development process – farmers themselves, their communities, civil society, governments and the international community.



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