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INSTITUTIONS AND ECONOMIC POLICIES FOR PRO-POOR AGRICULTURAL GROWTH

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

This paper draws together findings from different elements of a research project examining critical components of pro-poor agricultural growth and of policies that can promote such growth in poor rural economies in South Asia and Sub-Saharan Africa.

Agricultural growth, a critical driver in poverty reducing growth in many poor agrarian economies in the past, faces many difficulties in today's poor rural areas in South Asia and Sub-Saharan Africa. Some of these difficulties are endogenous to these areas while others result from broader processes of global change. Active state interventions in 'kick starting' markets in 20th century green revolutions suggest that another major difficulty may be current policies which emphasize the benefits of liberalization and state withdrawal but fail to address critical institutional constraints to market and economic development in poor rural areas.

This broad hypothesis was tested in an analysis of the returns (in agricultural growth and poverty reduction) to different government spending in India over the last forty years. The results reject the alternate hypothesis underlying much current policy, that fertilizer and credit subsidies, for example, depressed agricultural growth and poverty reduction in the early stages of agricultural transformation. The results show initially high but then declining impacts from fertilizer subsidies; high benefits from investment in roads, education and agricultural R&D during all periods and varying benefits from credit subsidies over four decades; low impacts from power subsidies; and intermediate impacts from irrigation investments. These findings demand a fundamental reassessment of policies espousing state withdrawal from markets in poor agrarian economies. Given widespread state failure in many poor agrarian economies today, particularly in Africa, new thinking is urgently needed to find alternative ways of 'kick starting' markets – ways which reduce rent seeking opportunities, promote rather than crowd-out private sector investment, and allow the state to withdraw as economic growth proceeds.

To investigate some of the potential opportunities and difficulties in achieving pro-poor agricultural growth in poor rural economies today, empirical work on Malawi and Zimbabwe used farm-household, rural economy and CGE models to analyze the structure of different rural livelihoods and to simulate policy impacts on livelihoods, rural growth and poverty. This work, together with findings from wider reviews and the Indian econometric work, highlighted very diverse constraints, opportunities and behavior among different household types and confirmed the importance of smallholder agricultural growth for poverty reduction through its impacts on labour and grain markets (even where it accounts for less than 50% of rural incomes). However, large productivity increases are needed from labour saving technical change if smallholder agriculture is to drive pro-poor growth, backed up by growth in the rural non-farm economy and longer-term tradable non-agricultural growth drivers for sustained poverty reduction. Where productive labour demanding technologies exist, there are large potential pro-poor growth benefits from reducing transaction costs to improve access to agricultural markets

and from increased smallholder household liquidity. Liquidity constraints lead to important synergies between some forms of welfare support and agricultural productivity and growth, while institutional development is needed to improve access to input, output and financial markets. Market intervention policies that stimulate the development of otherwise thin food grain and input markets can stimulate pro-poor growth if the major practical problems in the implementation of these policies can be addressed, and if these policies are backed up by significant and long term, but flexible and targeted investments.

Where widespread and large-scale increases in productivity cannot be achieved, agriculture will not be able to drive the overall rural growth and structural change needed to provide the base for significant poverty reduction. It still, however, has a vital role to play in 'livelihood protection and enhancement': supporting people's existing livelihoods and maintaining the natural resource base. Policies and investment in this 'livelihood protection and enhancement' role for agriculture should not be so demanding as those required for pro-poor agricultural growth, in terms of minimum scale, impact, coordination or institutional capacity needed for success. Nevertheless, significant investments will still be needed to develop appropriate technologies, to facilitate coordinated service provision for smallholder farmers, and to encourage a more secure and favorable political and economic environment conducive to agricultural and rural investment. The returns to these investments need to be analyzed against the costs of livelihood and natural resource failure in these poor rural areas, and against the human and fiscal costs of these rural communities' becoming increasingly dependent on long term welfare support and emergency relief.

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1. INTRODUCTION

Sub Saharan Africa and parts of South Asia are likely to hold large numbers of very poor rural people for the foreseeable future[1]. Despite a pre-eminent role for agricultural growth in poverty reduction in poor agrarian economies in the past, such growth today faces new difficulties. Many of these difficulties are endogenous to today's poor rural areas, others result from broader processes of global change, but some may also be due to the current development orthodoxy that argues for internal market liberalisation, state withdrawal and trade-led growth to promote pro-poor growth in poor countries. However, policies building on this orthodoxy show disappointing social and economic progress in rural areas of many liberalising countries, particularly in Africa. They have also been associated with many donors and governments questioning the value of investments in agriculture, following perceived failures of earlier investments in agriculture-led development, the recognition of the role of non-farm activities in rural livelihoods, and reduced agricultural investment portfolios following liberalisation policies.

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[1] According to projections by the Population Reference Bureau (2004), Sub-Saharan Africa's population will increase by 132% until 2050, i.e. from currently 733 million (mid-2004) to 1,120 million in 2025 and 1,701 million in 2050. South Central Asia's population will increase by 60% during the same period. Both regions thus largely contribute to an increase in the world's population of 45% between 2004 and 2050, Other regions show much lesser rates of demographic growth. These regional growth rates are largely driven by the growth of some of the largest poor countries in the respective regions, e.g. Nigeria (124%), Ethiopia (139%), Bangladesh (98%), and Pakistan (85%). World Bank (2000b) and Hanmer *et al.* (2000) predict that on current trends there will be large numbers of poor people in these regions in 2015, albeit with declining proportions of poor people in South Asia. Concerning the focus countries of this paper, Malawi is expected to quadruple its population from 12 million in mid-2004 to 47 million in 2050, while India is expected to grow by 50% from currently 1,086 million to 1,628 million in 2050, thereby passing China as the country with the largest population in the world.

The objective of the study reported in this paper was to gain insights into the components of Pro-Poor Agricultural Growth (PPAG) and policies to promote such growth. The research aimed to:

- enhance understanding of the role of institutional, micro-economic, macro-economic, and international factors in determining the scope for PPAG;
- identify appropriate policy initiatives to address related constraints, and
- develop policy tools to support PPAG.

The work focused on research questions regarding first, the validity of the basic hypothesis vis-à-vis differences between issues facing the poor today and those facing their Asian counterparts in the latter part of the 20th century; and second, the growth and poverty impacts of different types of policy-induced change. The work was conducted in three overlapping and interactive phases: literature review, country-focused empirical analysis, and synthesis.

The *review phase* sought to further investigate and develop the basic hypothesis of the project, according to which current arguments for market liberalization and state withdrawal are not appropriate in poor agrarian economies prior to an agricultural transformation. It involved a wide ranging literature review examining the characteristics of historical pro-poor agricultural growth, conditions necessary for such growth, and impact and development pathways of such growth (Dorward *et al.*, 2004). Specific reviews of three case study countries (Malawi, Zimbabwe and India) identified particular issues for subsequent economy wide and micro-economic analysis (Dorward and Kydd 2002; Poulton *et al.* 2002; Smith and Urey 2002).

The *Country-focused empirical analysis* adopted two different approaches. The analysis for Malawi and Zimbabwe examined the effects of different types of change on different categories of poor people, integrating various dis-aggregated empirical models. For India, earlier econometric work on the effects of investments on agricultural growth and rural poverty was extended with the construction of new variables to investigate the effects on poverty and growth of different kinds of government support (for technology, infrastructure, human capital, and direct input subsidies) over different time periods.

2. POLICIES FOR PRO-POOR AGRICULTURAL GROWTH: A REVIEW

In this chapter we draw together lessons from reviews of broad global experience with pro-poor agricultural growth and of specific experience in India, Malawi and Zimbabwe in order to identify critical questions needing empirical investigation.

2.1. Agricultural Growth and Poverty Reduction: Lessons From the Past?

Changes in poverty incidence over the last 30 years and projections over the next 20 years or so show that despite considerable progress in reducing income poverty incidence globally and in some parts of the world, there are increasing numbers of poor people in South Asia and Sub-Saharan Africa (World Bank 2000b). The depth and severity of poverty is at its worst in Sub-Saharan Africa. Predicted poverty reduction scenarios suggest that in the 1990's global poverty reduction was less than half the rate needed to meet the commitment to halve poverty by 2015, and in Sub-Saharan Africa, it was too low by a factor of 6 (Hanmer *et al.* 2000).

What are the causes for these regional disparities in poverty reduction? We note, first, that within these regions, poverty is largely a rural phenomenon, with estimates of the proportion of the world's poor living in rural areas ranging from 62% (Pinstrup-Andersen *et al.* 2001) to 75% (IFAD 2001). Second, these patterns of variation in poverty reduction are closely mirrored by variation in per capita agricultural growth rates. Thus, the agricultural sector in LDCs (with a preponderance of Sub-Saharan African countries) showing low rates of growth in the 1980s and 90s (indeed declining value added per capita over most of the period) (World Bank 2000b; FAO 2000; Dorward and Morrison 2000) contrasts with Asian performance. In both East and South Asia, agricultural growth advanced ahead of population growth, with continuing increases in labour productivity in agriculture. Sub-Saharan Africa also stands out for having achieved more than 70% of increased cereal production from area increases, compared with other regions achieving 80% or more of their increased cereal production from yield increases (with large increases in irrigated areas and fertilizer use, increases which are largely absent in Africa) (World Bank, 2000b; FAO, 2000; Dorward et al, 2001).

These observations suggest that agricultural growth played a significant role in poverty reducing growth, a proposition that is supported by a number of econometric studies from the sectoral productivity literature (see the review by Thirtle *et al.* 2001 citing evidence from Hanmer and Nashchold 2000; Ravallion and Datt 1999; Timmer 1997; Datt and Ravallion 1996; Stern 1996; Matsuyama 1992; Kogel and Furnkranz-Prskawetz 2000; Irz and Roe 2000; Kanwar 2000; Rangarajan 1982; and Wichmann 1997) and by two long standing strands of theory regarding the role of the agricultural sector in wider economic development and in the rural economy.

With regard to the role of the agricultural sector in wider economic development, Johnston and Mellor 1961, argued that in the early stages of development in agrarian dominated economies, agriculture generates export earnings, labour, capital and domestic demand to support growth in other sectors; while agricultural products meet increasing

domestic demands from increasing populations with high income elasticity of demand for food. Paradoxically, successful agricultural growth then leads to a fall in its relative importance in the economy (though not normally in its total contribution to the economy), as other sectors build on the foundations laid by agricultural growth, then growing more rapidly than agriculture.

These processes are considered in more detail in the literature analyzing linkages between different activities within rural economies (for recent reviews see for example Delgado *et al.* 1998, and Dorward *et al.* 2001). An important conclusion from this exploration of exogenous change effects on the rural economy is that the impact of price or productivity change on a rural economy and on poverty depends on the local demand characteristics of the affected goods (their average and marginal budget shares for different income groups), their tradability, their local production characteristics (supply elasticities, labour and tradable input demand, upstream and downstream linkages), and the operation of factor markets that affect both elasticity of supply and the distribution of income within the rural economy (see Dorward *et al.* 2003a). The broad conclusion from this analysis is that in many poorer rural areas increasing productivity of labour-intensive farm activities producing cash crops or staple food crops will have greater potential for driving and stimulating poverty reducing growth, than farm and non-farm activities producing goods and services for local consumption. This is because as compared with non-farm activities, farm activities tend to possess a variety of features that can make them 'linkage rich' drivers of economic growth: high average budget shares; access to urban and export markets; lower requirements for scarce capital, knowledge, infrastructure and institutions; relatively high demands for unskilled labour; relatively low barriers to entry; and large numbers of agricultural labourers. Non-farm activities do, however, have potential to offer major poverty reducing benefits when following, or supporting, rural growth initially driven by agricultural growth, particularly if they have low barriers to entry and high labour demands. Pro-poor growth is also encouraged by more equitable distribution of income, and by local consumption patterns favoring local rather than imported goods and services.

2.2. Local and Global Difficulties Facing Agriculture in Today's Poor Agrarian Economies

However, reliance on pro-poor agricultural growth as the main weapon against rural poverty today may not work if smallholder agriculture in today's poor rural areas faces more difficult conditions than those faced in areas, which experienced sustained pro-poor agricultural growth in the latter part of the 20th century. Dorward and Morrison in a review of agricultural successes identify conditions necessary for such growth as including large (international or national) output markets, stable macroeconomic and sectoral policies, a conducive institutional environment, supportive context-specific institutional arrangements, dynamic technological and market opportunities, access to seasonal crop finance, good physical infrastructure, appropriate technologies, and dynamic local institutions and processes supporting technological and institutional change.

Arguably more difficult agro-climatic conditions, population density, human capital and communications infrastructure were a major cause of the lack of any agricultural transformation in many of today's poorest rural areas. These tend to have varied and complex agro-ecological systems, a high proportion of cultivated land subject to soil fertility constraints, and the lack of irrigated land and of land with 'drought proofing' irrigation. These characteristics demand a wider range of more challenging technological solutions, with higher unit costs of agricultural research, information and other services, greater risks and lower returns to investment (Kydd *et al.* 2001a). Tradability for root crops is also limited by a high bulk/nutrient ratio and (for some crops) rapid post-harvest deterioration. R&D requires substantial increases in resources and management and is less able to draw on work performed elsewhere.

These difficulties are exacerbated by lower population densities and low levels of human capital and administrative capacity, which further increase costs in developing, delivering and accessing services (for input or output markets, or research, extension, health or education services). Communications infrastructure continues to be a problem and a number of studies have found that truck transport costs are higher in Africa than in Asia (Doyen 1993; Platteau 1996; Hine *et al.* 1997). However the rapid spread of cell phone systems offers the potential for low cost access to phone services in rural areas.

Today's global markets, population trends, urbanisation, and new technologies also present challenges to agricultural development. There is a clear downward trend in real prices for primary agricultural commodities, (World Bank http://www.worldbank.org/data/wdi2001/pdfs/tab6_4.pdf) and agricultural prices are likely to remain lower than in the 1970s and 80s (http://www.worldbank.org/prospects/gcmonline/subscriber/0002/appendix.pdf). The globalisation of markets within the world economy (as semi-tradables become tradables, and local prices fall towards world market prices) further reduces the terms of trade for poor farmers and may weaken local demand for non-tradeables and its positive effects on consumption linkages and growth. There is more optimism about opportunities for intensive export-based patterns of growth (World Bank 2000a), but poor infrastructure may encourage enclaves of larger commercial farms with limited poverty reducing linkages (e.g. Kydd and Dorward 2001; Kaplinsky 2000). There is also little evidence that globalisation of financial markets will benefit smallholder agriculture in poorer areas and the long run benefits of globalisation may be concentrated in intellectual property rights, knowledge and governance, where barriers to entry allow transnational corporations to retain rents (Kaplinsky 2000), while transaction costs of coordinating and ensuring timely delivery of quality assured products militate against small producers (Kydd and Poulton 2000). The concentration of new bio-technology research by multinational corporations on problems facing large numbers of commercial farmers (Pingali 2001) means that potential opportunities to develop new varieties more quickly and cheaply to better address poor farmers' problems may not be realised (Kydd *et al.* 2000).

Current dependency ratios in Sub Saharan Africa countries tend to be higher than ratios in green revolution countries in the 1960s and 70s. They are, however, predicted to

fall in many countries to similar levels over the next 15 years or so with the demographic window of opportunity (IFAD 2001), despite the counteractive effect of HIV/AIDS, which reduces the economically active population. The HIV/AIDS tragedy will have other serious effects, undermining savings and attacking social, human and financial capital. At the same time, urban influences tend to be much greater on today's poor rural areas than they were 30 years ago (World Bank 2000b). This trend may shift the focus of agricultural policy away from rural poverty reduction to delivery of cheap urban food. It may be cheaper and easier to provision major cities from international markets rather than by investing in rural infrastructure and services to promote domestic production.

Finally although much has changed since September 11th 2001, global political interests in the 1990s did not place the same emphasis on agricultural growth in developing countries, as was the case in the 1960s to 80s. The green revolution occurred most dramatically in politically stable situations, often involving physical and social reconstruction following conflict, and often supported by global cold war interests.

2.3. Policies for Pro-Poor Agricultural Growth in Today's Poor Agrarian Economies

While many of the difficulties facing poor rural areas today are endogenous (the result of local agro-ecological, demographic and socio-economic conditions), or arise from broader global changes; other difficulties faced in today's poorer rural areas appear to be the direct result of changes in policy orthodoxy over the last twenty years or so, with two major changes, that are a large reduction in official investment in agricultural development, and major emphasis on liberalisation.

These two changes are related to one another. Reduced agricultural investment is the result of many policy makers' uncertainties about the effectiveness of such investment in reducing poverty: there has been increasing attention to non-farm incomes and activities in rural livelihoods, disillusionment with the lack of agricultural growth in poor areas despite heavy agricultural development investments in the past; concern that agricultural development in marginal areas is more difficult, and (with liberalization) acceptance that many of agriculture's problems lie outside the agricultural sector (in roads and telecommunications infrastructure, in macro-economic management, and in governance, for example). There are also limited prescriptions for direct investment in agriculture, with doubts about the effectiveness of research and extension; and concerns about recurrent costs, fiscal commitments, and appropriate models for finance and delivery (Kydd and Dorward 2001). Policy makers thus face what Kydd and Dorward 2001 term the 'agricultural investment dilemma' according to which even where the importance of agriculture is recognized, donors and governments find it difficult to design and gain approval for specific agricultural investment programmes.

The main arguments for liberalization rest upon the ineffectiveness and inefficiency of state service provision. There is extensive evidence of the failure of parastatals, such as late service delivery; increasing input prices, decreasing output prices, and large margins; late and non-payments to producers; large fiscal deficits; rationing of

services to exclude the poor; delivery of inappropriate services; and failure to innovate and develop markets. The roots of these problems are also well known: monopolistic and monopsonistic positions; lack of incentives to perform; overstaffing and patronage; political interference; multiple and contradictory objectives; lack of capital for investment; poor staff management and training; and corruption.

Policies addressing these problems have focused on the intrinsic problems of state failure and called upon the discipline, incentives, and resources of private market systems and players to more effectively and efficiently perform these functions and respond to service demand from smallholder farmers. This policy shift led to the removal of regulatory controls in agricultural input and output markets, elimination of subsidies and tariffs, reform, and in some cases privatization of parastatals. These changes have delivered some positive impacts, for example in the supply chain systems for some cash crops in Africa, and in reduced food prices to poor rural and urban consumers (Jayne and Jones 1997). However, in many situations, and particularly in the cereal-based economies in poorer rural areas, these changes have notably failed with the private sector not moving in to provide farmers with input, output and financial market services that are attractively priced, timely and reliable. Whether the overall situation is worse or better than it was in the immediate pre-liberalization period is debatable. Few would, actually, argue that the pre-liberalization situation could or should have been sustained. However, a lack of substantial improvement and continuing difficulties with liberalization policies are widely recognized, particularly with input and financial service delivery and with output marketing in remoter areas. The reasons for this lack of success and consequent prescriptions to address it are, however, debated.

One view is to argue that failure is not the result of the liberalisation agenda, but of inability to implement it thoroughly (see, for example, Kherallah *et al.* 2000a; Jayne *et al.* 2001). The main thrust of the 'too little liberalization' argument is that partial, rather than complete, withdrawal of the state, together with real or perceived threats of policy reversals and continued price controls and competitive advantages for parastatals, have depressed returns and increased risks to private sector investment. The solution is then to complete the market liberalization process[2], accompanied by other (often unspecified or general) measures to address problems in financial markets and affecting remote producers: for example, institutional innovations for input credit (such as contract farming and group approaches); increased investment in infrastructure, legal and market institutions, and agricultural support organizations (research and extension); promotion of smallholder production of export crops; short term targeted support to vulnerable groups in remote areas (presumably safety net transfers); and credible sustainable macro-economic policies (World Bank 2000a).

[2] Jayne (pers.comm.), for example, argues that greater reform of food grain markets in West Africa as compared to East and Southern Africa, has been associated with greater agricultural growth rates (although it may also be relevant to note the greater urbanization and also increased production of millet and sorghum, and decreased maize, in West Africa).

Another 'new institutional' view (see for example Dorward *et al.* 1998; Kydd *et al.* 2001b) argues that one reason for the states' often half-hearted commitment to liberalization, particularly in food crop markets, is their recognition that pervasive market failures prevent the private sector from delivering the necessary services. Policy makers, therefore, may legitimately continue to attempt to intervene to remedy these failures. This view does not deny that continued intervention (or its threat) is also due to short term political economy considerations and further impedes private sector investment, nor that the pre-liberalization situation was unsustainable and needed drastic reform. However, it does demand a different emphasis in the continuing search for more successful agricultural market and supply chain development to support food crop production in poorer rural areas.

The essence of the 'new institutional' argument is that the very low level of development in the institutional environment of poor rural areas, together with a low density of transactions, leads to very high transaction risks and costs[3] in financial, input, and output markets. This is particularly the case with financial markets and, to a lesser extent, with input markets. High transaction costs and risks, exacerbated by low population densities and poor communications, lead to coordination and, hence, market failures. As these market failures depress the level of economic activity, raising per unit transaction costs and (with thin markets) risks of transaction failure, a vicious cycle of under-development results.

In this analysis a key ingredient in agricultural development is institutional development where institutions are defined as the 'rules of the game' (North 1990), and a distinction is made between the 'institutional environment' (governing for example property rights and general relations between economic agents) and 'institutional arrangements' (the specific rules governing specific transactions) (Davis and North 1971). Key functions of the state and of other actors promoting development are then to support institutional development that will reduce the transaction costs of critical transactions: we focus here on financial, input and output transactions in the smallholder agriculture sector.

These arguments can, thus far, be seen as supportive of the 'too little liberalization' arguments and policy recommendations outlined earlier. However, new institutional arguments place more emphasis on understanding the extent of transaction costs (particularly transaction risks), and on the role of institutional arrangements in reducing these costs. Particular attention must be paid to finding institutional arrangements that overcome the transaction problems inherent in agricultural finance, as increased investment in seasonal inputs is a critical requirement for agricultural intensification and growth. There are parallels with the 'too little liberalization' calls for

[3] In the remainder of the paper the term 'transaction costs' will include what Dorward 1999, defines as pure transaction costs, associated transaction costs, and associated risks. Transaction risks dominate here: the risk of loss of specific assets invested by farmers (in crop production) or by traders (in stock, in financing, in relational capital, etc) through transaction failure due to opportunistic behavior or failure of complementary investments in the supply chain.

institutional innovations (for input credit and farmer groups for example). However, a more thorough institutional analysis can overcome apparent inconsistencies between, on the one hand, simultaneous calls for increasingly competitive input and output markets ; and, on the other hand, for non-competitive market arrangements.

This begins from a questioning of the fundamental advantages of competitive market systems in situations of high transaction costs and risks, high exposure to risk from asset specificity, and repeat transactions (Williamson 1985). There are strong theoretical arguments explaining the existence of firms and of bilateral contracts (Coase 1992), and these may also be used to defend support for non-competitive contractual relations in the early stages of agricultural development. Dorward *et al.* 1998, for example, argue that 'interlocking transactions' are a widespread contractual form that addresses some of the transaction cost problems of input credit systems. However, there may be incompatibilities between interlocking arrangements and competitive input and output markets. Benefits from monopsonistic crop marketing systems, thus, may exist, which can support interlocking arrangements for seasonal input finance; although robust regulatory frameworks are needed to avoid abuse of market power and to provide incentives for firms to continually look for technical and managerial advances and efficiency gains (Kydd *et al.* 2001b). These arguments, with theories of endogenous institutional innovation, provide some explanation for the development of interlocking systems by both cash and food crop marketing parastatals in Africa prior to liberalization, and for the development of these systems by some private companies engaged in marketing export crops (see for example Dorward *et al.* 1998; Gordon and Goodland 2000). They also explain the failure of such systems to develop or function in other situations, most notably in liberalized food crop production systems.

Further problems in food crop production arise where a staple crop from a poor region is either non-tradable (for example a perishable or bulky root crop or plantain), or semi-tradable (for example a grain crop in a land-locked country with very high internal and/or external transport costs placing a large wedge between import and export parity prices). Natural, climatic variation between seasons may then cause production to fluctuate above and below domestic requirements, causing large fluctuations in market prices between import and export parity prices. If these price variations cross thresholds that significantly affect the profitability of investment in agricultural intensification, such as fertilizer application, then such investment may be severely curtailed both by lowered average returns to investment and by risk. This then feeds into uncertainty for input and output traders, adding a further dimension to the vicious circle of high transaction costs, low institutional development, poor infrastructure, and low levels of economic activity described above.

Recognition of this vicious circle leads to serious questions about the extent to which development of infrastructure and the institutional environment will be sufficient on their own to attract the private sector investment necessary to drive a cycle of increasing economic activity and lower unit transaction costs at a rate that will achieve significant poverty reduction. A critical government role may be to intervene in financial, input and output markets, not necessarily to participate directly in these markets itself,

but to reduce the transaction risks and costs facing private agents engaging in these markets. This point is not a new one, for example Rosegrant and Siamwalla 1988, argued from experience in the Philippines that governments should intervene in low volume seasonal finance markets to reduce transaction costs (but not to subsidize interest rates) until volumes and institutional arrangements are built up and costs reduced. The bright side of this analysis is that if economic activity can be stimulated past a critical point, then high density of economic activity and development of institutions can lead to dramatic falls in transaction risks and costs. It is then important that governments quickly withdraw from expensive and distortionary interventions.

2.4. Policies for Pro-Poor Agricultural Growth in 20th Century Agricultural Transformations

How does this analysis compare with government policies and interventions historically in areas that have successfully followed a path of intensive cereal-based growth, and how do current policies in today's poor rural areas compare? Dorward *et al.* 2002 summarize policies in successful and partially successful green revolution areas at the time of transformation.

They found that:

- Irrigated transformations tended to be Asian (with the exceptions of Mexico and Egypt), to have happened before the 80s (with the exceptions of Bangladesh, China and Vietnam, where in the latter two the introduction of market reforms and a shift away from a command economy removed critical constraints to transformation)[4], and to have continued strongly thereafter. In contrast, rain-fed transformations are fewer, and have been more concentrated in Africa in the 80s. They have been weaker in their breadth, depth and persistence, with regression in the 90s[5]. India provides a significant exception on the latter point, with its 'second' green revolution in the 1980s in rain-fed areas (see discussion below and Smith and Urey 2002). This second green revolution, which was built on the achievements of earlier irrigated transformations, has been sustained and has shown strong poverty reducing characteristics:
- Transformations were generally associated with local research and extension[6], which used outputs from international research centres, as well as locally developed varieties. For (rain-fed) maize there has been much less emphasis on

[4] China had already achieved quite widespread adoption of many technical features of the green revolution, with improved varieties, fertilizers and irrigation; although these had not been utilized widely or effectively enough, largely due to a lack of effective coordination and incentives promoting efficiency and effort.

[5] Similar regression, though from a less dramatic transformation, has occurred in other African countries not included in Table 3, for example Zambia, Tanzania, Ghana and, in limited areas, in South Africa (Mosley and Coetzee 2001).

[6] Vietnam is an apparent exception to this but the basic technologies for increasing rice yields were initially transferred from the International Rice Research Institute in the Philippines with subsequent development of stronger research and extension efforts coordinated at the provincial level.

varieties developed internationally and much more dependence on locally developed varieties.[7]

- Investment in road infrastructure and land reform are other almost universal factors.[8]
- Most transformation governments intervened to stabilise output prices (maintaining them between import and export parity prices) to guarantee local procurement (unless there was a flourishing private market system), and to subsidise input supply and credit. Interlocking arrangements for input credit was also featured in a number of cases.

Taking these points together and relating them to earlier discussion about agricultural growth and its difficulties in today's poor agrarian economies, we postulate that there are certain necessary conditions for intensive cereal-based transformations to occur: appropriate and high yielding agricultural technologies; local markets offering stable output prices that provide reasonable returns to investment in 'improved' technologies; seasonal finance for purchased inputs;[9] reasonably secure and equitable access to land[10], with attractive returns for operators (whether tenants or land owners); and infrastructure to support input, output and financial markets. How may these conditions be developed?

As discussed earlier, these conditions may be achieved more easily where there is moderate to high population density, and where irrigation allows relatively low risk, high return multiple cropping with more or less standard technologies. These conditions are not characteristic of most of today's poorer areas. However, government policies and direct interventions played an active role in supporting these conditions even under the more favourable circumstances of successful agricultural transformation in Asia in the 1970s. These government interventions may be classified into those that are supported in current liberalization policies (for example investment in roads and, in principle at least, in research and extension services, even if the modes of finance and delivery are different), and those that are not supported and are indeed opposed by current liberalization polices (principally intervention in financial, input, output markets). The prevalence of the latter interventions in the green revolution processes challenges current

[7] Eicher 1995 notes (footnote 4) that CIMMYT recognized 25 'mega environments' for maize and only 7 mega environments for wheat, the largest of which encompasses about a third of the total wheat area in developing countries.

[8] Egypt, Japan (1) and Vietnam are exceptions as regards investments in roads, but in Japan water and road communications were steadily improving at the beginning of the 20th century. Poor road infrastructure is a frequently cited constraint to development in Vietnam (Barber 1994).

[9] A point should be made with regard to irrigated systems, that these not only increase productivity (per crop and, through allowing multiple cropping, per year), they also tend to reduce the difficulties that farmers have in financing seasonal inputs, as they both allow easier auto-finance and are more compatible with the structure of micro-finance lending.

[10] Land reform may have two important roles to play in pro-poor agricultural growth, by improving the incentives for land operators to invest in improved technology, and by increasing equity and hence the elasticity of poverty reduction with respect to growth.

liberalization policies, and begs three questions: Why have these policies been discredited? What did they contribute to the early stages of green revolutions? And what should be the current policy response?

Some of the reasons for the discrediting of these policies were outlined earlier. In areas where agricultural transformation occurred, they rapidly became very heavy and unsustainable fiscal burdens. The longer they were in place, the greater the fiscal constraints, and the less efficient and effective they became. In areas where agricultural transformation did not take place, they delivered few benefits but still involved large running costs. In both situations, they were seen to predominantly favour larger smallholder farmers. Their contribution to agricultural transformation in a brief critical period could thus be easily overlooked.

A number of contributions of these policies to agricultural development may be suggested: increased profitability of investment in intensification for farmers; reduced risks for farmers; increased profits for private agents involved in markets, perhaps compensating for high transaction costs and risks; reduced transaction risks for these agents; and the delivery of high transaction cost/risk marketing services by the state when these services would not otherwise have been delivered by private agents. Although interventions in financial, input, output markets tended to favour larger smallholder farmers, in some (generally irrigated, Asian) situations these farmers were not reckoned to need this support: technologies were still profitable without subsidies, and increased agricultural profitability was dominated by technical rather than price changes, although seasonal finance constraints might still have had a limited uptake (Desai 1988; Ranade *et al.* 1988; Rosegrant and Siamwalla 1988). This statement suggests that where very substantial improvements in yield may be achieved (a feature of many irrigated systems, but much less common in rain-fed systems), increased profitability of farmers' investments in intensification, and reduced farmer risk, may not be the main contribution of these policies. Indeed, their contribution was probably to deal with the high transaction cost problems inhibiting agricultural intensification by (a) easing farmers' seasonal finance constraints to increase effective demand for inputs and production[11], and (b) promoting accessible markets for farm inputs and outputs.

2.5. Agricultural Policies and Pro-Poor Growth in India, Malawi and Zimbabwe

These observations from a broad (and necessarily relatively shallow) review of successful and failed agricultural transformations around the world were supported by more detailed, in depth reviews of India (that experienced both irrigated and rainfed transformations in the latter part of the 20th century), and of Malawi and Zimbabwe (that both experienced abortive transformations in the 1980's).

The review of Indian experience (Smith and Urey, 2002) showed that the agricultural transformation engendered by the Green Revolution (GR) from the mid-

[11] Rosegrant and Siamwalla 1988, suggest that on irrigated farms in the Philippines a subsidized credit programme had a major impact on fertilizer uptake not through subsidized interest rates but through increasing the availability of finance.

1960s led to substantial poverty reduction. This followed years of volatility in food production and prices, when poverty and import dependence were rising. Poverty reduction was achieved by cost reducing but labour demanding technical change in farming that sustained the growth rate for agriculture above that for population, kept food prices low and stimulated rapid growth in both farm and non-farm employment. The GR tended to widen inequity both between households and regions, with lagged impacts on poverty as adoption of the technology spread from larger to smaller farms and from favoured irrigated areas in the Northwest to other regions. The second GR was critical to this as the first GR impacts were confined initially to wheat and rice in areas with good water control from established surface irrigation: the spread of the GR to less favoured areas in the second phase brought the biggest gains in poverty reduction, by reaching large numbers of poor people, and became sufficiently broad-based to have significant and sustained impact on measures of poverty at the national level. Thus, national food grain production more than doubled from the mid-1960s to mid-1990s, while national poverty incidence fell by 40 to 50%. However, great variations remain between favoured and less favoured areas, and large concentrations of poverty remain in the poorest states.

Four stages of policy implementation and agricultural change can be distinguished. Prior to 1965 (the pre- green revolution period), land reforms, irrigation expansion, and investment in agricultural research were important in providing critical pre-conditions for the first green revolution (from the mid-60s to late 70s). During this period, mild output price protection (especially for wheat) and stabilization facilitated the initial adoption of the GR technological package, and productivity gains more than compensated farmers for later relative decline in output prices, encouraging continued use of the modern inputs. Continued public expenditure in agricultural research and extension, rural roads, and state provision in input distribution and dispersed and guaranteed cereals procurement were critical to sustain it. Rural credit provision, though costly and inefficient, also provided liquidity to finance seasonal working capital and farm investment, as well as non-farm employment growth. A key feature was the use of public intervention to force commercial banks to open branches and operate in high cost and risky rural areas. This model for pro-poor agricultural growth was successful during the 1970s and 1980s, despite a continued anti-agricultural bias in macro policy.

During the second green revolution (from the early 1980s to mid 1990s), sectoral terms of trade declined (but remained neutral for wheat and rice). Input subsidies partially offset declining output prices in the 1980s. Although not being key determinants of technology adoption, they were increasingly poorly targeted while rising as a percentage of public expenditure. Private groundwater development; continued public investment in research, extension and rural roads; guaranteed procurement systems for cereals; and protection for oilseeds and other crops, all helped to sustain the green revolution and spread it to less favoured areas. In the fourth ‘post green revolution’ period (running from the mid-90s onwards), structural adjustment policies led to improved sector terms of trade but a slowdown in TFP growth. The remaining input subsidies contributed to inefficiencies and environmental degradation, thus becoming damaging when they

crowded out capital investment in research, infrastructure and human capital, as fiscal constraints began to bite under structural adjustment reforms.

Critical to the dramatic achievements of the 70s and 80s was the balance that was attained between stimulus and support to farm productivity growth on the one hand, and declining food prices that benefited the poor on the other. However, the fiscal strains of these policies and necessary macro-economic reforms, together with the technological slowdown of the 1990s, broke this balance, and highlighted problems faced by farm support programmes that were becoming increasingly inefficient and ineffectively targeted.

The reviews of the abortive green revolutions in Malawi and Zimbabwe also emphasized the importance of the agricultural sector for livelihoods and poverty reduction, and of labour-demanding technology and supportive institutional and price interventions in agricultural input, finance and output markets. Despite initial successes, these supportive institutions were, however, very costly and increasingly ineffective in the 1990s, rendered unsustainable by growing internal and external difficulties. Given the long periods of agricultural growth needed for significant poverty reduction in Asia, difficulties in sustaining supportive institutions at a reasonable cost under more difficult institutional, agro-ecological, and economic conditions present a major challenge in sub-Saharan Africa. Positive interactions between rural and urban areas were important in both countries, with urban areas providing important remittances to rural areas, which in return would provide food and some security to urban households.

The Zimbabwe review (Poulton *et al*, 2002) further highlighted the challenges facing drier areas where new technologies do not offer productivity gains sufficient to drive rapid agricultural growth. It also drew attention to the fact that benefits of growth were limited to more favoured agro-ecological areas, which also often have better road and market access. Growth benefits in these areas tended to bypass less favoured and more isolated areas where many of the poor live, as these areas did not gain from reduced food prices nor from increased access and returns to employment. However, this lack of impact in low potential areas needs to be evaluated in the context of the Indian experience of a lagged spread of benefits to poorer households and areas. Livestock play an important role in many of these areas, in both crop production and as assets providing protection against the vagaries of uncertain and marginal cropping systems.

Dorward and Kydd, 2002, developed from the Malawian analysis the critical concept of coordination risks and low-level equilibria as constraints to agricultural development. They highlighted the historical role of the state in providing coordination and taking on coordination risks itself where undeveloped markets cannot coordinate the different investments needed for market-led growth (input traders, financiers, farmers, and output traders all need to make investments whose returns depend upon complementary but uncertain investments by other players). While African states may have failed to effectively and sustainably fulfil this role in the past, state withdrawal and market liberalization will not, on their own, enable agricultural growth in poor rural areas with undeveloped markets. New mechanisms for coordination must be found, with

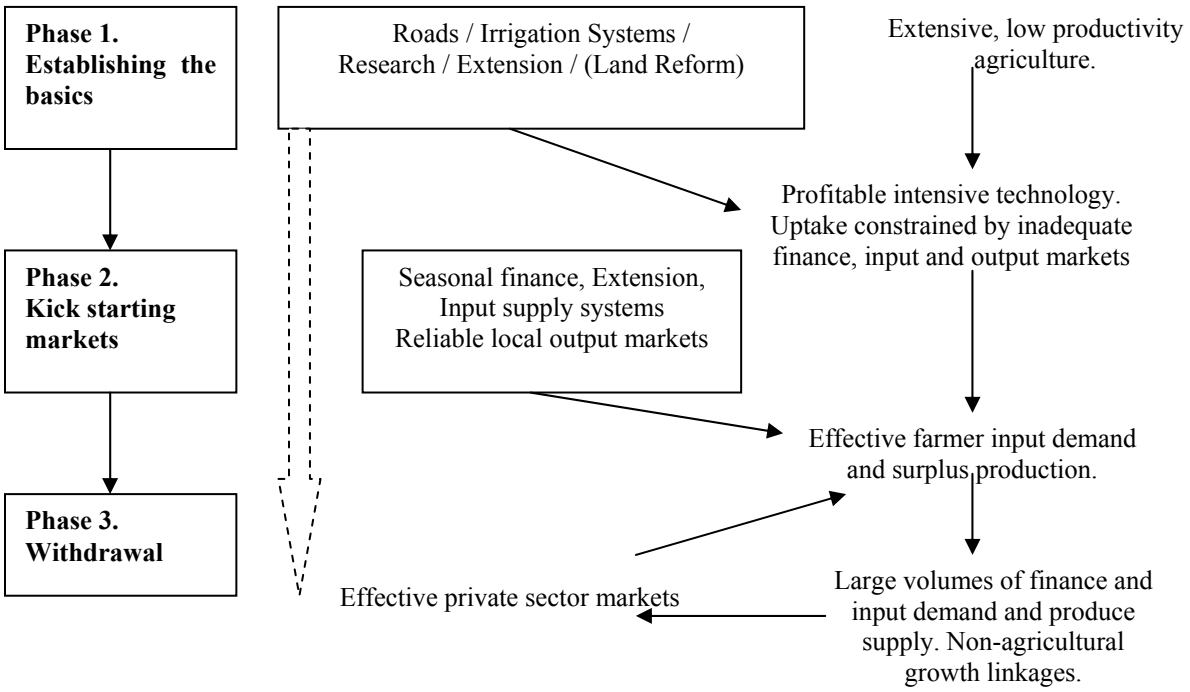
different roles for the state and for other interested stakeholders, such as farmer organizations and NGOs. It is a central challenge for pro-poor agricultural growth. Policies are needed to develop a system that coordinates and assures complementary investments by different players in the supply-chain, gives these players some security and insurance against the different shocks and risks that they are exposed to, supports profitable opportunities to produce for the market, and provides protection against opportunistic behaviour by other players; such as 'strategic default' by farmers, very low prices offered by maize traders at harvest time (when farmers are desperate for cash) or in remote areas (where farmers have no other sales outlets), poor quality or adulterated inputs sold by traders, or use of inaccurate or loaded weights and measures by produce buyers. Dorward and Kydd point out that where African parastatal systems worked effectively (as they did in Malawi in the 1980s and, to a lesser extent, in Zimbabwe over the same period), they were a major part of such a system, with the state taking on the risks of coordinated service delivery to smallholder farmers and manipulating prices to increase the profitability of smallholder farmer investments.

2.6. Kick Starting Markets – Policies and Policy Phases to Support Agricultural Transformations

The three country reviews therefore support the broad thrust of the wider international review of experience of agricultural transformations regarding the specific contribution of public investment and intervention in 'kick starting' thin and poorly developed markets. This is formalized in Figure 1 (from Dorward *et al*., 2004) which shows schematically how the contributions of financial, input and output market interventions to agricultural transformations may be considered in terms of phases of development. Phase 1 involves basic interventions to establish conditions for productive intensive cereal technologies. Once these conditions are in place uptake is likely to be limited to a small number of farmers with access to seasonal finance and markets. Agricultural transformation may then be 'kick started' by government interventions (in Phase 2) to enable farmers to access seasonal finance and input, and output markets at low cost and low risk. In more favourable environments with highly productive technologies and large markets, subsidies are required primarily to cover transaction costs, not to adjust basic prices. Once farmers have become used to the new technologies and when volumes of credit and input demand and of produce supply have built up, transaction costs per unit will fall, and will also be reduced with growing volumes of non-farm activity arising from growth linkages. Governments can then withdraw from these market activities and let the private sector take over (Phase 3), transferring attention to supporting conditions that will promote development of the non-farm rural economy. Difficulties arise in managing these interventions effectively and efficiently, as evidenced by our earlier examination of the record of state failures which made continuing policies of high state intervention unsustainable in most sub-Saharan African countries and built up demands for liberalization. Difficulties also arise from political pressures to include price subsidies with transaction cost subsidies, and to continue with these market

interventions and subsidies when they are no longer necessary (and are indeed harmful).[12] Furthermore, the deadweight costs of such interventions will be high if they are introduced too early, or continued too long. On the other hand, since their benefits only apply during a critical but relatively short period in the initial transformation, these benefits may easily be overlooked by analysts. This, we would suggest, is one of the causes of their neglect in current conventional policy, which attempts to move straight from Phase 1 to Phase 3.

Figure 1. Policy Phases Supporting Agricultural Transformations



There has been limited empirical study of the hypothesis set out in Figure 1, due largely to the lack of theoretical and policy attention to the issues raised in this paper. Chapter 3 of this paper therefore describes an econometric study testing the validity of the hypothesis across different Indian states, and examining the agricultural growth and poverty reduction returns from different types of government investment in different decades.

[12] This analysis of phases of growth follows Adelman and Morris 1997 in suggesting institutional stages in development, problems of market and coordination failure in the early stages, and the need for different types of policy and institutional development at different stages.

Chapters 4, 5 and 6 focus more on examining the problems facing poor rural economies in sub-Saharan Africa. An innovative combination of household, rural economy and economy-wide models is used to investigate possible impacts of different policies on agricultural growth and poverty incidence.

The final chapter of the paper (Chapter 7) draws together the findings from these different studies to consider their implications for our understanding of (a) the potential for pro-poor agricultural growth in today's poor rural areas and (b) the policies most likely to effectively promote such growth.

3. INVESTMENTS, SUBSIDIES AND PRO-POOR GROWTH IN RURAL INDIA

This chapter of the paper describes an econometric study that was undertaken to test against the Indian experience the hypotheses introduced in the previous chapter. The hypotheses suggest that various forms of government interventions (some of them frowned on by the Washington Consensus) play different roles over time and that policies which may have very positive impacts at an early stage of development may need to be withdrawn at later stages to avoid economic inefficiency and slowing of the pace of poverty reduction. Hypotheses are tested using state-level data from the early 1960s to the late 1990s to estimate a system equations model that traces the impact of various types of government spending and subsidies on employment, growth and poverty reduction. The study also estimated the marginal returns of various types of government spending over time.

The chapter begins with a more detailed historical overview of agricultural development, policy and poverty reduction in India from the 1960s to the late 1990s. This is followed by an analysis of the trend and composition of government spending, as well as the development of technology, infrastructure and human capital. The fourth and fifth sections estimate and analyze the trend of input subsidies on agricultural production and describe the analytical framework and model structure and estimation. Model results are then presented and their policy implications discussed.

3.1. Agricultural Development and Poverty Reduction

Immediately after independence, the Indian government placed a top priority on agricultural development. Realizing the importance of physical and scientific infrastructure for modern agriculture, the goverment allocated 31% of its budget for agriculture and irrigation during the First Plan (1947-1952). Massive irrigation projects, power plants, state agricultural universities, national agricultural research systems, and fertilizer plants were set up (Chandra et al, 2000). Simultaneously, an emphasis was put on land reform through cooperatives and community development programs (Chandra et al, 2000).

From 1949 to 1965, agricultural output grew at a respectable rate of 3% per year. However, this growth was not sufficient to feed the rapid industrialization and an increasingly large population growing at a rate of 2.2% per year. Food prices began to rise after 1950s. India, thus, had to import large quantities of food. Under PL480, grain imports from the U.S. rose from nearly 3 million tons in 1956 to 4.5 million tons by 1963. In 1966, grain imports reached more than 10 million tons after two consecutive years of droughts in 1965 and 1966 (Figure 4).

With food imports reaching unsustainable levels, promoting domestic food production became the top agenda of the government in the mid-1960s, and a new agricultural development strategy was implemented. Government investment and other policies favoured high-potential areas like the irrigated Punjab in Northwest India. The

introduction of the high-yielding semi-dwarf wheat from Mexico through CIMMYT was rightly timed. With irrigation and sufficient fertilizer, the CIMMYT varieties doubled and even tripled wheat yields (Figure 3). From 1966 to 1970, in just four years, grain production in India increased from 64 million metric tones (mmt) to almost 92 mmt, or an increase of 40%. As a result, grain imports declined to 3 mmt in 1970, and to only 0.66 mmt in 1972 (Figure 4).

Figure 2. Grain Yield (mt/ha)

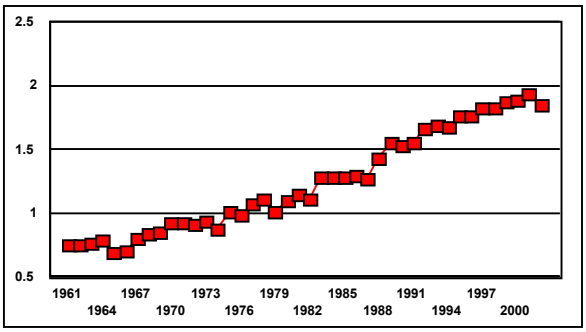


Figure 3. Grain Areas and Output

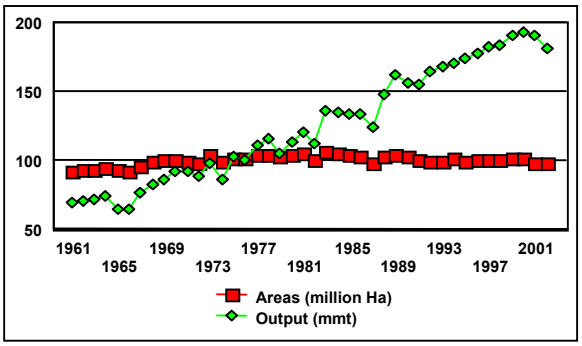


Figure 4. Stocks and Imports of Grain

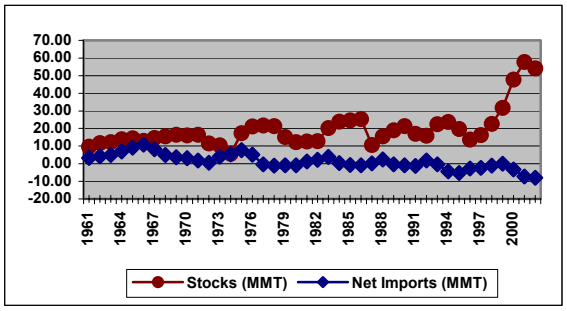


Figure 5. Rural Daily Wages (1999 price)

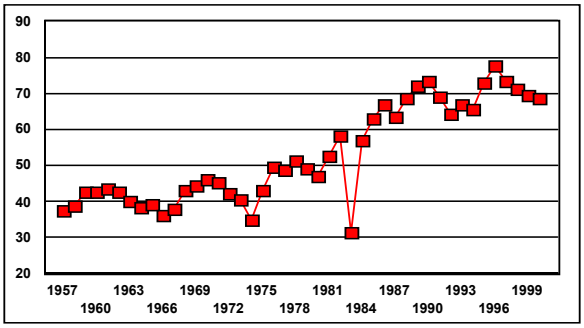


Figure 6. Rural Poverty Incidence

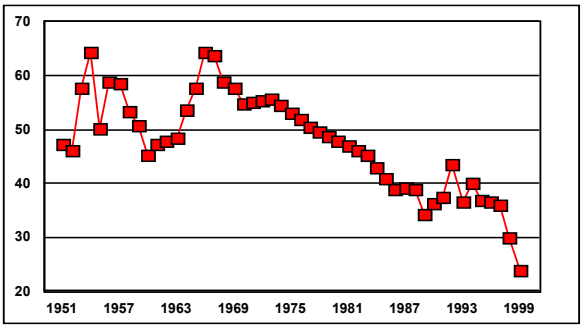
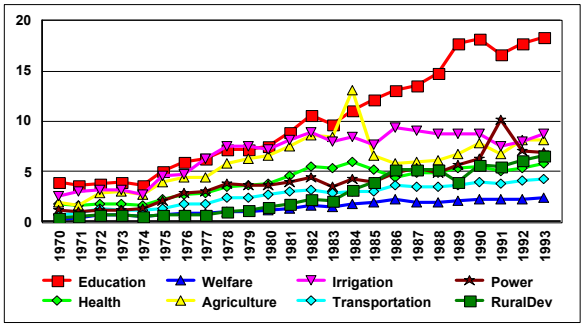


Figure 7. Public Investment (1960 Bn Rs)



Grain production continued to increase after the initial phase of the Green Revolution (see Figure 3). In the 1980s, agricultural intensification, through the adoption of high yielding varieties together with intensive use of fertilizer, moved towards Eastern India. This change not only opened new frontiers for increased agricultural production in India, but also had a profound impact on poverty reduction, as most of the poor were concentrated in these regions before they adopted the Green Revolution technologies. By the 1980s, total grain production reached 160 mmt. This not only made India self-sufficient in food, but also maintained a buffer stock of grain of 30 million tons. Towards the end of the 1990s, India began to export grains. By 2000, Indian grain production increased to 192 mmt. Since 2001, India has maintained a grain stock of over 50 mmt (Figure 4).

These changes in agricultural productivity have been accompanied by major changes in agricultural and non-farm employment. Total rural employment based on usual principal status (UPS) grew by 1.89% p.a. during 1977-1983, by 1.23% p.a. during 1983-1987, improved again to 2.14% p.a. during 1987-93, before slowing to 0.66% p.a. in the 1990s (1993-2000). The slow growth in total rural employment during the 1990s was largely due to a slow down in agricultural employment, which increased by 2.08% p.a. during 1987-93 but fell to only 0.80% p.a. during 1993-2000. Non-agricultural employment, however, has grown faster than agricultural employment with faster growth until 1987, a significant slow down (to 1.76% p.a.) during 1987-1993, and then a further pick up in the 1990s when it grew at 2.60% p.a. As a result of these changes, real rural wage rates increased by 2.01% per year in India during the period 1958-2000. However most of this increase occurred after 1980: The 1960s and 1970s saw a decline in rural real wages, which gave way to very rapid increases (9.2% p.a.) during the 1980s, falling to 4.58% p.a. in the 1990s (see Figure 5).

In parallel with the rapid agricultural growth, India has drastically reduced the percentage of population living in poverty since the early 1950s, albeit with uneven progress over time. Rural poverty fluctuated between 50 and 65% in the 1950s and the late 1960s without any clear trend. It began to show a steady decline from the late 1960s until the late 1980s, from about two thirds to over one third of the rural population (see Figure 6). Rural poverty increased again to 40% in the beginning of the 1990s, but declined between 1993-94 and 1999-2000. However, this rapid decline in rural poverty in the 1990s has been disputed by researchers due to serious problems of comparability. Nevertheless, there seems to be an agreement that rural poverty has possibly gone down in the 1990s, but the rate of reduction has slowed down quite considerably.

3.2. Government Spending and Development of Technology and Infrastructure

As noted earlier, India's achievements in agricultural growth, higher farm and non-farm employment, higher wages, lower food prices, and rural poverty reduction were accompanied by significant government investments and subsidies.

India has a rather decentralized spending system. State governments are responsible for irrigation, power, agriculture, animal husbandry, soil conservation,

education, health, family planning, cooperatives, rural development, and forestry development and protection. States generate revenues through taxes to cover these expenses. Central government funds for agricultural and rural development are also largely channelled through the states, therefore the use of these funds is also reflected in states' spending.

Government expenditure is divided into revenue expenditure and capital expenditure. In theory, revenue expenditure is mainly used to cover day-to-day operation costs such as salaries, and maintenance of public capitals and offices, among many other items. Capital expenditures are expenses used for long-term capital investment. In reality, however, the distinction between revenue and capital expenditures is difficult to define. For example, it is difficult to categorize salaries or wages that are used to build long-term capital. Revenue and capital expenditures can be further divided into development and non-development spending. Development spending includes both social services (such as health and education), and economic services (such as agriculture, irrigation, power, and transportation). Data on government spending mainly comes from the financial budget of the states and the Union.

Figure 7 shows government expenditures by expenditure category over the 1958-2000 period. Total expenditure has grown thirty-four-fold from 1958 to 2000, with an annual average growth rate of 8.58%, although the rate of increase has slowed in recent years, particularly in the 1990s.

The growth in total government expenditures varies widely across states. Total expenditures grew at an average rate of 6.37% per year in India between 1965 and 2000, but the rate of change varies from 2.69% in Orissa to 9% in Haryana. The per year growth rate for a large majority of states, however, is fairly close to the national average.[13] A significant feature in the pattern of government spending has been the declining share of capital expenditures (falling from 20% of total government spending in the 1960s and 1970s, to 10% in 2000). One reason is the rapid increase in input subsidies; another is the high operational costs generated by the heavy capital investment in irrigation and power in the 1960s and 1970s. Interestingly, the share of capital expenditures for road investment has increased from 40% in the 1960s to more than 50% in the 1990s. It is also noteworthy that the relative importance of overall spending across sectors has not changed much over the last several decades.

In the initial stage of the Green Revolution, canals, tubewells, along with HYVs and fertilizers, became catalysts for rapid agricultural growth in India (Gulati and Svendsen 1995). Many studies have highlighted the role of irrigation in intensifying the production of food grains, particularly of fine cereals (mainly wheat and rice); and its role in maintaining the public distribution system. However, the impact of irrigation on yield increase differs greatly between regions (Dhawan, 1988). Crop areas under irrigation continued to expand after the initial stage of the green revolution, with the percentage of

[13] The only exception was Himachal Pradesh, whose unusual high rate may be due to the formation of the state in 1965-66.

total crop area under irrigation increasing to 21% by 1980, 24% by 1990 and 30% by 2001.

In the early phase of the Green Revolution, from the mid-1960s to 1970-73, the new HYV technology was more or less confined to Punjab, Haryana, and some districts in western Uttar Pradesh. The proportion of area planted with HYVs for five major crops (wheat, rice, maize, bajra and jowar) increased from 19% in 1970 to 40% in 1980 (Fan et al. 1999), reaching 77% in 1997. Substantial regional differences remained, however, as states with higher levels of irrigation generally had a higher HYV adoption rates.

The country also made significant progress in rural electrification, in terms of power supply to the agricultural sector and village electrification. In 1970, only 30% of rural villages had access to electricity, compared with over 90% by the end of the 1990s. The expansion of the power supply to the agricultural sector was particularly rapid prior to the 1990s, growing at an average rate of 9% p.a. Electricity supply to the agricultural and non-agricultural sectors varies widely across states. Electricity consumption in agriculture increased at a rate of 8.4% per year at the national level, with considerable variations between different states.

Rural road density, measured in terms of kilometer of roads per thousand square kilometers of geographic area, has increased two-fold between 1970 and 1995, at an average growth rate of more than 3% p.a.. It is worth mentioning again the significant state-level variations in road development.

Another important achievement in rural India over the last 5 decades is the rapid improvement in rural education. The literacy rate has increased steadily from 23% in 1970 to 49% in 2001, or at 3.93% p.a. There are significant inter-state variations in literacy rates, which vary from 80% in Kerala to 36% in Bihar. Other states where the literacy rate is below the national average of 50% include Jammu & Kashmir, Uttar Pradesh, and Rajasthan.

3.3. Input Subsidies: Estimates and Trends

There are wide ranges of input subsidies sources in India. Different levels of governments (central, state and local) can provide direct financial support to input industries, parastatal and private input traders, and farmers. They can also intervene to subsidize inputs indirectly. Subsidies estimates have been made from various government documents, following the procedure used by Gulati and Narayanan (2003). The aggregate national data are summarised in Figure 8.[14]

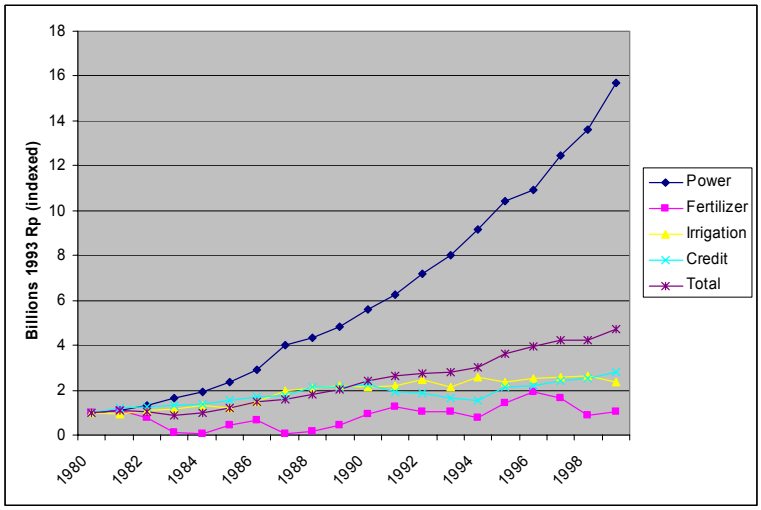
The fertilizer subsidy is defined as the difference between the farm gate cost of imported fertilizers and the price actually charged to farmers. These estimates include both direct government financial support to farmers and fertilizer industries, as well as indirect support through import subsidies and tax or price preferential policies granted to the fertilizer industry.

[14] See Fan *et al.* 2004 for further details.

The volume of fertilizer subsidy has increased substantially over the last thirty-five years, at a rate of 6% p.a. between 1965-1999. There are, however, significant differences across decades in the direction and rate of change, with a brief contraction period from 1983 to 1989 when subsidies were substantially lower. They have also fallen a little since 1996, as a result of market liberalization and withdrawal of state intervention in several economic spheres. Significant variations are also observed in the direction and rate of increase (or decrease) in the fertilizer subsidy across states. In the 1980s, fertilizer subsidies declined in seven out of seventeen states, but in the 1990s, almost all states experienced a cutback in their level of subsidy.

The introduction of HYVs led to a substantial increase in the demand for credit from cooperatives, which were the only official providers of agricultural credit at that time. In 1969, commercial banks started to provide agricultural credit after their nationalization in 1969. Moreover, the Regional Rural Banks (RRBs) were created in 1975 to target districts with a weak credit base. This led to a shift of lending from informal to formal sources. By the early 1990s, 50% of total agricultural credit was coming from commercial banks. While formal credit was taking off, informal credit was still part of the credit system in India. Dandekar and Wadia (1989) provide evidence that, by 1985, only 40% of rural credit was provided by these formal institutions and 60% was still being supplied by moneylenders. Similarly, Bell (1990) claims that the erosion of moneylenders was not as extensive as the government had reported and that informal lenders took advantage of the expansion of formal credit as it provided them with opportunities to act as financial intermediaries.

Figure 8. Input Subsidies in Indian Agriculture



Credit subsidies are calculated as interest subsidies (the difference between commercial rates and farmers' rate) plus defaulted loans to agriculture. The national

volume of credit subsidy increased at a rate of 10.8% p.a. from 1960-2000. However, considerable differences in growth rates across decades can be noted: credit subsidies grew at 12.62% p.a. during the 1960s; the rate of increase then doubled in the 1970s, to an average of 22% pa., with a consequent increase in the volume of credit subsidy. The annual growth rate in credit subsidies then fell to 7.31% in the 1980s, and to 4.74% in the 1990s. Rates of growth in credit subsidies vary across states, although less than for most other subsidies.

Irrigation subsidies are calculated as the difference between the total operation and maintenance (O&M) costs and the total revenue in the irrigation sector. From 1966 to 1999, the level of irrigation subsidy, which includes major, medium, and minor irrigation schemes, increased quite dramatically at 7.6 & p.a.. The rate of increase was somewhat higher during the 1960s (20%), compared with the 1970s (10%) and the 1980s (5%). During the 1990s, the growth rate in irrigation subsidies came down significantly to only 1% per year.

Overall, power subsidies to the agricultural sector grew at a per year rate of 19.7% in India between 1966 and 1999. However, the rate of growth has been uneven over time: a rising trend is clearly observed in Figure 8. During the 1960s and the 1970s, power subsidies grew substantially at an annual average rate of 7.2% and 38.5% respectively. The rate of increase declined to 19.7% in 1980s. In the 1990s, it fell further to 11.9% p.a. Since the 1980s, the regional shares in power subsidies have changed significantly (Gulati and Narayanan, 2003). The Eastern region has lagged behind in terms of power consumption although its power subsidy share increased from 4 to 7% between 1982-83 and 2000-01.

When we aggregate all the different types of subsidies, several features are apparent (Figure 8): (1) Subsidy volumes have increased substantially during this 35-year period. The rate of increase was, however, relatively higher for power (19.6% per year) and credit (11.2% per year), as compared to irrigation and fertilizer subsidies (about 5.5% and 7.6% respectively). (2) The rate of change in the amount of subsidies was uneven over time. Overall, subsidies on all four inputs increased at a much faster rate during the 1960s and the 1970s. In the next two decades, subsidy growth on all four inputs slowed down.

3.4. Analytical Approach and Model

In a previous study published by IFPRI, Fan et al. (1999) used state-level data from 1951 to 1993 to estimate the marginal returns of different types of government spending on agricultural growth and poverty reduction. The impact of government spending on poverty was estimated by looking at linkages across agricultural growth, the development of the rural non-farm economy, and rural wages. However, the study was unable to conduct the analysis by different time periods due to limited data, and to distinguish between impacts arising from investments and those from subsidies. These two types of analyses are critical for testing the hypotheses developed in the previous chapter. For the purpose of this study, therefore, the system equations model developed

by Fan et al. was adapted and the database extended to analyze the impact of various types of government investments and subsidies on both growth and poverty reduction over time. A double-log functional form was used for all the equations in the system.

Most studies that examine the impact of public spending on growth and poverty reduction use a single-equation approach. There are two disadvantages to this method. First, many poverty determinants are generated from variables, which are also endogenous variables. This can lead to biased estimates of the poverty effects. Second, certain economic variables affect poverty through multiple channels. This study thus uses a multi-equation system to estimate the effects of government investment and subsidies on poverty. The estimation technique is a full information maximum likelihood method. The system of ten equations includes a poverty equation, which is a function of agricultural growth, changes in wages, non-farm employment and food prices. We further endogenize equations of agricultural growth, rural wages, non-farm employment and food prices. These equations are then linked to public capitals such as agricultural research investment, improvements in roads, electricity, education, and irrigation. These sets of equations finally model the relationships between government spending and public capitals.[15] The relationships described by these equations are shown in Figure 9.

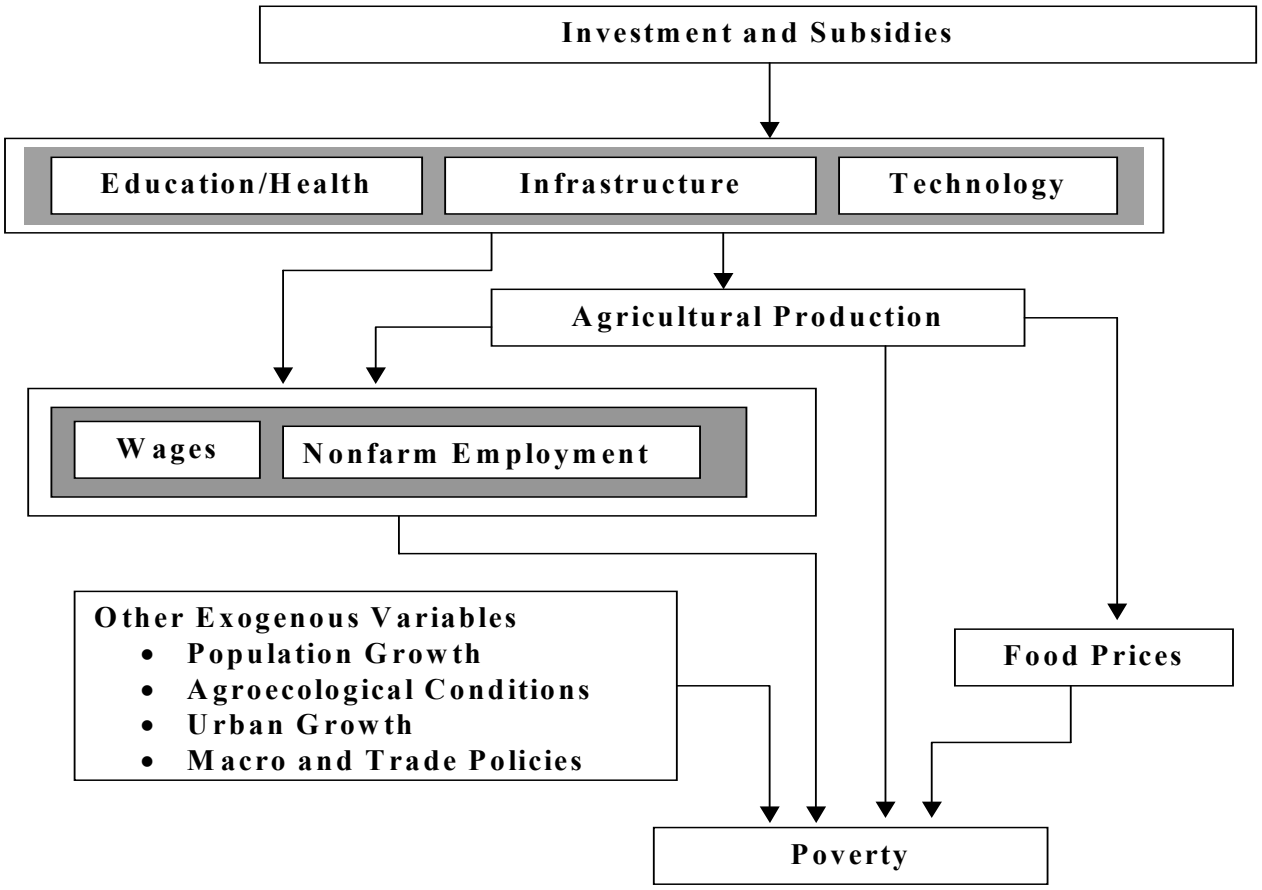
The marginal impact and elasticity of different types of government subsidies and expenditures on rural poverty can then be obtained by differentiating the equations from their estimated coefficients. These returns are calculated for four decades: 1960s (1967-70), 1970s (1971-79), 1980s (1980-89), and 1990s (1990-97). Marginal effects are expressed as: (i) production (rupees per unit of spending in 1999); and (ii) poverty (number of poor brought out of poverty per unit of spending in 1999). For example, the returns to investments in irrigation are measured as rupees of additional production (or the number of persons brought out of poverty) for every additional million rupees spent on irrigation. These measures provide useful information for comparing the relative benefits of additional units of expenditure on different types of investment items in different regions. They can also establish priority investment for government expenditures to further increase agricultural production and reduce rural poverty.

3.5. Marginal Returns in Growth and Poverty Reduction

In the estimated poverty equations, agricultural labour productivity and rural wages are negatively correlated with rural poverty in all decades; although in the case of rural wages, this relationship is not significant (at 95%) for the two earlier decades. Non-farm employment is also negatively correlated with poverty, but only in the 1980s and 1990s. Agricultural terms of trade (relating agricultural and non-agricultural prices) is negatively correlated with poverty for the first three decades (although only in the 1980s is it significant at 95%). It then is found to be positively related to poverty in the 1990s (this result is significant at 95%). Higher agricultural prices therefore appear to have

[15] Further details of the model are provided in Fan *et al.* (2000) and Fan *et al.* (2004)

Figure 9. Model Relationships Between Public Investment and Poverty



benefited the poor in earlier decades, but harmed them in the 1990s, presumably as non-agricultural activities were becoming increasingly important in their livelihoods. These findings suggest that in the course of Indian agricultural development, structural changes occurred in the relationships between poverty on the one hand, and non-farm employment and agricultural terms of trade on the other hand. Evidence of structural change is to be found in changes in other coefficients estimated in the equation system such as: (a) over time fertilizer use and road density appear to have an increasing impact on agricultural labour productivity; (b) rural wages are increasingly affected by literacy rates, but decreasingly affected by road density; (c) urban growth has an increasing impact on non-farm employment (although there is no evidence of change in the positive effects of literacy on non-agricultural employment); (d) agricultural terms of trade have only been negatively affected by agricultural growth from the 1980s onwards, and are only weakly affected by urban growth and world prices (but the direction of these relations changes as weakly negative effects of urban GDP growth become weakly positive starting in the 1980s, and weakly positive effects of world prices become weakly negative); and (e) irrigation subsidies have a declining impact on fertilizer use.

Together, these changes in estimated coefficients (and in their levels of significance) suggest increasing integration in the economy, with the growing importance of non-agricultural employment on wages (from (b) and (c) above) and of rural–urban linkages (from (c) and (d) above); and increasing efficiency in the use of purchased (fertilizer) inputs (from (a) and (e) above). These observations of structural change are broadly in line with the processes of development hypothesized in Figure 1.

The policy implications of these structural changes can be investigated further by examining the marginal growth and poverty reduction effects of different types of government investment and subsidies over the four decades.

Table 1 details the estimated marginal effects of different types of government expenditure in each decade, in terms of impact on agricultural GDP and on poverty reduction. Figures 10 and 11 present the same information graphically.

Considering first the estimated returns to agricultural GDP (see Table 1 and Figure 10); in the 1960s, most investments and subsidies generated returns that were both significantly greater than zero and larger than their costs.[16] Roads and education investments, in particular, had estimated benefit-cost ratios of 6 to 9. Agricultural research investments and subsidies on irrigation, fertilizer and credit yielded benefits were 2 to 4 times the amount spent. This was the period when HYVs, fertilizer, and credit were being promoted as a high pay-off technology package. Irrigation investments and subsidies, and power subsidies yielded the lowest returns in this period, though returns to irrigation investment and subsidies were estimated as more than double spending.

In the 1970s, the returns to most of these subsidies and investments declined, with the exception of agricultural R&D and education. Road investments and fertilizer subsidies however remained good value for money (with returns of 300% or more). Estimated returns to irrigation investments and subsidies, and to power and credit subsidies, however, had fallen to 200% or less. By the 1980s, returns to fertilizer subsidies had fallen to below 100%, returns to agricultural R&D was continuing to rise, while returns to road and educational investments had fallen but remained 'good buys', along with irrigation investments and credit subsidies (their estimated returns had risen). By the 1990s only agricultural R&D and road investments were continuing to yield estimated returns of more than 300%. Estimated net returns to irrigation investments and education were low but still positive, whereas credit, power and fertilizer subsidies were estimated to have negative net returns, and subsidies on irrigation appeared to have had no significant impact on agricultural production at all.

Turning now to consider the poverty reduction impacts of different types of government spending in the different decades, Table 1 provides the estimated number of people lifted out of poverty per million Rp spent. Figure 11 turns these numbers around,

[16] The coefficients of the labor productivity function are used in calculating the returns in agricultural GDP. These coefficients should be the same as the agricultural GDP function if constant returns to scale are assumed.

showing the estimated cost per person lifted out of poverty (in UK£ at current exchange rates). Results follow the same broad pattern as expected from the estimated returns in agricultural GDP growth discussed above, with some (generally minor) differences. Across all decades estimated costs are low for roads, agricultural R&D, and education spendings (although the last rise in the 1990s). Fertilizer subsidies, however, are estimated to have been effective in reducing poverty in the two earlier decades, but to have become highly ineffective over time. Credit subsidies are effective in the 1960s and 1980s. Power subsidies never are a good buy.

Table 1. Returns in Growth and Poverty Reduction to Investments and Subsidies

	1960s		**1970s**		**1980s**		**1990s**	
			returns	***rank***	***returns***	***rank***	***Returns***	***rank***
Returns in Agricultural GDP (Rps per Rps Spending)								
Roads	8.79	1	3.8	3	3.03	5	3.17	2
Education	5.97	2	7.88	1	3.88	3	1.53	3
Irrigation Investment	2.65	5	2.1	5	3.61	4	1.41	4
Irrigation Subsidies	2.24	7	1.22	7	2.28	6	n.s.	8
Fertiliser Subsidies	2.41	6	3.03	4	0.88	8	0.53	7
Power Subsidies	1.18	8	0.95	8	1.66	7	0.58	6
Credit Subsidies	3.86	3	1.68	6	5.2	2	0.89	5
Agric. R&D	3.12	4	5.9	2	6.95	1	6.93	1
Returns in Rural Poverty Reduction (Number of Poor reduced per Million Rps Spending)								
Roads	1272	1	1346	1	295	3	335	1
Education	411	2	469	2	447	1	109	3
Irrigation Investment	182	5	125	5	197	5	67	4
Irrigation Subsidies	149	7	68	7	113	6	n.s.	8
Fertiliser Subsidies	166	6	181	4	48	8	24	7
Power Subsidies	79	8	52	8	83	7	27	6
Credit Subsidies	257	3	93	6	259	4	42	5
Agric. R&D	207	4	326	3	345	2	323	2

Figure 10. Agricultural GDP Returns to Government Spending

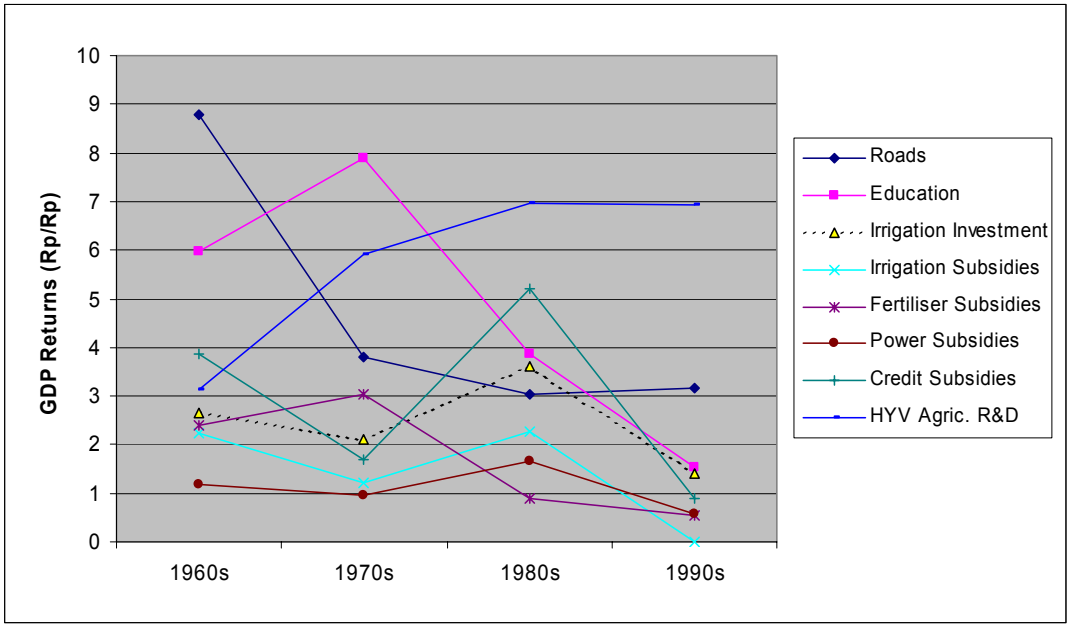
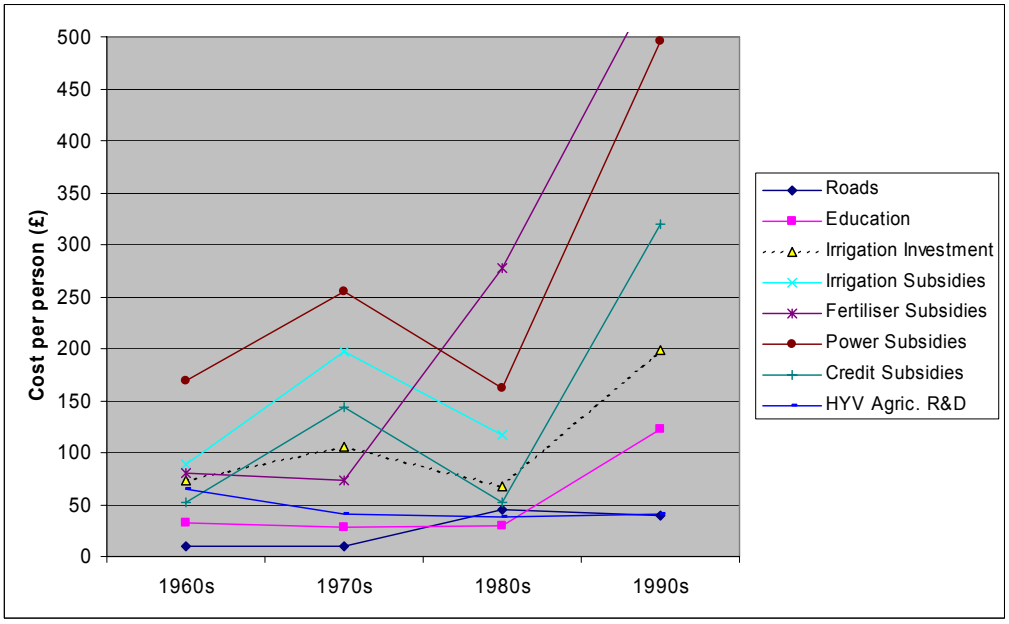


Figure 11. Cost Per Person Lifted Out of Poverty



3.6. Key Findings and Policy Lessons

Although there are some discrepancies in particular estimates (the pattern of returns to credit subsidies, for example), these findings provide broad support to the hypotheses developed in the previous chapter and summarized in Figure 1. Subsidies can play a critical role in 'kick starting' markets at the initial stages of a successful agricultural transformation in poor rural areas. However, once the agricultural transformation has taken hold, these subsidies exert a drag on economic growth and poverty reduction. However, the strongest conclusion that emerges from these results is not so much their support for the 'kick starting markets' hypothesis of Figure 1 (although as noted above the broad pattern of estimated returns does provide such support), but rather their rejection of particular elements of the Washington Consensus hypothesis. This is clearly demonstrated in Table 2, where two alternate sets of hypotheses are presented (positive and negative net returns to spending) with the conclusions regarding these hypotheses.

Table 2. Hypothesis Tests on Net Agricultural GDP Returns on Government Spending

Hypothesis	***Government spending***		***Hypothesis rejection (X) or non-rejection (-) or confirmation* (+)***			
			1960s	***1970s***	***1980s***	***1990s***
Negative net return on agricultural GDP (or benefit-cost ratio<1)	Investment	Agricultural R&D	X	X	X	X
		Roads	X	X	X	X
		Education	X	X	X	X
		Irrigation	X	X	X	n.s.
	Subsidies	Irrigation	X	X	X	+
		Fertilizer	X	X	-	+
		Credit	X	X	X	n.s.
		Power	n.s.	n.s.	X	+
Positive net return on agricultural GDP (Benefit-cost ratio>1)	Investment	Agricultural R&D	+	+	+	+
		Roads	+	+	+	+
		Education	+	+	+	+
		Irrigation	+	+	+	n.s.
	Subsidies	Irrigation	+	+	+	X.
		Fertilizer	-	+	X	X
		Credit	+	+	+	n.s.
		Power	n.s.	n.s.	+	X

Notes:
The Wald test is used to test whether marginal returns are large than 1.
Negative net return on agricultural GDP (or benefit-cost ratio<1): Marginal returns <1 and statistically significant at the 10% level.
Positive net return on agricultural GDP (or benefit-cost ratio>1): Marginal returns >1 and statistically significant at the 10% level.
Statistically insignificant: The estimates are not statistically significant at the 10% level.

As Table 2 demonstrates, the hypotheses according to which government spending on investments yields positive returns is generally confirmed in all decades (the negative hypothesis is rejected), in line with both the 'Washington consensus' and the 'kick starting markets' hypotheses. However, when we turn to consider net returns to spending on subsidies, negative returns (as hypothesized by the 'Washington consensus') are rejected in a number of cases in the earlier decades. Even when negative returns are not rejected, neither are positive returns in most cases; thus indicating that the data does not offer definitive support to either hypothesis. In later decades, however, rejection of positive returns to subsidies is more common, in line with both the 'Washington consensus' and the 'kick starting markets' hypotheses. The switches in returns to subsidies are in line with the 'kick starting markets' hypothesis, and the hypothesized structural mechanisms causing these changes are also supported by estimated changes in equation coefficients, as discussed earlier.[17]

These findings have a number of important policy implications.

First, if the returns to government spending on different types of investment and subsidy change as development and structural change occur, then policies for government spending should also change: there is no 'one size fits all' set of policies. In areas which have not yet achieved an agricultural transformation it may be appropriate for governments to spend significant sums on fertilizer and credit subsidies. However, the failure of such spending to achieve sustained development in many African countries in the 1970s argues for caution on two counts: first, it is important to note that, in India, such spending was preceded by important investments in infrastructure, technology and land reform (stage 1 in Figure 1), and without prior investment to establish the right conditions for the agricultural transformation, subsidies to kick start markets cannot succeed; second, subsidies need to be administered reasonably effectively and efficiently, without too much leakage.[18] This poses important challenges to improve governance in many of today's poor economies.

This set of conclusions arguing for effectively administered subsidies to kick start markets in poor rural economies which have already achieved the base conditions necessary for an agricultural transformation is highly relevant to today's poor rural economies in Africa. It demands a shift in policy to develop strategies for effective subsidy administration where the base conditions have been met, and investment in infrastructure and technology to develop these base conditions where they do not yet prevail.[19] These conclusions are also highly relevant to India, in particular given the

[17] These coefficient changes also suggest that the declining returns to subsidies are caused by hypothesized structural changes, rather than just diminishing marginal returns to the increasing subsidy volumes shown in Figure 8.

[18] The administration of these policies in India, and in other countries which used similar policies to promote agricultural transformations, was not free of the distortions and deadweight of corruption and political patronage. Nevertheless, the administration was sufficiently effective for the subsidies to have a significant impact.

[19] As the results presented in Figure 9 and Table 1 show, investment in infrastructure and agricultural technology is likely to continue to yield high returns throughout the process of agricultural transformation.

results of the 2004 general election, demanding different policies in different states. In the states that have already achieved substantial agricultural growth and poverty reduction (and where large continuing subsidies are in direct competition with more long-term capital investment in roads, rural education, and agricultural research), subsidy withdrawal and market liberalization is required. However, other states that have not yet achieved an agricultural transformation and where rural poverty is most severe require increased and better investment and subsidies. This is a major challenge for the new Indian government.

These policy conclusions are very challenging for politicians and policy makers. It is difficult to change policies to match different stages of growth, to follow the right timing for subsidy introduction, to design and implement effective subsidies (especially in increasingly liberalized global markets and in relatively small states), and to withdraw them when they are no longer needed. Nevertheless, the findings from this analysis also show that the trade-off between agricultural growth and poverty reduction is generally small among different types of public spending: the comparison of the rankings in Table 1 shows that the forms of spending that are most effective in promoting agricultural growth in the different stages of development also tend to have the largest impact on economic growth and poverty reduction.

4. PRO-POOR POLICY LESSONS FROM HOUSEHOLD AND INFORMAL RURAL ECONOMY MODELS IN MALAWI

We now address some of the questions raised in Chapter 2 by describing the development of a set of models representing the major features of poor rural livelihoods, and of the informal rural economy in Malawi. We, first, briefly describe Malawian smallholder agriculture and the critical policy issues it faces. It, then, sets the agenda for the development and application of farm/household models. Third, we describes base model results as regards different household livelihoods structures and responses to change. This, finally, leads onto the development of an informal rural economy model used to explore different policy scenarios. The scope of the work is ambitious with regards to both the policy issues addressed and the analytical methods used. We, therefore, pay attention to both policy questions and methodological challenges faced in their investigation.

Table 3. Social and Economic Indicators for Malawi

		1997	**2000**
Population	Total Population (million)	9.7	10.3
	Population Growth (annual %)	2.4	2.1
	Urban population (% of total)	13.7	14.7
Health, malnutrition and poverty	Life Expectancy at birth (years)	40.7	38.8
	Mortality rate- under 5s (per 1,000 live births)	188.6	193.0
	Adult HIV-1 seroprevalence (% of population aged 15-49)	14.9	16
	Malnutrition prevalence (% of children under 5)		25.4
	Poverty (% of pop. below national poverty line)		60*
Education	Illiteracy rates-adult males (% of 15+)	27.3	25.5
	Illiteracy rates-adult females (% of 15+)	56.7	53.5
	Gross Primary enrolment (% of school age population)		131*
Economy	GNI per capita-Atlas method (current US$)	220	170
	GDP growth (annual %)	3.8	1.8
	Inflation GDP deflator (annual %)	7.8	25.1
	Agriculture, value added (% of GDP)	36.3	41.6
	Industry, value added (% of GDP)	17.5	19.1
Trade	Exports of goods and services (% of GDP)	22.5	26.1
	Imports of goods and services (%of GDP)	34.4	39.0
	Tobacco exports (US$ millions)		247
	Food imports (US$ millions)		30
Technology and Infrastructure	Fixed lines and mobile phones (per 1,000 people)	4.4	9.0
	Paved roads (%of total)	19.0	N.A.
Finance	FDI, net inflow (current US$ millions)	22.0	45
	Short-term debt outstanding (current US$ millions)	23.5	78.4
	Total debt service (% of exports of goods and services)	13.1	11.6
	Aid per capita (current US$)	35.5	43.2

**: Latest available figures between 1995 and 2001*
Sources:[World Bank, 2002 #57], [FAO, 2002 #58].

4.1. Background and Policy Issues

Malawi is one of the poorest countries in the world, as shown by a range of social and economic indicators (see Table 3). Key elements in the poor performance of the Malawian economy include high dependence on agriculture; high population densities and small holding sizes; low productivity in maize production (the staple crop which accounts for around 70% of cultivated area); depressed world prices for traditional export crops; lack of other exploitable natural resources; isolation and high import and export costs due to its land-locked location and poor external transport systems; recent collapse of the industrial economy due to exposure to outside competition; poor macro-economic management and performance with large budget deficits, high interest rates, large devaluations of the Malawi Kwacha (MK), and high inflation rates; poor physical infrastructure; a burgeoning crime rate in urban and rural areas; weak governance; high rates of HIV/AIDS infection; chronic poor health, with very high infant mortality from malaria, water-borne diseases, and mal- and under- nutrition; and low levels of literacy and education.

Major strategic policy questions in Malawi can be considered in terms of the balance between investments in improving social and human capital (for example through health and education programmes), direct investments in welfare support through safety nets, and direct investments promoting economic development. Four main alternative (but by not mutually exclusive) strategies are commonly debated in pursuit of economic development (see for example Orr and Orr 2002, Ellis et al. 2002): rural diversification out of agriculture, expanding smallholder cash crop production, more intensive maize production, and diversification away from maize towards other staple crops (such as cassava and sweet potato).

To examine the general potentials for agricultural-based rural economic development, we build empirical models of rural livelihoods and of the informal rural economy of which they are a large part. This approach allows us (a) to develop further analytical understanding of key relationships within rural livelihoods; and (b) to investigate impacts of different types of change on different households' livelihood opportunities, activities and welfare.

4.2. Development and Application of a Farm/Household Model of Rural Livelihoods

Farm/Household Model Structure

Understanding of farm/household livelihoods drew heavily on a large literature on Malawian smallholder agriculture and insights from earlier modelling activities (Dorward 1984, 1991; Dorward 1996; Dorward 1997, 1999b, a). This understanding, and its interactions with the strategic policy options discussed above, the patchy data available (discussed below), and the flexibility required of the models in examining responses to different stimuli suggested the use of a programming model with the broad structure presented in the Appendix.

The model structure represents the following major features of Malawian rural livelihoods:

1. *Seasonal constraints*: The year is divided into 'cropping', 'pre-harvest', 'harvest', and 'post-harvest' periods. Crops make heavy demands on labour in the cropping period, with potential trade-offs between on-farm work and off farm work (generating lower but more immediate returns which may be important for cash and food scarce poor households, needing to sustain minimal levels of cash and food consumption prior to harvest). In pre-harvest period, on-farm labour demand is limited. In harvest period, crop prices fall and farm labour demand and off-farm wage rates rise. In post-harvest period, crop prices and wages rise.

2. *Varied cropping and off-farm activities*, with varying seasonal demands for labour and purchased inputs, stocking and buying and selling activities across time periods. Off-farm activities are described in terms of hiring out of labour at differing rates in different periods. Borrowing (for cash or tied crop inputs) and technical change and the introduction of new crops or new income earning opportunities can be described by specific activities in the model.

3. *Heterogeneity* between households in terms of differences in options open to them (for example different cropping activities), in their asset holdings (land, seasonal labour, pre-seasonal holdings of cash and grain stocks), and in relations between consumption needs and assets.

4. *Partial engagement with imperfect markets* with a 'wedge' between market, farm-gate and local purchase prices. Farm-gate sale prices are calculated as market prices less a markdown, and consumer purchase prices as market prices plus a mark-up.[20] Transaction costs are allowed for in unskilled labour markets, with supervision time demands when hiring in labour, and travelling time when hiring out labour. Over-supply on the *ganyu* (informal) labour market (and a wage above the market clearing wage) is allowed for by introducing time search costs for those seeking *ganyu* employment.[21] Complete credit market failure is assumed in the base model.

5. *Food security objectives in uncertain markets*: It is frequently argued that uncertainty about the reliability and costs of food purchases cause Malawian smallholders to set a high premium on subsistence maize production, inhibiting specialisation in otherwise more productive activities (see for example Dorward 1999a; Orr and Orr 2002). Food consumption was modelled in terms of calorific

[20] To represent local maize deficits in the 'crop' period, farm-gate (sales) prices were not subject to the markdown, but in the harvest and post-harvest periods local maize surpluses could be purchased at farm-gate price.

[21] Households with non-farm semi-skilled labour may sell it off the farm for a higher wage or use it on farm. No attempt is made to model specific non-farm enterprises and all non-farm activities (skilled or unskilled) earn a wage, although this might represent self-employment in, for example, cutting firewood or grass, or petty trading.

requirements. Before harvest, maize can be consumed either from stocks carried forward from the previous season or from purchases. After harvest, calories could be provided from own production of grain or root crops, or from purchases of maize. Subsistence production was encouraged by the wedge between maize purchase and sales prices. Food price uncertainty was modelled by introducing three alternative market conditions in the base model, representing expected, high and low maize purchase prices.

6. *Non-separability*: The modelling of seasonal constraints, imperfections in maize, labour and credit markets (as outlined above), and household objectives allows for strong competition and interaction between consumption and production activities.

Farm/Household Types

Data from the Integrated Household Survey or IHS (IFPRI and NSO 2002) were used to develop a typology differentiating households in terms of agro-ecological zone and socio-economic characteristics within each zone (Dorward 2002). Three agro-ecological zones were identified (mid-altitude plateau; the lakeshore and the Shire Valley; and central highlands) with an estimated 60% of rural households living in mid-altitude plateau areas. Within each area, cluster analysis of the IHS data set identified groupings or types of household. Variables used in the classification were regular off-farm employment, remittances, value of productive asset holdings, estimated retained maize per household member, land holding size per household member, access to credit, and gender of household head. Seven household types were identified for each zone, and each household type was estimated by a range of variables required for household differentiation in the farm/household models. Table 4 presents the features of household types in the Plateau zone.

Farm/Household Model Data Sources

Given the variability and heterogeneity within smallholder agriculture, and the partial and imperfect markets in peasant economies, obtaining seasonal price and technical information presented major challenges. Existing data sources were used, pulling together information gleaned from a wide range of sources. [22] Particular difficulties were faced with labour data. In this topic and others where data sources were limited or gave conflicting information, pragmatic judgments were made, and, for wage rates for example, the effects of alternative assumptions were investigated as regards the balance between hiring in and out of labour in different household types.

[22] For further information see Dorward (2003).

Table 4. Characteristics of Different Farm/Household Types

		Larger Farmers	Medium Farmers w/ assets	Borrowers	Poor male headed	Poor female headed	Employed	Remittace
Household Members	(Semi) Skilled males	0.7	1	0	0	0	1	0
	Unskilled males	0	0.3	1.4	1.4	0.5	0.4	1.0
	Unskilled female	0.7	1.1	1.4	1.3	1.4	1.3	1.3
	Children	0.1	0.8	1.6	1.2	1.3	1.3	1.3
	Infants	0.1	0.8	1.1	1.0	0.7	1.0	0.8
	Elderly	0.1	0.1	0.1	0.1	0.1	0.0	0.2
Land area (ha)		1.5	1.3	1.3	0.6	0.4	0.8	1.2
Opening cash stock (MK)		2000	2800	1800	800	600	2500	2300
Opening maize stock (kg)		654	673	364	0	0	160	287
Non staple daily expenditure MK/ cap		4.0	3.5	2.5	1.6	1.5	5.0	5.0
Monthly Remittance income MK		0	0	0	0	0	0	600
Tobacco Credit access		no	no	yes	no	no	no	no

4.3. Base Results

Crop Patterns and Production

Table 5 presents basic estimates produced by the model for the base scenario for the 1997/1998 seasons. The lower part of Table 5 compares model estimates of national crop areas and production with the widely quoted Ministry of Agriculture and Irrigation 'crop estimates' data for the same season (MAI 2000). Methodological difficulties with these data are widely recognized, particularly as regards (over) estimates of cassava and sweet potato areas and production.[23] There are also difficulties in estimating total cultivated area, due to intercropping. Making allowance for this, the estimates of the Ministry of Agriculture for total cropped smallholder area are probably in the region of 1.75 million ha. The model predicts total smallholder cultivated area of just over 1.6 million ha.

Model predictions of total maize area are 7% above the Ministry of Agriculture estimate. The model and Ministry of Agriculture estimate almost identical land under traditional or local varieties of maize, but model estimates of hybrid maize areas are

[23] Failure to anticipate the severity of the 2001/2 season food shortages in Malawi is attributed in part to the Ministry of Agriculture crop estimates overestimating cassava and sweet potato production (Devereux 2002), although the large increases in estimated root crop production during the 1990s have been implausible and criticized for some time.

higher.[24] The model's smallholder maize production of just under 1.7 million tonnes is 10% above the Ministry of Agriculture estimates (1.5 million tones): average yields of both local and hybrid maize in the model are about 20% below crop estimate yields, but the model's larger area under hybrid maize more than offsets this. Model estimates of tobacco area are substantially (30%) above the Ministry of Agriculture estimates.

The model performs less well on other crops. Most of these discrepancies have fairly simple explanations: there is no allowance in the household typology for irrigated land; cassava and sweet potato areas estimated by Ministry of Agriculture are likely to be inflated; cotton is of declining interest to farmers; and groundnuts, cassava and beans intercrops can enter model results if minor changes are made. Here minor variations in maize prices and wages lead to different crops entering model solutions. The limited range of crops in the model results presented in Table 5 (and hence some over- and under-estimates of crop areas) can be explained by the limited range of farm/household types and circumstances modelled. Nevertheless, the model's low production estimates for cotton, cassava, and rice is a particular problem for the Lakeshore/ Shire Valley zone where rice, cotton and cassava are most important. This suggests that household typology in this zone does not capture the opportunities and constraints facing households in its more diverse farming systems. Livelihood modelling in the Plateau zone does appear to be more robust, and, with around 60% of Malawi's rural households, descriptive of the dominant rural economy in Malawi. In the remainder of the paper, we thus consider only model results for the Plateau zone.

Turning to cropping patterns for different household types, the broad pattern of variation is very close to patterns generally observed in Malawi. The two categories of very poor households have very small cultivated areas and are constrained from increasing by limitations on access to land access and/or to seasonal labour, which arise from severe seasonal capital constraints and their consequent need to hire out labour during the cropping season to provide for immediate consumption requirements. Their land is almost entirely devoted to local maize, with a small amount of cassava (with relatively small changes in maize prices and wage rates these households move in and out of cassava, sweet potatoes and intercropped beans). The next poorest group ('borrowers') have higher stocks of maize and cash at the start of the season and can access credit with which to buy tobacco inputs.[25] However, these households are still heavily constrained by shortages of seasonal capital, hiring out labour to finance some of their consumption. 'Medium farmers with assets' start the season with substantially larger amounts of cash and maize and invest this in maize and tobacco. They hire out semi-skilled labour during the cropping period, and hire in *ganyu* to replace this, but have surplus labour to hire out during subsequent periods. The 'large farm' category, with larger pre-seasonal stocks of cash and maize and higher land: labour ratios, hire out their

[24] In the model the term 'local maize' describes the use of seed saved from the previous season, and grown without the use of fertilizers, whereas 'hybrid maize' uses purchased seed and fertilizer.

[25] Credit for inputs for cotton production is not taken up in the Lakeshore zone

Table 5. Base Scenario Model Results, 1997/98: Cropping Patterns

										Sales	Purchases	
	AllMaz	LocMaz	HybMaz	Tob'co	Rice	Beans	Cass'va	S.Pot	Total	Maize kg	Maize kg	Inputs MK
Plateau:												
1 Large farms	1.42	0.66	0.76	0.08	0.00	0.00	0.00	0.00	1.50	1633	105	2284
2 Medium assets	1.03	0.45	0.59	0.27	0.00	0.00	0.00	0.00	1.30	888	221	2625
3 Borrowers	1.03	0.74	0.29	0.27	0.00	0.00	0.00	0.00	1.30	543	358	754
4 Poor male head	0.54	0.54	0.00	0.00	0.00	0.00	0.03	0.00	0.57	36	660	2
5 Poor female head	0.36	0.36	0.00	0.00	0.00	0.00	0.03	0.00	0.39	17	501	2
6 Employed	0.80	0.22	0.58	0.00	0.00	0.00	0.00	0.00	0.80	834	496	1478
7 Remittance	1.15	0.58	0.57	0.05	0.00	0.00	0.00	0.00	1.20	1043	318	1666
Lakeshore / Shire												
8 Large farms	0.82	0.65	0.17	0.00	0.40	0.00	0.28	0.00	1.50	483	115	1256
9 Medium assets	1.07	0.27	0.79	0.00	0.13	0.00	0.00	0.00	1.20	1126	221	2303
10 Borrowers	0.73	0.73	0.00	0.00	0.17	0.00	0.20	0.00	1.10	257	509	354
11 Poor male head	0.51	0.51	0.00	0.00	0.00	0.00	0.04	0.00	0.55	21	656	3
12 Poor female head	0.33	0.33	0.00	0.00	0.00	0.00	0.04	0.00	0.37	0	493	3
13 Employed	0.70	0.33	0.37	0.00	0.00	0.00	0.00	0.00	0.70	725	585	955
14 Remittance	0.67	0.06	0.62	0.00	0.03	0.00	0.00	0.00	0.70	760	206	1744
Highlands												
15. Large farms	1.27	0.43	0.84	0.33	0.00	0.00	0.00	0.00	1.60	1311	213	3518
16 Borrower	1.68	0.93	0.76	0.42	0.00	0.00	0.00	0.00	2.10	1514	286	3687
17 Poorer borrowers	0.63	0.63	0.00	0.18	0.00	0.00	0.20	0.00	1.01	284	699	23
18 Poor male head	0.44	0.44	0.00	0.00	0.00	0.00	0.06	0.00	0.50	10	630	5
19 Poor female head	0.34	0.34	0.00	0.00	0.00	0.00	0.04	0.00	0.39	0	522	3
20 Employed	1.00	0.59	0.41	0.00	0.00	0.00	0.00	0.00	1.00	926	590	1060
21 Remittance	0.80	0.58	0.22	0.00	0.00	0.00	0.30	0.00	1.10	689	620	588
Average ha/hh												
Plateau	0.73	0.47	0.26	0.08	0.00	0.00	0.01	0.00	0.83	437	467	895
Lakeshore / Shire	0.59	0.43	0.16	0.00	0.05	0.00	0.06	0.00	0.70	283	501	527
Highlands	0.71	0.46	0.25	0.10	0.00	0.00	0.05	0.00	0.86	458	502	1012
Total	0.69	0.46	0.23	0.06	0.02	0.00	0.03	0.00	0.79	393	481	796
Total Area ('000 ha)												
Plateau	886.5	571.9	314.8	95.5	0.0	0.0	18.0	0.0	1,000			
Lakeshore / Shire	356.7	260.8	95.9	0.0	32.8	0.0	37.4	0.0	427			
Highlands	144.4	93.8	50.6	19.7	0.0	0.0	10.6	0.0	175			
Total	1,387.5	926.4	461.3	115.1	32.8	0.0	66.1	0.0	1,602			
Crop Estimates *	1,292.7	937.7	354.9	90.0	41.8	310.0	151.9	135.3				
Difference (%)	7.3	-1.2	30.0	28.0	-21.5	-100.0	-56.5	-100.0				
Yield (kg/ha)	1,206	876	1,868	900	959	N/A	1,356	N/A				
Totals ('000 tons)												
Production	1,673.2	811.6	861.5	103.6	31.5	0.0	89.6	0.0				
Sales	793.6	350.3	443.3	103.6	31.5	0.0	89.6	0.0				
Purchases	970.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Fertiliser	0.0	0.0	53.8	28.4	3.3	0.0	0.0	0.0	85.5			

** Crop estimates data for the same season (MAI 2000) also include other crops such as cotton (see text).*

semi-skilled labour throughout the year, hiring *ganyu* in all periods, but particularly during peak farm labour demand in the cropping season. The two other household categories have substantial non-farm income sources, from wage employment and from remittances. Both grow local and hybrid maize, investing their non-farm income in hybrid maize inputs. Neither household hires in *ganyu* labour, and indeed both hire out unskilled labour throughout the year.

As regards land use, the households in the two poorest categories have small mean cultivated holdings of less than 0.6 and 0.4 ha respectively, and these households make up 52% of the households in the Plateau zone. Allowing for variation around mean holding size for each group, about 33% of households would be cultivating less than 0.5 ha. This is comparable with findings from the last comprehensive agricultural survey (National Sample Survey of Agriculture, 1992/93) where 36% of households nationally had cropped areas of less than 0.5 ha (NSO 1998). Variations between household types as regards cropping patterns show a strong concentration on local maize, with a little cassava, for the poorest households, with less constrained households also producing hybrid maize and tobacco (or rice) and households with remittances and employment concentrating more on hybrid maize than tobacco. There is some weak evidence to support this broad pattern from the limited information available from the cluster analysis of the IHS data (Dorward 2002).

Labour Use

The model makes no attempt to model labour demand for non-agricultural labour, and a substantial surplus of labour supply over demand is expected (Table 6). The small number of household types demanding '*ganyu*' labour for agriculture, and the very large number supplying unskilled labour throughout the year does not seem to be compatible with the widely recognized importance of *ganyu* (unskilled casual agricultural labour) in the rural economy but this is a problem that has faced most previous attempts to develop smallholder models in Malawi (Simler 1994a**;** Dorward 1984; Dorward 1997; Alwang and Siegel 1999) and it highlights difficulties in modelling labour markets where social relations are extremely important and wage rates do not fall to clear markets, despite substantial over supply of labour. This problem cannot be solved by simply assuming that the model is using too high a wage rate: as discussed later, over some wage ranges lowering wage rates increases labour supply more than it increases demand. The model's limited demand for hired labour by less poor households is also likely to be due in part to it use of only four different time periods.[26]

It is also widely recognized that rural households engage in a substantial amount of unskilled non-farm labour. These activities vary between seasons and include petty trading (Orr and Orr 2002) and natural resource harvesting activities (for example gathering wild foods, firewood and thatching grass) for both household use and sale, as

[26] The model makes no distinction between labor use at different times within the October to January cropping period, but farmers often face tight labor shortages in specific weeks in November and December. This increases demand for hired labor at these times, but also releases labor in October and January.

well as paid employment (on commercial farms, in rural businesses, and in government agencies and NGOs). The high ratio of labour supply to smallholder agricultural demand is therefore not unrealistic.

Household Farm and Non Farm Incomes and the Structure of the Rural Economy

There is a strong relationship between incomes per capita estimated from the model and incomes estimated from the IHS clusters (Table 6). Lower estimated incomes from the model may be due to the model's failure to properly capture off-farm income opportunities (particularly for 'large farms'), minor remittances and consumption of home produced minor crops and animal products.

The high proportions of non-own-farm[27] income in Table 6 can be examined in the context of the wider rural economy by multiplying model income estimates for different farm household types by the estimated number of households of each type to obtain aggregate estimates of overall income flows, within what we term the informal rural economy or IRE. Aggregate estimates of the informal rural economy's total 'imports' (input purchases, maize purchases, and purchases of other tradable goods and services as discussed above) and of its crop sales and remittance 'exports' then allow 'balance of trade' calculations to estimate inflows from labour paid by external sources and from transfers into rural areas. These figures are presented in Figure 12 for the Plateau Zone.[28]

The estimates of non-own-farm income accounting for 68% of total income are higher than the commonly cited figure of 50% for rural areas in Africa (Reardon 1998; Ellis 1998, Jayne *et al*., 2001) though more in line with figures of 55% to 80% in different southern Africa case studies cited by Bryceson (1999). This is associated with the large labour surpluses commented on earlier. Over-estimates of the agricultural labour surplus in the model could arise from the model underestimating labour demand from larger, better off smallholder farmers, or from overestimates of labour supply from and income to poorer households. The latter is unlikely, in terms of income at any rate, as this would further reduce already very low estimated household incomes and the estimated proportion of income from non-farm sources is therefore unlikely to fall below 50%.

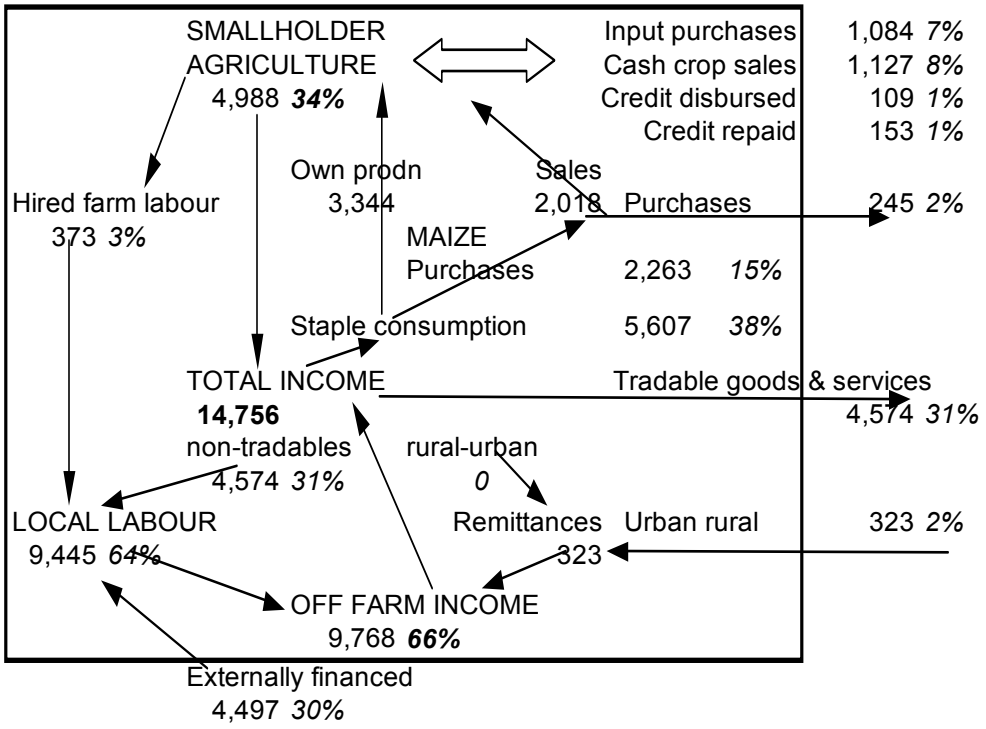
[27] We distinguish in this paper between non-farm (i.e. non agricultural) income and activities, off-farm income and activities (which may be agricultural on other people's farms or non-agricultural away from the homestead), and non-own farm income and activities (which may be agricultural on other people's farms or non-agricultural at or away from the homestead).

[28] We focus discussion on the Plateau zone since the cropping patterns in the Lakeshore /Shire Valley and Highland zones suggest that the household typology in these areas does not capture the opportunities and constraints facing households in these areas. Livelihood modeling in the Plateau zone does appear to be more robust, and, with 60% of Malawi's rural households, describes the dominant rural economy in Malawi. The informal rural economy is defined as smallholder farming activities and household incomes for the range of household types included in our typology and models. Non-farm rural activities are included in as far as they demand household labor or goods or services produced by such labor.

Table 6. Base Scenario Model Results, 1997/98: Labour and income

	Unskilled labour, hours/hhold						Net Income MK/hhold					
	Buy		Sell									
	Nov Jan	Nov Jan	Feb Mar	Apr Jun	Jul Oct	Total	Non-Farm	Farm	Total	Non-Farm %	Total/ Cap	IHS Mean %
Plateau:												
1 Large farms	881	0	0	0	0	0	5,565	3,120	8,685	64%	5,109	77%
2 Medium assets	393	0	86	165	97	348	6,642	6,439	13,081	51%	3,191	74%
3 Borrowers	0	401	548	1,234	952	3,136	6,358	6,874	13,232	48%	2,363	62%
4 Poor male head	0	875	597	1,389	1,087	3,948	8,065	2,986	11,051	73%	2,210	76%
5 Poor female head	0	642	421	1,013	737	2,812	5,742	2,076	7,818	73%	1,955	72%
6 Employed	0	59	263	583	342	1,246	14,407	4,427	18,834	76%	3,767	93%
7 Remittance	0	150	399	887	608	2,043	11,296	5,917	17,214	66%	3,742	82%
Unskilled Labour Surplus, Supply - Demand, hrs/hh month							***Average Incomes***					
Plateau		118	196	296	164	191	8,063	4,117	12,180	66%	2,667	75%
Unskilled Labour Surplus , Supply - Demand, million hours												
Plateau		431	474	1,076	795	2,775						

Figure 12. The Informal Rural Economy, Plateau Zone (income flows in million MK)



Following through the income flows in Figure 12 there are two possible sources for this labour demand: transfers and payments for labour for tradable goods and services not included in the farm model (this could include livestock products, for example), and local purchases of locally produced, non-tradable goods and services (including exploitation of natural resources for own consumption or cash income). The latter is limited by available rural income and the proportion of that income spent on tradables. If 50% of non-staple expenditure is on non-tradables (estimated from Simler 1994b) then we can calculate expenditure on non-farm goods and services supplied by local labour: local non-own-farm labour accounts for a little over 50% of the total labour market in value terms[29] while labour 'exports' and transfers (remuneration for semi-skilled and skilled labour working, for example, as government, NGO or private sector employees in education, in services, in estate agriculture, or in food for work, or selling charcoal or firewood to urban people) account for between 40 and 50% of labour earnings and for around 30% of total income. Hired smallholder farm labour demand accounts for only 4 to 5% of the total labour market value.[30]

The high proportion of income derived from non-farm sources does not, however, provide a true picture of the importance of the agricultural sector, for two reasons. First, the model does not include income from livestock production or small-scale vegetable production. More fundamentally, much non-farm income is itself dependent on labour demanded in the supply of services to households who have derived a significant part of their income from agriculture. This becomes clear if we make a distinction between what we shall term 'driver' and 'supporter' income sources (and the demand they generate) (see Poulton and Dorward 2003). 'Driver' income is generated by production of tradables (agricultural products and externally financed employment for example), remittances and production of high average budget share non-tradables without the operation of multipliers and linkages (see Dorward *et al.* 2001**,** for a discussion of multipliers, linkages and budget shares in the growth of rural economies). 'Supporter' income arises from providing local, non-tradable goods and services to satisfy demand arising from driver and supporter income (through multipliers and linkages).

Figure 12 shows that 'driver' income (net farm income, labour exports and remittance income) accounts for just under 70% of total net income, and farm income accounts for 50% or more of this driver income. The remaining driver income is derived from remittances and from labour 'exports', made up of formal and informal employment and transfers. Principal external sources of employment will be commercial agriculture and rural non-farm enterprises producing tradables (firewood, charcoal, crafts, etc), and government and NGO activities, the latter paying employees and also proving transfer payments to the wider rural population (through food for work, etc). Important though remittances and government and NGO expenditure may be in providing welfare services

[29] Noted that these proportions are in values, and the proportion of hired days used for farm labor would be considerably higher, due to its low wage relative to skilled and semi-skilled labor.

[30] This rises to 22% of unskilled labor in the cropping period (13% of total skilled, semi-skilled and unskilled labor income), and represents 16% of total hired labor time in the cropping period.

and support to rural people, increases in these cannot be expected to drive growth. It is then an empirical question as to what proportion of the 'labour exports' is made up of such expenditure, and what proportion comprises 'tradable' employment in agricultural and non-agricultural enterprises. If, for the purposes of argument, the proportion is 50%, then smallholder farm income would account for around 70% of the driver income. These figures demonstrate that even if farm income is a small proportion of rural incomes (around 35% estimated here), smallholder farming may still be the dominant potential driver of pro-poor growth. Box 1 pulls together different insights from this analysis as regards roles of farm and non-farm activities in pro-poor growth.

Box 1. Farm and Non-Farm Activities in Pro-Poor Rural Growth

The analysis of individual livelihood structures of poor households and of their position within the Informal Rural Economy demonstrates complex, interrelated and changing roles of agriculture and own-farm and non-own-farm activities in poor people's livelihoods, roles which go beyond polarized debates about the importance of the agricultural and non-agricultural sectors.

Three observations might suggest that pro-poor policy should promote the development of the non-farm sector rather than the farm sector: first, with such a small proportion of their income coming from own-farm production, very substantial increases in own-farm productivity would be needed for any significant impact on overall net incomes to occur for the poorest households; second, the greatest potential for growth may be expected where poor households already earn most of their incomes, that is off their own farms; third, non-farm incomes play a critical role in financing farm employment and investment among the less poor, and therefore investment in the non-farm sector would benefit farm activities.

Counter-arguments may also be put forward from the examination of the same livelihoods: first, both access to ganyu employment and wages in such employment depends in part upon on-farm labour demand (among less poor farmers); second, non-farm growth opportunities depend largely on agriculture driving the local economy; third, maize prices and production affect real incomes of the poor (and in the absence of reliable integration with wider markets, local production may have a critical role on maize prices and access); fourth, own-farm labour tends to have higher average and marginal returns to labour than off-farm employment; fifth, the demand for own-farm labour has a major impact on local labour markets (if own-farm labour use were to contract, it would result in the release of a large labour force into the local market, depressing wages and returns to labour in all activities); and, sixth, reduction in own farm food production by the poor would have a major impact on, and present major challenges to, local food markets.

Own-farm smallholder production and its continued development is, therefore, critically important to the poor, so is also the non-farm sector. Both must develop together so that if all goes well the non-farm sector can, with time and improved markets, increasingly take over from smallholder agriculture its current dominant influence on real wages and food security.

4.4. Modelling Household Responses to Change

We now turn to examine the responses of the different household types in the Plateau zone, when subjected to different types of change to highlight the diversity across the various household types and validate the respective differentiated behaviour of the model. We consider here direct 'first order' impacts of changes on households, ignoring for the moment 'second order' effects that result from the way that these household responses themselves affect markets and prices.

Direct Livelihood Impacts of Maize Price Variation

A critical dilemma in agricultural policy for poor rural areas concerns prices for locally produced staples: poor, net consumers (the majority of the Malawian population in rural as well as urban areas) benefit from low maize prices. Surplus producers, however, benefit from higher prices, and surplus production for net maize consumers depends upon the incentives to and ability of less poor farmers to produce surplus maize. A debate is currently active in Malawi as to the extent to which smallholder maize production does respond to price incentives: although better-off farmers may respond to higher maize prices by producing more maize, higher maize prices prior to harvest lead to higher maize expenditures by poorer farmers and, due to credit constraints, reduce the resources available for maize production. Furthermore, it is argued that cultural factors and risk aversion make most Malawian households grow as much of their own household maize requirements as possible irrespective of market prices, while the number of households producing maize to sell is very small. Therefore, higher prices are largely irrelevant to national maize production. On the other hand, some smallholders in Malawi are currently experiencing substantial surplus maize production.

Figure 13 shows a range of model results with varying maize price for different households.[31] Proportionate maize price changes were applied across all time periods in the model. The first two graphs show for most households a clear positive production response over a limited range of price changes around the prices in the base scenario. This results in increases in production and (not shown in the graphs) a switch from a mean annual deficit of around 200kg per person to a surplus of a little over 40kg per person per year. This production increase occurs mainly over a fairly narrow price range and results largely from a switch into production of more intensive maize production using hybrid varieties and inorganic fertilizers. However, these two graphs also show two different patterns of price response among different households. The pattern that results in the increased maize production is found in less poor households with greater access to seasonal capital. The poor male and female-headed households show a very different price response. In the lower price range, their response is initially fairly flat, followed by a modest response. However, as prices rise further, the price response

[31] Throughout Chapter 4 responses to change are shown using graphs with proportionate changes in the independent variable along the horizontal axis, and household impacts or estimated responses to change, on the vertical axis, indexed to the 'base' scenario. The use of indices can be misleading where a variable is very small in the base scenario. Relatively small absolute changes may thus lead to large index changes.

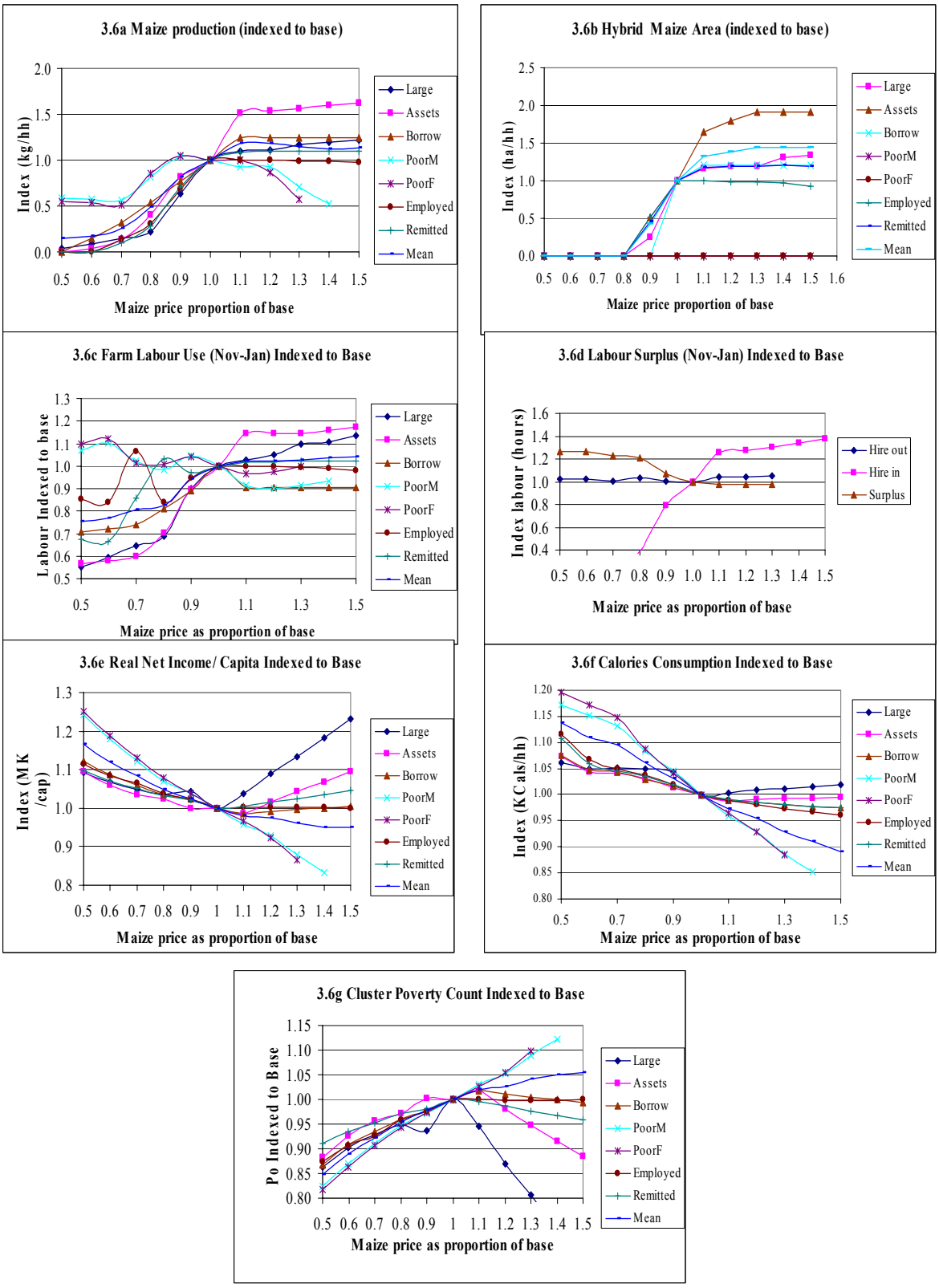
becomes negative. This discrepancy results from higher costs of maize consumption purchases prior to harvest, requiring them to switch labour from their own farms to off-own farm ganyu labour which offers a more immediate but lower return. As prices rise further, they are unable to finance maize purchases, and are initially forced to restrict their maize consumption, before the model becomes infeasible, as they cannot afford to buy sufficient maize (hence the lack of observations plotted for these households at the highest prices). For these households, the model is thus describing a vicious circle often reported in Malawi (e.g. [UNICEF, 1993 #48]; [Dorward, 1996 #20]; [Pearce, 1996 #22]), although we are aware of only one instance where it has been formally observed and documented ([Pearce, 1996 #22]). Pearce's observation was in the Central Region. Dorward's earlier work was in the Northern Region. In both cases, land pressure is lower and holding sizes generally larger than in the more crowded parts of the Southern Region, where poverty incidence and severity are highest. In these areas, the lower holding sizes of poorer households may suggest on-farm labour demand is lower, the vicious circle described hence not being so important.[32]

The second pair of graphs shows the simulated impacts of maize price changes on farm labour use (including own-farm family labour and hired in labour) during the cropping period. Consistent with the maize production response pattern, we see less poor households showing broad increases in farm labour use (with some variations--a little exaggerated by the use of indices--due to movements in and out of tobacco and groundnuts, which are particularly labour-demanding crops). The two poorest household types, however, show declining own-farm labour use with increasing maize prices. At very low maize prices, households grow small areas of groundnuts (a labour-demanding crop) and cassava. With increasing maize prices, they switch land first to maize, then to less labour and input-demanding lower plant density intercropped maize, and, finally, to very small areas of fallow, before minimum consumption levels become untenable and the model becomes infeasible. Overall, increasing maize prices lead to increased farm labour demand by some households (with increased hired labour demand or decreased hired labour supply), and increased labour supply by others. The overall mean impact is a fairly rapid increase in farm labour demand with price increases in the lower range, and then this flattens off with further price increases. The impact of this on the hired labour (ganyu) market is shown in the fourth graph.

Although this result needs to be interpreted with caution (as the larger proportionate increases in hired labour demand build on a very low base), higher maize prices lead to a tightening of the labour market over a limited range of prices. If this tightening raises wages, it will benefit poorer households who hire out labour, and dampen the impacts of higher maize prices on all households.

[32] This was investigated by repeating the analysis with households having holdings with only 50% of the area of those in the base scenario. As might be expected, the result is a very similar set of graphs to the first two in Figure 13, except that the response curves for the two poorest household types are shifted to the right, indicating that there is still a negative production response to high prices, although occurring at higher prices. The overall mean price response across all households has a very similar shape.

Figure 13. Household Responses to Varying Maize Prices



The first-order impacts of maize price increases on household welfare are shown in the graphs in the lower part of Figure 13. All households suffer falls in real net income with lower maize prices, where all are maize deficit-households. As prices increase further and maize production becomes more attractive, some households achieve maize self-sufficiency and surplus production, while further price rises begin to benefit these households. This situation does not, of course, arise for the poorest households, who show a steep decline in real income for all maize price increases (it should be noted that this interpretation ignores any second-order effects of maize price rises on wages, and their impact on household activities and incomes).

The impacts of maize prices on real incomes are reflected in estimated poverty count impacts, estimated from the cluster analysis on IHS data, with all households in each cluster having their real per capita daily expenditure changed by the proportionate increase in income estimated by the model. All households suffer rising poverty incidence with price rises in the lower range, although some households recover from this rise, or are not affected by further price rises; since at higher prices they produce enough to be self sufficient with, in some cases, surplus sales. The poorest households, however, are the most affected, with the steepest increases in poverty incidence across the range.

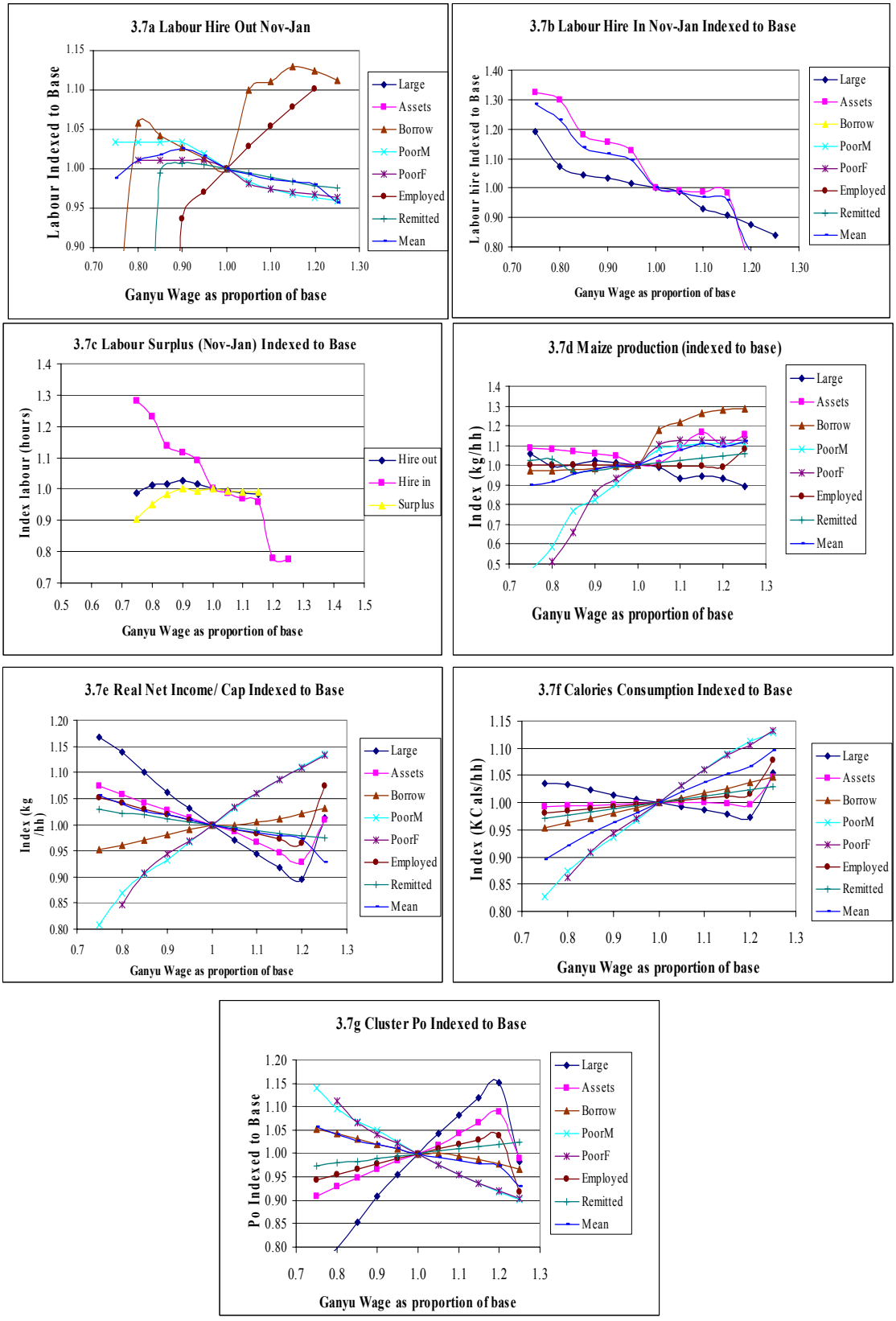
Direct Livelihood Impacts of Variation in Unskilled Wage Rates

Figure 14 shows a range of model results with varying unskilled wage rates in the cropping period of November to January, again without allowing for any second-order effects within the rural economy. The first graph in Figure 14 shows the labour supply response for different households during the cropping period. Of the five household types that hire out unskilled labour, one (households with permanent employment) shows a substantial positive response; one (the 'borrowers') shows a negative response over the lower range and then a positive response as wages increase further; two (the two poorest household types) have a significant negative response; and one has a very slight negative response. The negative responses in the two poorest households and, at lower prices, for the 'borrower' households are associated with cash flow problems. For the 'borrower' households, it affects the funds available to invest in crop inputs. Increases in the lower wage rates provide cash in the cropping period that can be used to purchase more maize inputs, leading to higher on farm labour use. For the poor male-headed and poor female-headed households, increases in wage rates allow households to hire out less labour to finance purchase of the maize they need to consume prior to harvest, and thus to devote more time to own-farm activities, which are more remunerative over the entire season.

Overall, the weighted mean across all households shows a negative supply response for hired labour in the cropping period over most of the range of wage rates modelled.[33] On-farm demand for labour, on the other hand, declines with increasing

[33] As with the discussion of maize price responses mentioned earlier, the perverse effect depends upon the importance of the vicious circle of 'forced ganyu hire' for poor households in the cropping period. If wage rates are varied for households with much less (half) land, the perverse response is weakened, and the responses in Figure 8 are become almost horizontal for all households.

Figure 14. Household Responses to Varying Unskilled (ganyu) Wage Rates



price, and with approximate unit elasticity. The perverse or inelastic supply curve for *ganyu* labour suggests that shifts in demand will cause large relative shifts in wages with only small changes in total quantity of labour supplied. Since wages have far reaching impacts on the welfare of the poorest households, upward shifts in labour demand during the cropping period have the potential to be important drivers of poverty reduction. Conversely, contractions of labour demand in this critical period are likely to have significant detrimental impacts on the poor.

These patterns of supply and demand responses to wage changes are reflected in household cropping activities, since higher wages lead to higher maize production among the poorest and the 'borrower' households (the latter using higher wage income to buy more maize inputs). With higher wages, though, maize production remains fairly constant for other households who transfer labour from tobacco production to maize, and from less to more intensive maize production. These changes are reflected in the net income and poverty counts. Unskilled wage increases lead to a rise in real net incomes for the poorest households, falls in real net incomes for households hiring in unskilled labour, and more ambiguous effects for other households.[35]

Direct Livelihood Impacts of Variation in Marketing Costs

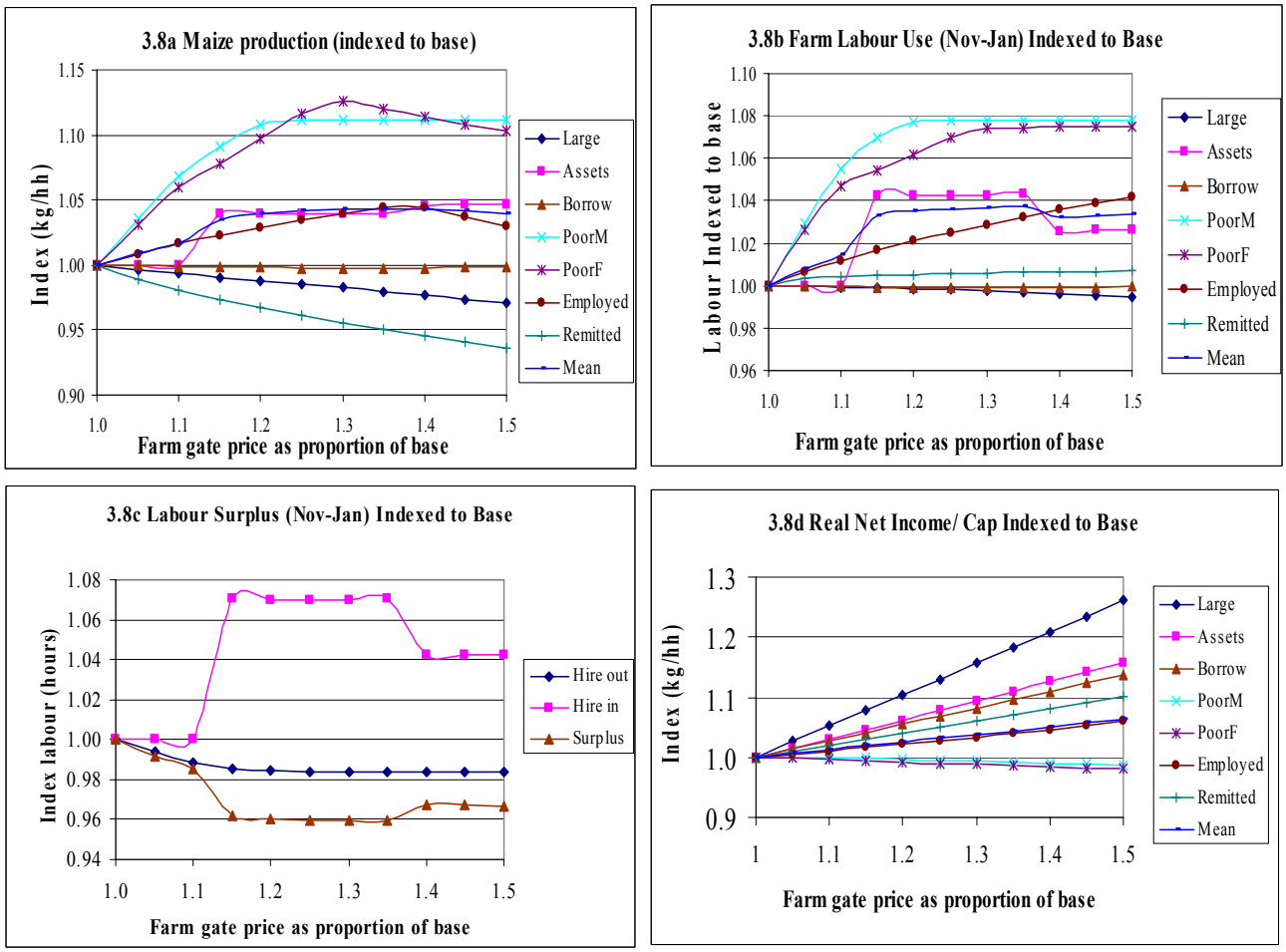
The base scenario of the model allows for price 'wedges' between farm gate and local market crop prices (for tobacco these are 55 % and for other crops 35 %**,** estimated from [van Donge, 2002 #49] and [Ngongola, 1997 #62]). These wedges depress selling prices of crops in the harvest and post-harvest periods (and in these periods also lower the prices at which these crops can be bought in rural areas). Better infrastructure and more competitive marketing systems could reduce these wedges, raising prices received by farmers. Figure 15 shows model results with falling wedges leading to increasing farm gate prices.

The different household types again respond in different ways to these changes. Most households respond with an increase in maize production (two households expand tobacco production at the expense of hybrid maize), own-farm labour use, hired farm labour demand; and with a slight reduction in hired labour supply. Most households benefit from increased real incomes and falling poverty incidence; although the two poorest households are an exception. As net maize purchasers, they are disadvantaged by

[35] The calculation of real net incomes allows for changes in prices for consumption of locally produced goods and services, estimated to account for about 50% of expenditure on non-staple consumption. This reduces some of the real benefits of wage increases for households dependent upon (and otherwise benefiting from) wages, while for households hiring in unskilled labour it exacerbates the increasing costs of labour hire.

higher local prices at which they purchase maize, and hence suffer a (modest) fall in real incomes with increased poverty incidence.

Figure 15. Household Responses to Varying Marketing Costs



Impacts of Sickness

The final type of 'exogenous' change for which we investigate livelihood impact is chronic sickness. Model estimates of labour available to the households make some allowance for the average effect of acute illnesses on household labour supply. On the other hand, chronic illnesses, increasingly common with the spread of HIV/AIDS, can be expected to have quite different impacts. To allow simple comparison of the impact of a common shock across different households, sickness was simulated by varying proportionate loss of (a) labour standardized in terms of the proportion of an unskilled female's seasonal labour supply, and (b) 400MK cash expenditure (on treatment, etc).

Figure 16 shows impacts of varying losses of labour and cash. Where sickness occurs in the November to January cropping period, the impacts are striking. All households are affected, but the two poorest household types, and particularly the poor female-headed household, are most seriously affected. The loss of labour and capital has a much greater proportionate impact. The result is a dramatic reduction in net income, and in maize production (with first a shift from maize to cassava, and then a reduction in cropped area).[36] For other households there are substantial losses in welfare (especially since the simulations describe the effects of only up to 50 % loss of a person's unskilled labour and 200MK expenditure) and changes in cropping patterns, with shifts out of tobacco and in and out of hybrid and local maize and cassava. The impact of similar labour and cash losses are much less serious in the post-July to October period (see Figure 16). Considerations of the impact of greater proportionate losses than those modelled, of skilled worker's incomes and of remittances, and impacts of all these on labour markets, all suggest that the impact of HIV/AIDS infection on affected households will be even more severe than indicated by these results.

4.5. Aggregation of Farm/Household Models: the Informal Rural Economy

As discussed thus far, the model constructions and results have focused on the independent behaviour of individual households, apart from the aggregation of crop production, labour use and income for the base 1997/98 scenario, to provide some testing of model validity and insights into the structure of the rural economy. However, to analyse households' responses to change, we need to capture second-order impacts of local people's buying and selling behaviour on local markets (Dorward *et al.* 2003a). We now develop a model providing such opportunity in the 'informal rural economy' in the Plateau zone of Malawi. We use this model to investigate impacts of policy changes on rural people.

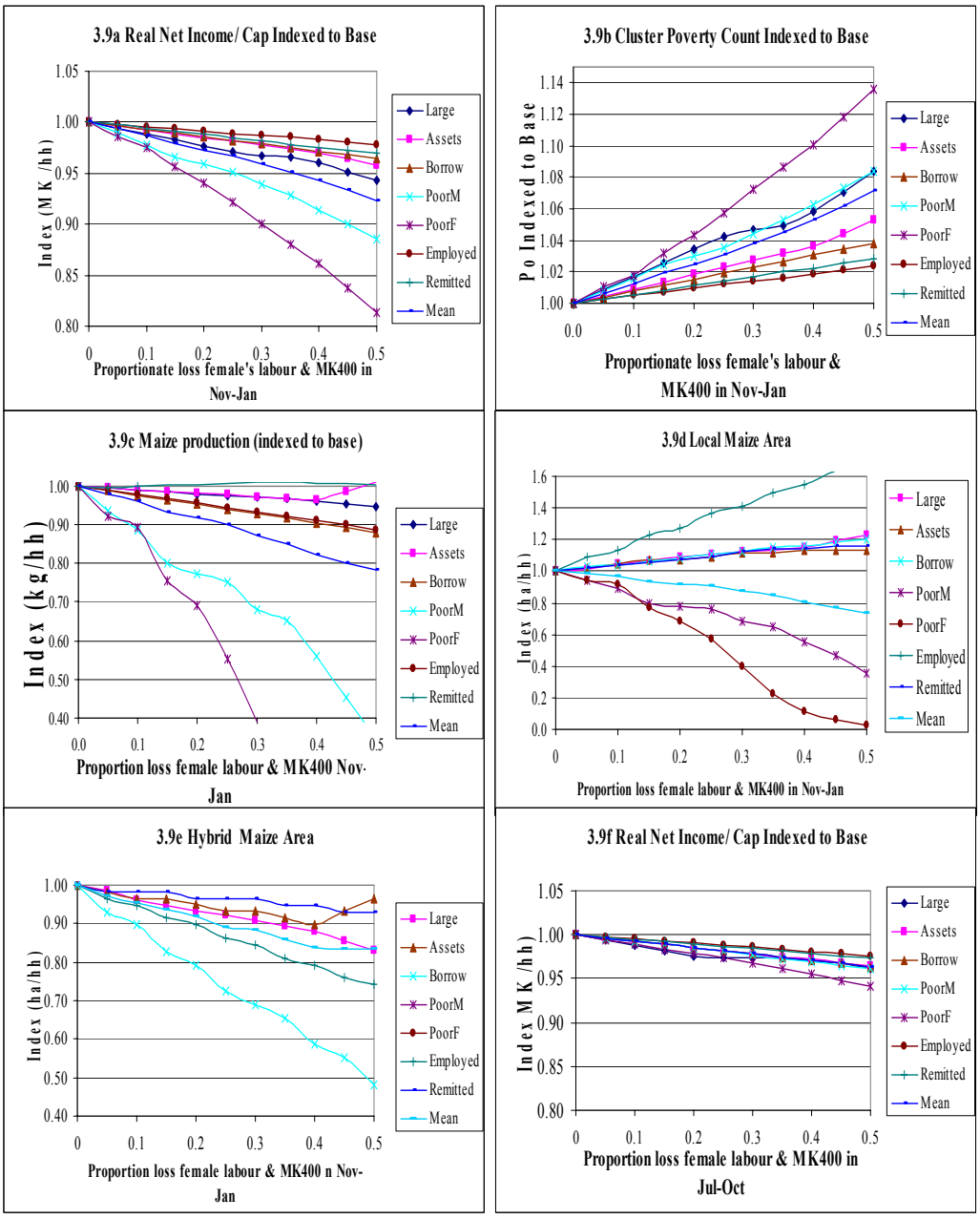
4.6. The Informal Rural Economy Model: Methods

Aggregate farm household results were used earlier to describe the broad structure of the informal rural economy, in terms of the main income flows and exchanges within the informal economy (i.e. between households) and between the informal economy and the rest of the world (see Figure 12). This static model of the rural economy as an aggregation of independently determined livelihood activities was developed into a partial equilibrium model of responses to different shocks by an iterative process involving (1) imposition of an exogenous shock on the different households, (2) aggregation of income flows(as in Figure 12), then (3) modification of wage rates and maize prices to make the IRE's labour exports and maize imports (or exports) consistent with specified external elasticities of demand and supply for labour and maize. Unit elasticity of demand for labour services and a fairly elastic maize supply were assumed. This basic model was extended to allow for the expectation that improvements in household income would lead to households being able to save and carry over more cash

[36] Sickness often comes after critical cropping decisions have been made.

to the beginning of each season. For each scenario, a number of iterations were run to find an equilibrium position allowing 50 % of extra end of season real income (above base scenario income) to be added to the opening cash stock.

Figure 16. Household Responses to Effects of Chronic Sickness



Modelling the Informal Rural Economy: Results and Discussion

The IRE model was then used to investigate impacts of different policy scenarios selected to shed light on the main interventions currently being considered in Malawi, followed in the past in Malawi, or used successfully in other parts of the world: different levels of input subsidies, universal and targeted free input distribution, marketing cost reduction, cash transfers, credit subsidies, and maize prize stabilization at different price levels. The main scenarios are described in Table 7 and the results are summarized in Table 8.

Table 7. Scenarios simulations with the informal rural economy model

Scenario Name	Description
InpSub10	Universal 10% subsidy on smallholder farm inputs (principally fertilizers)
InpSub20	Universal 20%subsidy on smallholder farm inputs (principally fertilizers)
TIP100	Universal distribution of free fertilizer and seed pack for 0.1ha of hybrid maize, worth 204MK per household
TIP52	Targeted distribution of free fertilizer and seed pack for 0.1ha of hybrid maize to poor male and female headed household types, 52 % of households, worth 204MK per recipient household
Wedge50	50% reduction in crop marketing costs
WedgeCred	50% reduction in crop marketing costs plus universal access to cash on credit at 10% interest over 6 months
MazP100	Maize price stabilisation with guaranteed end of season maize prices at base price
MazP90	Maize price consumer subsidy and stabilization with guaranteed end of season maize prices at 90% of base price
MazP110	Maize price consumer support and stabilization with guaranteed end of season maize prices at 110% of base price
Cash100	Universal distribution of start of season cash transfer of equal value to seed and fertilizer pack under TIP100, i.e. worth 204MK per household
Cash52	Targeted distribution of start of season cash transfer of equal value to seed and fertilizer pack under TIP52, to poor male and female headed household types, 52% of households, i.e. worth 204MK per recipient household
Cash52P110	Maize price support and stabilization plus targeted cash transfers as above
TIP100Seas	Universal distribution of seed and fertiliser packs as above, allowing for seasonal wage and maize price formation and responses over two years
Yield80Seas	Effects of unanticipated 20% yield loss for all crops, allowing for seasonal wage and maize price formation and responses over two years

Table 8. Results of IRE Scenario Simulations (Difference from Base results)

	Base	WedgeCred	Wedge	TIP100	InpSub20	Cash52P110	InpSub10	TIP52	Cash100	Cash52	MazP90	MazP110	MazP100
Nominal wage rate (% of base)	base	+50.00%	+35.00%	+5.00%	+10.50%	+6.00%	+6.00%	+1.50%	+1.00%	+0.50%	+3.80%	+2.00%	-3.50%
Maize price (% of base)	base	-1.50%	+1.00%	-0.50%	-0.50%	+10.00%	-0.25%	0	0	0	-10.00%	+10.00%	0
Real wage rate (% of base)	base	+28.15%	+19.95%	+3.35%	+6.74%	+0.86%	+3.90%	+0.97%	+0.65%	+0.32%	+5.56%	-1.64%	-2.30%
Poverty head count (cluster estimate)	*64.1%*	*-16.9%*	*-19.6%*	*-4.1%*	*-4.7%*	*-6.1%*	*-2.6%*	*-1.9%*	*-2.0%*	*-1.3%*	*-1.3%*	*-2.0%*	*+0.2%*
Target group real income (mill MK)	*6,217*	*+34.3%*	*+29.7%*	*+9.0%*	*+7.9%*	*+6.9%*	*+5.0%*	*+5.0%*	*+3.6%*	*+3.3%*	*+1.3%*	*-1.1%*	*-3.4%*
All hhlds real income (mill MK)	*14,756*	*+17.5%*	*+20.9%*	*+4.4%*	*+4.9%*	*+6.8%*	*+2.7%*	*+2.0%*	*+2.2%*	*+1.3%*	*+1.4%*	*+2.5%*	*+0.0%*
Maize consumption '000 tons	*1,124*	*+19.6%*	*+15.2%*	*+4.9%*	*+5.7%*	*+0.9%*	*+3.3%*	*+2.2%*	*+2.0%*	*+1.5%*	*+5.6%*	*-3.0%*	*-1.5%*
% Farm Income	34%	+33.4%	+29.5%	+6.9%	+7.0%	+18.6%	+3.6%	+3.4%	+4.9%	+2.8%	-4.0%	+10.9%	+2.0%
Maize area ('000 ha)	887	-32.0%	-26.3%	+4.2%	+2.5%	+1.2%	+3.5%	+0.2%	+4.6%	+3.9%	-33.9%	-4.4%	-12.1%
Average maize yield (kg/ha)	1,227	+90.3%	+17.1%	+6.7%	+10.6%	+1.0%	+5.1%	+5.8%	+1.4%	-1.1%	-28.7%	-1.3%	-28.7%
Maize production '000 tons	1,088	+29.4%	-13.7%	+11.2%	+13.4%	+2.2%	+8.8%	+5.9%	+6.0%	+2.8%	-52.9%	-5.6%	-37.3%
Maize labour use /ha (hours)	1397	+50.82%	+10.45%	+3.79%	+6.44%	+1.50%	+3.15%	+3.15%	+0.79%	-0.72%	-16.46%	-0.07%	-16.18%
Real value maize input use MK/ha	952	+827.42%	+54.52%	+15.16%	+16.74%	+3.57%	+9.67%	+14.30%	+4.83%	-3.47%	-88.45%	-3.78%	-88.45%
Cash crop sales (mill MK)	1,127	+303.4%	+289.9%	-7.3%	+8.2%	+20.3%	-0.4%	-3.1%	-10.0%	-4.0%	+158.6%	+17.8%	+78.7%
Tobacco area ('000 ha)	95	+113.7%	+113.7%	-3.6%	+12.6%	+25.2%	+3.6%	-0.1%	-6.4%	-0.0%	+44.1%	+22.6%	+44.1%
Labour exports (mill MK)	4,497	-4.3%	+0.1%	-0.2%	+0.0%	-0.2%	+0.5%	-0.5%	+0.3%	+0.1%	-0.5%	-0.2%	-0.1%
Net maize purchase (mill MK)	245	*-244.3%*	*+557.3%*	*-87.7%*	*-106.7%*	*-40.6%*	*-79.1%*	*-58.7%*	*-54.0%*	*-12.4%*	*+823.0%*	*+22.6%*	*+586.6%*
Real Unskilled Labour FP		*+21.9%*	*+23.6%*	*+2.4%*	*+3.9%*	*+5.4%*	*+2.0%*	*+1.0%*	*+2.0%*	*+1.3%*	*+6.3%*	*+2.3%*	*+2.8%*
Real Rural GDP (mill MK)	*13,785*	*+18.9%*	*+20.3%*	*+2.1%*	*+3.3%*	*+4.7%*	*+1.7%*	*+0.9%*	*+1.7%*	*+1.1%*	*+5.4%*	*+2.0%*	*+2.4%*
Real Agric GDP (mill MK)	*3,234*	*75.41%*	*+63.9%*	*+6.2%*	*+6.7%*	*+27.3%*	*+3.1%*	*+3.5%*	*+7.9%*	*+5.2%*	*+6.8%*	*+15.9%*	*+11.5%*
Unskilled Labour FP in maize		+2.1%	+8.8%	+5.2%	-2.3%	+15.1%	-2.5%	+2.5%	+8.0%	+5.2%	+8.1%	+9.6%	+16.8%
Land FP in maize		+36.7%	+16.5%	+9.1%	+4.3%	+16.6%	+0.7%	+5.6%	+8.9%	+4.4%	-2.8%	+9.5%	+2.6%
Total cost excl. admin. (mill MK)		*??*	*??*	*247*	*299*	*128 + ??*	*129*	*128*	*247*	*128*	*??*	*??*	*??*

In Table 8 the different scenarios are arranged from left to right in order of declining estimated impact on target group incomes (i.e. the incomes of the two poorest household types), with scenario results presented as percentage changes from base model results. The last row of Table 8 indicates the costs that are associated with the respective government intervention for those scenarios that involve actual government expenditure, which are calculated as part of the scenarios results.

All simulations lead to increases in both agricultural GDP and rural GDP within the rural economy, but with greater proportionate increases in agricultural GDP. This increase occurs because poorer households generally gain higher returns to unskilled labour from own-farm activities than from non-own farm activities, so that where their incomes increase and cash flow constraints are eased somewhat, they tend to transfer labour from non-farm to own-farm activities, with increased labour productivity. Where scenarios promote increased cultivation of. Hybrid maize, then both labour and land productivity in maize increase, with greater increase in land than labour productivity, indicating labour demanding technical change, which increases both labour productivity and labour demand per ha, with these together stimulating real unskilled wage increases, which in turn benefit the poor.

Very high poverty impacts are estimated from the two scenarios where marketing costs are slashed by 50%, the second scenario also allowing households access to cash on credit at 10 %over six months. These are 'ideal' scenarios, where markets are working effectively. They have dramatic impacts on the rural economy as resources move into agriculture, particularly tobacco, and wages rise. They assume, of course, that a doubling of tobacco production is possible without any fall in prices, and these results also do not allow for losses of non-own farm income that many rural households currently obtain from petty trading of agricultural produce. These scenarios therefore over-estimate the growth and poverty reduction benefits that are likely to be achieved by policies, which deliver such change, were it possible. These results are highly significant to questions about pro-poor agricultural growth strategies, as they suggest that getting markets working and increasing access of the rural poor to markets can have dramatic effects on poverty where they also promote increased production of labour demanding crops. Key questions remain, however, about how such pro-poor market access can be improved.

The remaining scenarios attempt to describe the effects policies that have been applied or are being applied in Malawi. None deliver very dramatic reduction in the predicted poverty count, but this finding is sensitive to assumptions of the rest of the world's elasticity of labour demand. More inelastic demand assumptions, which are quite likely, yield higher poverty reduction impacts. Among these scenarios, the highest simulated increase in target group incomes is achieved by the universal distribution of a seed and fertilizer input pack. A 20%input subsidy (principally on chemical fertilizers) is the next most effective scenario in raising target group incomes. These subsidies provide direct benefits to less poor households, but stimulate increased demand for labour (in both agricultural and non-agricultural activities), thus tighten labour markets, and raise wage rates.

The next most effective scenario (and more effective than a 10% input subsidy, targeted input distribution, or universal or targeted cash transfers) is a combination of support and stabilization of maize producer prices, accompanied by cash transfers to the poorest households. This policy combination attempts to stimulate agricultural production by raising and stabilizing maize prices, while offering protection to the poor in the form of income support. This is very similar to policies followed in India with support and stabilization of grain prices accompanied by social protection for the poor through fair price shops and guaranteed employment schemes. It does, however, lead to lower maize consumption than the other scenarios. The various price stabilization policies discussed earlier come further down the list, as do a universal cash transfer (of equal value to the seed and fertilizer pack), a targeted transfer of the seed and fertilizer pack, and targeted cash transfers. It is surprising that, in the model, cash transfers are less effective in reducing poverty than input transfers of equivalent value. This is a highly topical issue in Malawi. The model appears to mimic the logic of the arguments for input distribution, as a forced form of saving over the 'hungry gap'.

Table 9 compares results for the targeted and universal distribution of the seed and fertilizer pack, with and without allowance for their second-order impacts by tightening labour markets. Taking the target group of the two poorest household types, the material costs of targeting distribution are just over 50% of the costs of universal distribution. The poverty, average income and rural GDP benefits, however, are less than 50%. As with reduced coverage, there are reduced spillover effects from higher wages in tightened labour markets. Consequentially, indirect, second-order effects of an intervention may be significant if the intervention is sufficiently large, thus generating increasing returns to such expenditure.

Table 9. Comparison of Targeted and Universal Input Distribution

	Base	***TIP52 Hhold***	***TIP52 Market***	***TIP100 Hhold***	***TIP100 Market***
		(difference from Base results)			
Nominal wage rate (% of base)	*base*	*0*	*+1.50%*	*0*	*+5.00%*
Maize price (% of base)	*base*	*0*	*0*	*0*	*-0.50%*
Real wage rate (% of base)	*base*	*0*	*+0.97%*	*0*	*+3.35%*
% Farm Income	*34%*	*+3.9%*	*+3.4%*	*+9.3%*	*+6.9%*
Maize area ('000 ha)	*887*	*-0.3%*	*+0.2%*	*+4.4%*	*+4.2%*
Average maize yield (kg/ha)	*1,227*	*+6.0%*	*+5.8%*	*+8.1%*	*+6.7%*
Maize production '000 tons	*1,088*	*+5.6%*	*+5.9%*	*+12.9%*	*+11.2%*
Cash crop sales (mill MK)	*1,127*	*-2.5%*	*-3.1%*	*-13.1%*	*-7.3%*
Tobacco area ('000 ha)	*95*	*0*	*-0.1%*	*-9.7%*	*-3.6%*
Labour exports (mill MK)	*4,497*	*-1.7%*	*-0.5%*	*-4.5%*	*-0.2%*
Net maize purchase (mill MK)	*245*	*-64.0%*	*-58.7%*	*-155.7%*	*-87.7%*
Real Unskilled Labour FP		*+0.7%*	*+1.0%*	*+1.2%*	*+2.4%*
Real Rural GDP (mill MK)	*13,785*	*+0.6%*	*+0.9%*	*+1.1%*	*+2.1%*
Real Agric GDP (mill MK)	*3,234*	*3.89%*	*+3.5%*	*+8.4%*	*+6.2%*
Total cost excl. admin. (mill MK)	*0*	*128*	*128*	*247*	*247*

Our conclusions from analysis using the IRE model are that getting markets to work better for the poor has substantial potential for pro-poor agricultural growth, but that the benefits depend on the ability of a significant number of households to grow high value, labour-demanding crops with a large external market. Unfortunately the model is unrealistically optimistic in over-estimating (a) households' ability to expand tobacco production in response to improved prices (whereas tobacco production requires skills and investments in tobacco curing facilities), and (b) external market options (the demand for Malawi's tobacco is not totally elastic, in other parts of Africa where other cash crops may play this role, world prices for such cash crops have been in long term decline). Reliance on other drivers of growth (through transfers, input subsidies, or maize price control) provides much lower (but nevertheless important) rates of growth and poverty reduction. As a result, policy options are more nuanced.

Significant general principles emerge regarding the importance of considering (a) policy impacts on real wage rates, (b) second-round effects in (primarily) wage rate impacts (with implications for decisions about both the nature of interventions and their scale), and (c) both the stimulation of processes that drive growth in the rural economy and the provision of support to protect poor households from negative impacts while enabling them to participate in and benefit from wider growth. More generally, however, these results and this discussion draw attention to the limitations of current opportunities in small-scale agriculture as a driver of agriculture growth. It may be the best (indeed almost only) current option for driving pro-poor growth. It is not able, though, to really make substantial impacts on poverty on its own. Other growth drivers are needed as well for substantial and sustained pro-poor growth.

We must also examine the reliability of these model predictions. It was argued earlier that the farm household models on which they are based provide a good general pattern of different types of opportunities, constraints and behaviours facing different households in a poor rural economy. Their aggregation into the IRE model involves a number of new assumptions, most importantly about the elasticities of supply and demand in the external maize and labour markets. External labour demand is likely to be more inelastic than assumed here. although its level of inelasticity is difficult to judge. It is unlikely to be more elastic. In this regard, model results are therefore conservative about pro-poor impacts of scenarios that tighten labour markets. There is much more uncertainty about elasticities of demand and supply in the external maize market. Model results are also sensitive to the proportion of income spent on tradable and non-tradable products.[37] Finally, it needs to be noted that the model remains a partial equilibrium model, it does not allow for wider general equilibrium effects in the Malawian economy as a whole, through fiscal policy impacts and through markets for goods and services apart from labour and maize.

[37] An increase in the proportion of non-staple income spent on tradables from 50% to 60%, for example, was estimated to lead to a 10% fall in real incomes of the two poorest household types, with an approximate halving of real income gains for these households from a 10% increase in tobacco prices.

4.7. Conclusions and Lessons

The primary purpose of the work described in this chapter of the paper was to address strategic, operational and intervention questions regarding policy for pro-poor agricultural growth, as raised earlier in Chapter 2. We conclude by briefly reiterating the principal findings from this chapter on pro-poor policies and policy analysis. Our analysis demonstrates:

1. The importance of both own-farm and non-farm activities to the rural poor, and of the agricultural and non-agricultural economies to pro-poor growth. Agricultural growth is shown to be vitally important to growth in the non-farm economy.
2. The importance of agriculture as a driver for rural pro-poor growth, but also its limitations. Other drivers are also needed to achieve sustained and substantial pro-poor growth.
3. The potential benefits from reducing marketing costs and raising farm gate prices for labour demanding crops, provided that farmers are able to expand supply in response to price increases, and that market prices do not fall as a result of increased supply, so that higher farm incomes (mainly for the non-poor) lead to significant poverty reduction by stimulating increased demand for farm and non-farm labour and driving up wages.
4. The most effective pro-poor growth policies appear to be those involving universal input distribution, input subsidies or maize price support with transfers to the poor to off-set the effects of higher food prices, if administrative difficulties can be addressed.
5. Changes in labour and food markets are critical to the livelihoods and welfare of the poor and, in linking the farm and non-farm economies. They are major determinants of growth, poverty, and food security. These interactions and impacts are easily overlooked by analysis that focuses on livelihood changes, but policy analysis must address these partial equilibrium considerations.
6. The importance of partial equilibrium analysis increases with larger scale interventions, but interventions which tighten labour markets will also have greater spill over effects and benefits when implemented on a large scale
7. The need for disaggregated analysis of different households' behaviour, as different households interact with, influence, and are influenced by market changes in different ways.
8. Seasonal constraints within rural livelihoods are critical to the productivity and behaviour of the informal rural economy as a whole. Policy interventions that relieve these constraints may play an important role in pro-poor rural growth.
9. The urgent need for information on wage rates, on the workings of rural labour markets, and on the rural non-farm economy.

10. The very serious impacts of HIV/AIDS on the livelihoods of affected poor households.

In the following chapters of the paper we extend this work to include dynamic and general equilibrium, economy-wide interactions.

5. PRO-POOR POLICY LESSONS FROM ECONOMY WIDE MODELLING FOR MALAWI

Complementing and building on the micro-economic analysis of Chapter 4, this chapter analyzes economy-wide impacts of alternative agricultural sector policies on pro-poor growth in Malawi using a dynamic Computable General Equilibrium (CGE) model with endogenous population growth and capital stock accumulation calibrated to a 1998 social accounting matrix. After a brief summary of model structure, different policy scenario simulations are described. Simulation results for the period 1998-2008 suggest some trade-offs between overall economic growth and equity or poverty reduction and the need for policies promoting growth to be complemented by policies alleviating the particular difficulties faced by the poorest categories of the population.

5.1. Model and Data

The dynamic CGE model used in this chapter is an extension of the static, standard CGE model set out in Lofgren *et al.* (2002) and is described more fully in Wobst et al (2003). It is formulated as a simultaneous equation system, including both linear and non-linear equations. The equations define the behaviour of the agents, including the government, as well as the environment under which these agents operate: market equilibrium conditions, macro balances, and dynamic updating equations.

The model equations are divided into a *within-period module*, which defines the decisions in each time period, and a *between-period module*, which provides a link between different periods.[38] Selected parameters (factor supplies, population, and factor productivity) are updated on the basis of both exogenous trends and the simulated results from previous periods. All agents (private and public) are myopic, making their decisions on the basis of past and current conditions with no explicit account of the future.

The preference for assuming myopic agent behaviour stems from the fact that there is little empirical support for the notion that, as a general rule, agents act on the basis of perfect foresight. The factors that prevent agents from realizing patterns of savings and investment that, according to some criterion, are inter-temporally optimal are not explicitly specified. However, they may include credit constraints and/or the belief that any knowledge about the future is too uncertain to act on.

Two model features, which also appear in the static version of the model and which are of particular importance in a Sub-Saharan African setting, are (a) an explicit treatment of transactions costs for commodities that enter the market sphere and (b) own-household consumption of smallholder food produce.

The model database consists of a Social Accounting Matrix (SAM), data on labour force and population, and a set of elasticities for trade, production and

[38] The *within-period module* that defines a one-period, static CGE model as well as the *between-period module* that covers the links between different time periods are described in detail in the project report and can be obtained from the corresponding author upon request.

consumption. The 1998 SAM for Malawi constructed by Chulu and Wobst (2001) is based on the Integrated Household Survey (IHS) conducted in 1997/98 by the National Statistical Office (NSO) in collaboration with the International Food Policy Research Institute (IFPRI). In addition to the IHS data, the SAM incorporates national accounts data, foreign trade statistics, government budget and current account information.

The 1998 SAM features 22 production activities, 20 commodities, 5 factors, 8 households, 2 other institutions (government and rest of the world) and 5 taxes. Some activities (namely, small-scale and large-scale tobacco, as well as small-scale and large-scale other agriculture) produce the same commodity (tobacco and other agriculture, respectively). Appendix Table A.1 presents all SAM accounts.

The household disaggregation in the SAM reflects factor ownership and locality. Agricultural households own land and may be located rurally, or may be urban agricultural households with access to land (peri-urban agriculture). The remaining households are classified on the basis of their level of education into unskilled rural or urban and skilled rural or urban. All household types are endowed with a different composition of productive factors and assets, with land being exclusively held by agricultural households.[39]

In line with Malawi's population structure from the 1998 Demographic Census, over 85% of the population is rural. 38% of total population are poor agricultural rural households with less then one hectare of land (HRAGR12), while another 22% of agricultural rural households own between one and five hectares of land (HRAGR34). Apart from these agricultural rural households that comprise 60% of total population, non-agricultural skilled (HRNAG-SK) and non-skilled (HRNAG-USK) rural households account for another 25% of total population. The urban agricultural (HUAGR) and non-agricultural households (HUNAG-SK and HUNAG-USK) comprise the remaining 15% of the population.

5.2. Baseline Economic Structure in the Model

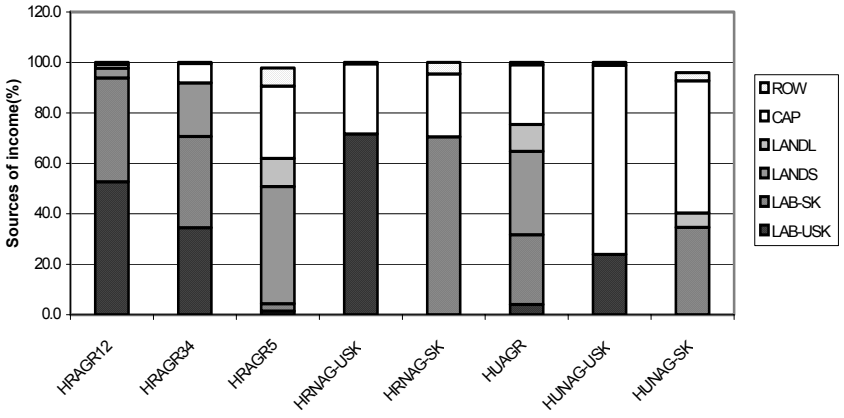
Table A.2 in the Appendix provides an overview of the estimated structure of the economy in 1998 with emphasis on the production side. Agriculture provides about 36% of the total value added of which maize, tobacco and other domestic agriculture are the dominant commodities. Agriculture also dominates the production shares, taking up 31% of total production. The sector employs about 89% of the labour force, 23% in maize, 8% in tobacco and 48% in the production of other agricultural commodities. The export share is also dominated by the agricultural sector, with 72% of the total exports originating from the sector, of which tobacco alone contributes about 56% and other agricultural commodities contribute about 16%. The non-agricultural sector does dominate the import shares, totalling about 92% of the imports, mostly in manufactured commodities, capital and private services. In terms of production and trade aggregates,

[39] With the exemption of large-scale land that is partly owned by urban non-agricultural skilled households (HUNAG-SK) who own most large-scale land in rural areas, but live in urban areas (absentees).

the data in the baseline show the reliance that the production structure has on the agricultural sector, particularly the production of primary commodities.

The factor composition structure indicates that both small-scale and large-scale agriculture are land and labour-intensive. With the exception of small-scale and large-scale tobacco production, the proportion of capital used in the production of maize and other agriculture is minimal, whereas the production of maize and tobacco absorbs most of the unskilled labour. Capital intensity increases in the manufacturing (incl. food processing) and industrial activities, while the service sectors absorb most of the skilled labour. Figure A.1 in the Appendix presents the activity factor shares in the base scenario in 1998.

Figure 17. Sources of Household Income Based in the Base



Note: ***ROW*** *= Rest of the world*
Refer to Table A.1 in the appendix for abbreviations of household and factor categories.

Apart from factor incomes, households also received some income from the other institutions, mainly the government, through transfers and from the rest of the world through remittances. Figure 1 shows the sources of the total household incomes in the base. The database for 1998 does not record any government transfers to households, although there have been significant transfers to (particularly poorer) rural households in some years.[40] Almost all estimated household income is therefore from factor endowments, with agricultural and unskilled households mainly earning from land and labour and non-agricultural and skilled labour endowed households earning from wages

[40] Malawi has been implementing a number of safety-net programmes such as the Starter-Pack Scheme in 1997/98, the Targeted Inputs Programme (TIP) from 1998/99 till now; and other small-scale food-for-work and cash-for-work programmes implemented by the government through the Malawi Social Action Fund (MASAF) since the mid-1990s.

and returns from capital. This is in line with one of the key vulnerability arguments that most of the Malawian smallholders engage in off-farm casual labour (*ganyu*) as a means of earning a livelihood (Moriniere *et al*. 1996 and Pearce *et al*. 1996). A relatively higher proportion of remittances are received by the richer rural agricultural households (about 7% of their total income) and the rural non-agriculture skilled labour households (about 5%). This could reflect their capability of investing in the education of their children, who are then able to remit back some money once they secure employment elsewhere.

5.3. The Economic Structure in the Base Dynamic Model

We now describe the changes in economic structure estimated in the dynamic model using base or default assumptions. These changes in structure are driven by assumptions regarding technological change and factor accumulation. With regard to the former, it is assumed that no significant technical change occurs in the medium run, and that change in total factor productivity for all production activities in the baseline scenario is exogenously specified as zero for the 10-year simulation period. However, the overall change in total factor productivity through factor reallocation to more productive activities over the simulation period is around 0.2 % annually, as a result of net investment and of labour market changes originating from assumed growth rates of the skilled and unskilled labour force. The rate of labour force growth per time period is given as a 95% share of the population growth rate of initially 1.94 %, assuming a 2% annual decline of the population growth rate.[41] For the capital market, the net capital income in any period is given as the difference between gross capital income and capital consumption, where capital consumption is capital stock multiplied by the depreciation rate, assuming a given net profit rate for capital.[42]

Within this general specification of factor market behaviour, further constraints on the use of capital in small-scale agricultural activities sector are introduced in this version of the model by fixing capital intensity in each activity with respect to the land area used. Hence, capital and land need to be employed in fixed proportions for small-scale crop production over the simulation period of 10 years. The use of capital in the aggregate small-scale agricultural sector therefore follows the (re-) distribution of land across the three small-scale agricultural sub-sectors. For example, if land is shifted from the less capital-intensive maize production into the more capital-intensive tobacco production, the aggregate small-scale agricultural sector needs to attract additional capital from the rest of the economy. However, if the opposite shift in land use occurs, the aggregate small-scale agricultural sector releases capital that needs to be absorbed by the

[41] The initial population growth used is estimated by NSO from the 1998 Population Census (1.94% p.a.). The population growth rate is assumed to decline at a rate of 2% per year, i.e. after 10 years the annual growth rate has declined from initially 1.94% to 1.59% reflecting (among other factors) the impact of HIV/AIDS on population growth in Malawi. The share of labor force growth in population growth is assumed to be 95% reflecting an increasing dependency ratio.

[42] Net profit rate for capital is assumed at 20% while depreciation is set at 5%. Capital stock is given as the gross capital income divided by the sum of net profit rate and depreciation rate.

rest of the economy. This model feature is important because of the central role that land and technology play in terms of capital mobility in the smallholder sector.

With these basic assumptions (with constant rates of change of net profit and depreciation rates), the dynamic model estimates that factor endowments do not change much over time. However, since different households are endowed differently with the various factors, per capita factor income by household category does differ. The level of per capita factor income is positively related to endowment of the more productive factors such as capital and skilled labour, and negatively related to population growth. Consequently, for the aggregate of all households, the per capita level of factor income remains more or less the same throughout the 10-year period increasing by about 2%, with significant variation by household type. For example, the larger agricultural households obtain an 11% increase in factor incomes and the urban skilled households experience a 17% increase in per capita factor income. By contrast, the rural non-agricultural skilled households lose 9% per capita and the rural non-agricultural unskilled households lose 11%. The largest decrease is however observed in the urban unskilled households where per capita factor income falls by 31% over the 10-year period. Interestingly, there is little change in per capita factor income for the smaller agricultural households. The relative differences in the impact on respective household incomes depend on (i) the household-specific factor endowment, (ii) the relative share of individual factor incomes in total factor income, and (iii) the change in real wages across the various factors.

Table 11, column headed "BASE", shows estimated annual changes in macroeconomic aggregates over the 10-year period, using the base assumptions above. Total annual GDP growth is estimated at about 2% over a 10-year period with higher average annual growth rate in the non-agricultural sector (at 2.3%) and a lower growth rate in the agricultural sector (only 1.4%). In per capita terms, average annual growth rates are 0.2% for total GDP, 0.5% for non-agricultural GDP, and –0.4% for agricultural GDP. The negative per capita growth in the agricultural sector results from the lower productivity of the agricultural sector relative to the non-agricultural sector. This results in fewer of the additional productive resources--added through population growth and through capital accumulation--being employed in agriculture. In fact, factor use in agriculture may decline as a result of shifts of capital and labour migration into the non-agricultural sector. Consequently, total per capita agricultural production and the per capita growth rate of GDP at factor cost decline.

5.4. Policy Scenario Simulations

The model was then used to investigate potential impacts of the different agricultural sector policy scenarios which were investigated by using Dorward's informal rural economy model, as described in Chapter 4.[43]

[43] Scenarios with fixed maize prices, above and below the current equilibrium, were not simulated in the CGE model due to difficulties in representing the effects of this, both in the CGE model described here and in the farm-household models described earlier by Dorward.

Table 10. Description of Alternative Policy Scenarios Analyzed

Policy Scenario	Description [1]	Factor productivity growth in the maize sector (in %) [2]	
		Unskilled labour	Small-scale land
CASH52	Targeted cash transfer of MK204 per household from the government to 52% of the poorest households plus 50% administration costs [3]	5.2	4.4
CASH100	Universal cash transfer of MK204 per household from the government to all rural households plus 50% administration costs	8.0	8.9
WEDG50	Reduction of market wedges by 50% plus increase in government infrastructure investment by 10% annually	8.8	16.5
WEDGCRD	As for WEDG50 plus total relaxation of the cash constraint, equivalent to an universal cash credit	2.1	36.7
INPSUB20	20% input subsidy on all smallholder chemicals	-2.3	4.3
INPSUB10	10% input subsidy on all smallholder chemicals	-2.5	0.7

Note:
[1] The policy changes are implemented over the entire 10-year period. The GAMS code of the model and the simulations is available on request.
[2] These columns show additional factor productivity changes in the maize sector for unskilled labour and small-scale land as compared to the Base scenario. The respective factor productivity for all policy scenarios are introduced over the first five-year period in 20% increments, assuming incremental phasing in of impacts from policy change.
[3] Poorest households are defined as being those in the following household categories: HRAGR12 and HRNAG-USK which together comprise approximately 52% of the population

Modelling these policy scenarios within the CGE model posed considerable challenges, as the structure of the data from which the model was constructed did not allow it to properly represent policy impacts on important microeconomic features of smallholder agriculture discussed earlier by Dorward in Chapter 4, such as severe seasonal capital constraints leading to non-separability between crop production, unskilled employment and household consumption in poorer households. The CGE model could not, therefore, describe the impact of policies, which promote some relaxation of those constraints (policy impacts which, as Dorward shows, can be very important). To describe these impacts, equivalent scenario simulations with the Dorward's partial equilibrium model of the informal rural economy, were used to estimate changes in labour and land productivity in small-scale maize production, and these were fed into the CGE model (as detailed in column 3 and 4 of Table 1).

In Chapter 6 of this paper, Dorward *et al.* provide a more detailed comparison of the micro- and CGE models and their results, but it is important to note here that as compared with the partial equilibrium informal rural economy model, the dynamic CGE model allowed more sophisticated consideration not only of the economy-wide impacts

of policy changes (allowing for the impact of fiscal costs throughout the economy) but also of phased introduction (over 5 years) of the scenario policies and of the productivity changes that they stimulate. The household classifications used in the two models also differed in terms of coverage (the CGE model including all households in the economy as opposed to just rural households) and in the criteria used for classification of rural households (which, as detailed earlier in Chapter 4, were disaggregated in the micro model by indicators related to household structure, working capital and credit access, and land holding).

Column 2 of Table 10 provides further information on the ways that the different policy scenarios were represented in the different simulations. Two (WEDG50 and WEDGCRD) were designed to provide an indication of the gains that could potentially incur if "all" constraints to productivity growth in the agricultural sector were alleviated. The two simulations were achieved by respectively (1) reducing the trade and transportation wedge (the costs of transacting) by 50%, and (2) reducing the wedge (as in (1)) together with the provision of a universal cash credit. These simulations give an indication of the gains generated from reducing the costs of transacting, but the fiscal and investment costs needed to achieve these changes are not modelled. The simulations should therefore simply be used to provide a gauge against which the other simulations can be assessed in terms of their strategic objectives, operational requirements and cost effectiveness.

The remaining simulations can be grouped into two broad categories: (a) cash transfers intended to allow households to overcome credit constraints at crucial stages in the year - these are universal and targeted transfers to all (CASH100) and 52% of the poorest households (CASH52) respectively, and (b) input subsidies (on chemicals) at 10% and 20% levels for smallholders (INPSUB10 AND INPSUB20). All simulations except CASH52 lead to labour demanding technical change in maize production. The strongest productivity changes (see columns 3 and 4 of Table 11) come from WEDG50 and WEDGCRD, then CASH 100 and CASH52, and finally INSUB20, with very small changes from INSUB10. In interpreting the results of the simulations, the two broad categories of alternative policy interventions are assessed against both the dynamic base and the results of the simulations of the removal of all constraints (WEDG50 and WEDGCRD).

5.5. Simulation Results

The results of the simulations are described and discussed under four main sub-chapters in line with the different types of impacts of interest to the project. These are (i) the impacts on macro-aggregates such as total and per capita GDP (disaggregated into agriculture and non-agriculture components) and on trade aggregates, (ii) impacts on factor employment levels, (iii) impacts on maize consumption, production and prices, and (iv) overall impacts on household welfare. In the concluding chapter we draw these findings together to consider the relative merits, from an economy-wide point of view, of the alternative policies simulated.

Table 11. Selected macro indicators

	BASE	CASH52	CASH100	WEDG50	WEDGCRD	INPSUB20	INPSUB10
Agricultural GDP at factor cost	*1.4*	1.004	1.007	1.024	1.035	1.002	0.999
Non-agric GDP at factor cost	*2.3*	0.983	0.970	0.996	0.996	0.990	0.995
Total GDP at factor cost	*2.0*	0.990	0.982	1.005	1.009	0.994	0.996
Agricultural GDP per capita	*-0.4*	1.004	1.007	1.024	1.035	1.002	0.999
Non-agric GDP per capita	*0.5*	0.983	0.970	0.996	0.996	0.990	0.995
Total GDP per capita	*0.2*	0.990	0.982	1.005	1.009	0.994	0.996
Total Absorption	*1.9*	0.990	0.983	1.011	1.015	0.994	0.996
Total Household Consumption	*1.7*	0.996	0.993	1.015	1.020	0.998	0.998
Total Investment	*2.2*	0.932	0.883	0.942	0.941	0.967	0.983
Total Government Consumption	*2.3*	1.013	1.023	1.055	1.055	1.000	1.000
Total Exports	*2.2*	0.983	0.971	1.013	1.014	0.994	0.996
Total Imports	*1.9*	0.985	0.975	1.009	1.010	0.994	0.997
Real Exchange rate	*0.1*	1.005	1.008	1.008	1.014	0.996	0.997

Note: The BASE column shows annual growth rates 1998-2008 (%). The other columns show the ratios between terminal year (2008) variable levels for the simulation in question and for the BASE. (i.e., for agricultural GDP at factor cost and the scenario WEDGECRD, a value of 1.030 indicates that in 2008, the level for this variable is 3.0% higher under this scenario than for the BASE.)

Macroeconomic Aggregates

Table 11 shows for a range of macroeconomic indicators the percentage differences between dynamic model results achieved over ten years (1998-2008) with the base assumptions (referred to in future as the 'dynamic base' results) and with the different scenario simulations. Differences from the dynamic base are generally small. However, the two scenarios designed to simulate an alleviation of constraints to productivity increase in the agricultural sector (WEDG50 and WEDGCRD) have a minor positive impact on GDP levels. With these scenarios total GDP in the terminal year 2008 are 0.5 % and 0.9 % higher respectively as compared to total GDP in the terminal year of the dynamic base scenario. In these (as with the other) scenarios, there are larger increases in agricultural (2.4% and 3.5% respectively) compared to non-agricultural GDP. In both scenarios, the agricultural GDP effect more than compensates for the negative effect on non-agricultural GDP.

The input subsidy simulations have a minimal impact on total and on non-agricultural GDP because these scenarios are related to a small factor productivity decrease for unskilled labour. However, the 20% input subsidy has a slight positive impact on the level of agricultural GDP. The cash transfer simulations all have a small negative impact on total GDP, with a decline in non-agricultural GDP masking small increases in agricultural GDP. The targeted cash transfer has a more negative impact on non-agricultural and total GDP than the universal transfer.

Total exports are a little higher under the WEDG50 and WEDGCRD scenarios compared to the dynamic base. This stems directly from the increase in the production of

non-maize commodities in the economy, particularly tobacco, by far the most important cash crop in Malawi. Of the other policy scenarios, cash transfer simulations reduce levels of total exports relative to the dynamic base because of their impact on driving resources away from exportables towards supporting the production of non-tradables and/or import substitutes.

Compared to the dynamic base, the levels of government consumption and total household consumption are consistently improved in the WEDG50 and WEDGCRD scenarios, affecting positively GDP levels. Total household consumption in the terminal year under WEDGCRED changes by 2.0% as compared to the dynamic base scenario. In contrast, household consumption in the terminal year falls in the cash transfer simulation. These results reflect attributes already discussed in terms of corresponding changes in per capita GDP growth rates as well as exports. Total investment declines for all simulations (in the terminal year relative to the dynamic), but is most significantly reduced in the case of a universal cash transfer (minus 11.7% for CASH100).

The impacts on the macro indicators show that policies that are targeted at the poor and/or at the agricultural sector will not necessarily result in the greatest positive impact at the economy-wide level, indeed, there appears to be a demonstrable trade-off between growth and the policies that are targeted at reducing poverty. In the following chapters, we present results that allow a better appreciation as to why this may be the case and for informing the trade-offs that will inevitably need to be made.

Factor Employment

As explained earlier, the rates of factors accumulation and the manner in which they are allocated are the driving forces of the dynamic model. This chapter presents the results of the simulations in terms of factor shifts across sectors.

Unskilled Labour

As discussed earlier (and shown in Table A.3), unskilled labour use in large-scale and small-scale tobacco production in the dynamic base increases above the economy-wide average at about 3 % annually over the 10-year period. This is offset by lower rates of growth in demand for labour in maize and other agricultural activities. Both scenarios that reduce the cost of transacting (WEDG50 and WEDGCRED) result in a shift of labour into small-scale tobacco production at the expense of maize production, because the profitability of tobacco increases proportionately more.

The cash transfer simulations have the effect of reducing unskilled labour use in maize and large-scale tobacco as compared with the dynamic base. However, the universal cash transfer slightly increases labour use by small-scale tobacco. The impact of the input subsidy, on the other hand, is to slightly increase labour allocation to both maize and small-scale tobacco production, generally at the expense of large-scale tobacco and other agricultural production. The 20% input subsidy results in a greater increase in labour use by the small-scale tobacco sector than the 10% input subsidy. However, the reverse is true for maize, where the lower rate of subsidy results in marginally higher

demand. These differences are related to differences in labour use intensity and wage rates shown in Table A.3.[44]

Land Use

The dynamic base results in a shift of small-scale land from the dominant activity, maize, into small-scale tobacco production. This shift is particularly accentuated in the WEGD50 and WEDGCRED simulations due to the greater increases in land productivity in maize (cf. Table A.4 in the Appendix).

Capital

Changes in the allocation of capital to the different activities show a more mixed pattern, but it must be remembered that for small-scale agricultural activities the land: capital ratio is fixed, and capital shifts thus reflect land shifts (see Chapter 4.4). Looking across all other activities, capital demand falls relative to the dynamic base in the cash transfer and input subsidy simulations (CASH52, CASH100, INPSUBb20 and INPSUB10). By contrast, in the WEDGCRD and WEDG50 simulations show an increase in capital demand for many agricultural and non-agricultural activities.

Maize Consumption and Production

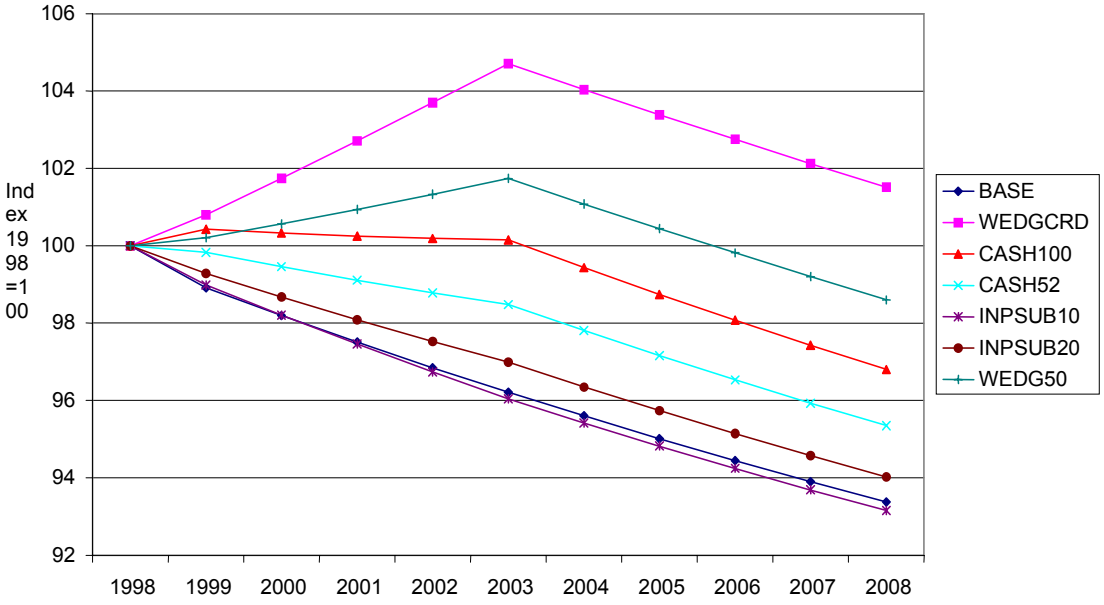
Given the importance of maize in Malawi's economy in general and to rural smallholder livelihoods in particular, we now examine how its production and consumption are influenced by the different policy scenarios. Table A.4 in the Appendix provides an indication of how different scenarios lead to different changes in the allocation of land to maize production over the ten-year period. Most scenarios show little change from the dynamic base, which has a gradual decline in land devoted to maize, although this decline is so gradual that, over a decade, the production structure of agriculture remains almost unchanged. Only the WEDG50 and WEDGCRD simulations show appreciable differences from the dynamic base in maize land allocation, with slightly greater decline in land allocation to maize production. The cash transfer simulation allows a more limited shift of land out of maize production, while the input subsidy simulations have little impact as compared with the dynamic base.

Figure 18 shows a declining trend in terms of per capita maize production in the dynamic base, due largely to the increasing population, limited TFP growth and minimal changes in factor composition and technologies. The patterns shown by the different scenarios depend on the balance between land maize-productivity increases, on the one

[44] The pattern of changes in demand for skilled labour follows that of unskilled labour, with changes in large and small-scale tobacco production being more responsive than in the production of other agricultural commodities. This is because the technologies employed change in more or less constant relative shares of factor inputs used since the constant elasticity of substitution (CES) function allows limited substitutability between skilled and unskilled labour. Thus, as unskilled labour becomes more productive and consequently abandoned as compared to skilled labour, all sectors will substitute skilled with the cheap unskilled labour. The extent to which this is possible depends on the initial relative factor use.

hand; and increasing population and shifts of land out of maize, on the other hand. All scenarios, though, show declining per capita maize production after 5 years, when all policy induced maize productivity increases have been completely phased in. For the two scenarios that more fully release the productivity constraints (WEDGCRD and WEDG50), this actually raises per capita maize production as productivity increases are phased in over five years (this raise occurs despite their larger shifts of land out of maize). The CASH52 and CASH100 scenarios, with lower productivity increases than the WEDGCRD and WEDG50 scenarios but lower switches of land from maize to tobacco, maintain rather than increase maize production in the first five years. The INSUP10 and INSUB20 scenarios show very little difference from the dynamic base for maize production, with small productivity increases and movements of land out of maize very similar to those in the dynamic base.

Figure 18. Changes in Capita Maize Production by Scenario



Per capita grain consumption among poor rural agricultural households shows a very similar pattern to overall per capita production as discussed above, with a steady decline in the dynamic base and in the different scenarios after productivity changes stop coming through. The WEDG50 and WEDGCRD scenarios show similar small absolute gains (totaling 3-4 %) above initial levels before this decline sets in. The INSUB10 and INSUB20 scenarios are very similar to the dynamic base (the INSUB20 scenario performing a little better), while the CASH100 scenario lies between these two groups. However, the CASH52 scenario, which is targeted at these households, provides an

immediate welfare gain from the receipt of the cash transfer in year 1 of policy implementation, but only small gains from the productivity increases in subsequent years.

The only policy scenario that reduces total grain consumption relative to the dynamic base is the 10% input subsidy. This reduction in total grain consumption is compensated, to a certain extent, by an increase in the aggregate consumption of other foods. Households respond differently when it comes to grain consumption. Two of the richer household categories, rural agricultural households with more than 5 ha of land and the urban households with skilled labour, both continue increasing their per capita grain consumption as they are endowed with adequate production factors and purchasing power. At the other extreme, the poorest household groups, the rural unskilled and urban unskilled, experience a decline in per capita grain consumption under the dynamic base and the input subsidy scenarios over the 10-year period. All other scenarios cause slight increases in per capita grain consumption of poor households, relative to the dynamic base.

Household Welfare

A key issue in the research is to determine the most promising set of policy interventions for reducing poverty by assessing the simulated impact of the different policy scenarios on factor incomes and overall household incomes, and on household welfare. Household factor incomes and consumption levels depend on factor endowments in general, and endowment of factors that yield a higher return in particular. Consequently, households that are poorly endowed with productive factors, such as households in rural areas with little landholding and the rural and urban households with no skills, tend to lose in relative terms.

Table 12 shows that all simulations except the 10% input subsidy positively impact real consumption relative to the dynamic base for the poorer households (HRAGR12, HRAGR34, HRNAG-USK, HUNAG-USK and HRNAG-SK). On the other hand, all simulations except for WEDG50 and WEDGECRED impact negatively on the other (richer) households (because of the re-distributional elements of these scenarios, which are only offset by wider growth in the WEDG50 and WEDGCRED scenarios). However, it should be noted that the results of the different scenarios tend to deviate from the dynamic base by very small amounts—a deviation of 3.2 % over 10 years, for example, representing an annual difference of just over 0.3 % per year. With this proviso, however, it is worth noting that for poor households, the targeted cash transfer has a more positive impact than the universal cash transfer, which in turn has a more positive impact than the input subsidies. The richer households experience the reverse impact. Even the INSUB20 scenario is pro-poor, despite the direct benefits of input subsidies being captured largely by less poor smallholders' households with more land.[45] This mimics the pro-poor benefits of input subsidies in successful green revolution areas

[45] The model makes no allowance for the effects of leakages to large-scale commercial producers or to neighbouring countries. Even here, however, Malawian smallholder farmers would presumably gain from a cash injection equal to the (marked down) value of the inputs.

in India, described by Fan et al in Chapter 2. These policies can all be labelled pro-poor, but with the cash transfers more pro-poor than the input subsidies.

Table 12. Real Consumption by Household Type

	BASE	CASH52	CASH100	WEDG50	WEDGCRD	INPSUB20	INPSUB10
HRAGR12	*16.5*	2.2	1.8	2.9	4.1	0.2	-0.1
HRAGR34	*14.5*	-0.5	0.7	2.7	3.4	0.3	0.0
HRAGR5	*28.4*	-1.7	-3.0	1.5	0.9	-0.5	-0.3
HRNAG-USK	*4.7*	2.1	2.2	2.9	4.1	0.5	0.1
HRNAG-SK	*8.1*	-0.2	1.1	2.3	3.1	0.1	-0.1
HUAGR	*10.5*	-0.6	-1.1	1.7	1.3	0.0	0.0
HUNAG-USK	*-15.6*	1.3	2.4	2.0	2.6	0.8	0.3
HUNAG-SK	*36.0*	-2.6	-4.6	0.5	0.8	-1.3	-0.7

Note: The BASE scenario column shows percentage changes over the 10-year period (numbers in italics). All other simulation columns show percentage point deviations of the respective simulation results from the BASE column results. Abbreviations for household categories as in Table A.1.

Relative to the dynamic base, welfare increases most significantly under the WEDG50 and WEDGCRD scenarios, as indicated by the changes in real consumption reported in Table 12. For the poor agricultural households (with an increase in population of over 18%), per capita consumption declines in the dynamic base. Cash transfers offset this decline to a greater extent than the input subsidies. Unskilled labour non-agricultural rural households also face a reduction in per capita consumption under the WEDGCRD and WEDG50 simulations.

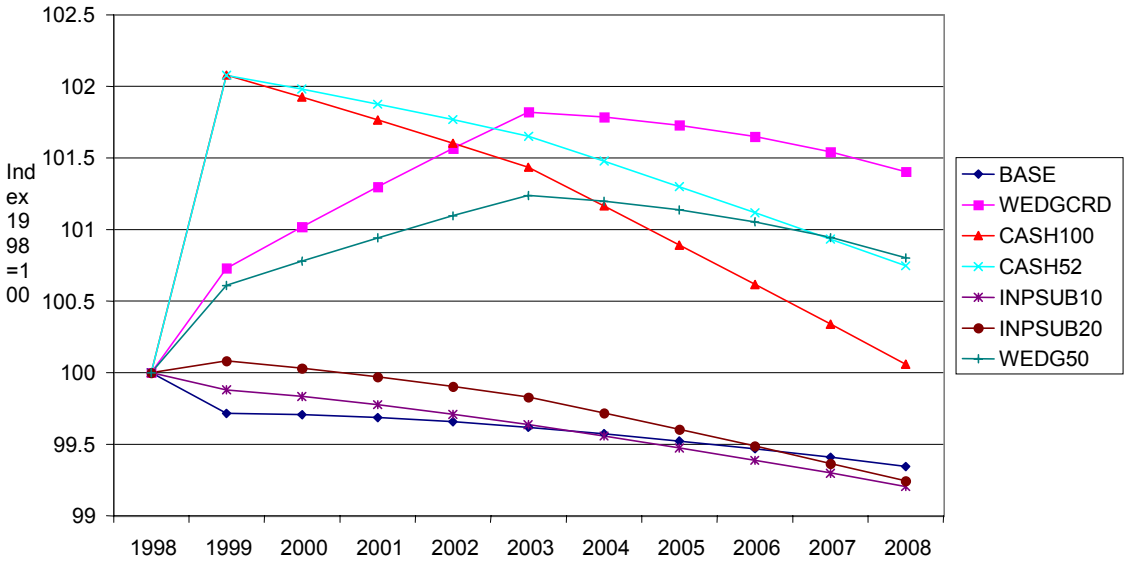
The skilled labour endowed rural non-agricultural households gain relative to the dynamic base under all scenarios except the input subsidies and CASH52 scenarios, albeit with reduced per capita consumption over the decade in all cases. Again, the WEDG50 and WEDGCRD simulations have the greatest impact.

Turning to the agricultural landowning households, the larger (>5ha) households *gain* relative to the dynamic base only in the WEDG50 and WEDGCRED scenarios. The universal cash transfer results in the lowest rate of welfare gain for these households. The smaller agricultural households (HRAGR12 and HRAGR34) face a negative trend in welfare in the dynamic base. This is reversed for the WEDG50 and WEDGCRD simulations for HRAGR12.

On a per capita basis, factor income declines less relative to the dynamic base for the input subsidy simulations, but more for the cash transfer simulations. Thus, the positive welfare impacts of the cash transfers are partially offset by lower factor incomes under these scenarios. This is demonstrated by *total* per capita income for the poor agricultural households under the cash transfer scenarios, where there is a notable positive impact relative to the dynamic base for the poorest rural agricultural households (HRAGR12). Figure 19 shows that these households initially gain from the targeted

transfer, and by the end of the decade the increase is sustained above the dynamic base, although close to the initial 1998 position for the universal transfer (due to the greater fiscal burden to the economy). The 20% input subsidy also provides a small initial boost to incomes, but as with the 10% input subsidy, it is approximately the same as the base by 2008.

Figure 19. Changes in Per Capita Income in Poor Agricultural Households (HRAGRI2)



5.6. Comparison of CGE and Household Based Analysis

This chapter of the paper has developed a dynamic, economy-wide (CGE) model of the Malawian economy which has analyzed different policy scenario impacts using results of simulations of the same policy scenarios from the household-based partial equilibrium Informal Rural Economy model described in Chapter 4. Before considering the policy conclusions that arise from the CGE analysis, we briefly compare the two methods, in terms of their analytical scope, strengths and weaknesses, and the results that they generate.

Table 13 compares the two different types of model for a wide range of features, demonstrating their often complementary strengths and weaknesses. The Informal Rural Economy (IRE) model gives a more detailed representation of the opportunities and constraints faced by farm households, and captures interactions with the rural non-farm economy. The CGE model covers the economy-wide effects of policy changes on the economy over a 10-year period but at the cost of a less detailed representation of farm household livelihood constraints and opportunities. The two models therefore differ in

time frames (static vs. dynamic), coverage and factor mobility across sectors (rural economy vs. economy-wide), and in the representation of farm household activities and technical change.

Table 13. Comparison of Informal Rural Economy (IRE) and CGE Modelling of Policy Scenario Impacts

Scenario Impacts	***IRE Model***	***CGE Model***
Seasonal livelihood opportunities & constraints, household working capital accumulation	Yes	Addressed by using IRE model estimates of labour and land productivity changes
Technology changes	Yes	No
Informal rural non-farm economy growth	Yes	Not treated differently from the rest of the economy.
Labour shifts	Between different farm & non-farm activities, and between rural & non-rural sectors	Across broad activities / sectors
Equilibrium effects	partial	General
Government expenditure	No	Yes
Population growth	No	Yes
Phasing of scenario benefits	No	Yes
Cross border leakages	No	No

The use of IRE model estimates of scenario impacts on productivity for the CGE scenario modelling was intended to introduce the latter allowance for the impact of household seasonal capital constraints on household activities and productivity. This appears to have been an effective 'fix' in many ways, capturing the effects of labour-demanding technical change in the IRE model. Table 14 shows that the two sets of models results generally agree on the direction of policy impacts. However, the dynamic, economy-wide model generates much weaker policy impacts for comparable simulations. The 'damping down' effects of CGE models are well known, since they incorporate countervailing changes in input and output prices and view the policy impact in the context of wider growth opportunities and constraints in the overall economy.

An important reason for the more limited policy impacts in the CGE simulation results is that the dynamic analysis over 10 years suggests that the simulated policy impacts are dwarfed by the other major processes of change in Malawi – population and labour force growth. The dynamic base simulation in the CGE therefore itself constitutes *the* development trajectory for Malawi's economy: the simulated policy impacts increase factor productivity of unskilled labour and small-scale land only in the maize sector, and these cause only moderate changes in the economy as compared with population and labour force growth, which dominate the dynamics of the system. The IRE model does not allow for these major population and labour force growth changes, changes which

lead to a greater abundance of unskilled labour as compared to other productive factors, with a decrease of its relative wage and hence reduced levels of income, consumption and welfare in poor households for which unskilled labour is the dominant factor endowment.

Table 14. Comparison of IRE and CGE Simulation Results

	WedgeCred	Wedge	TIP100	InpSub200	InpSub10 InpSub10	Cash100	Cash52
Informal rural economy model (% change from base)							
Nominal wage rate	+50.00	+35.00	+5.00	+10.50	+6.00	+1.00	+0.50
Maize price	-1.50	+1.00	-0.50	-0.50	-0.25	0	0
Real wage rate	+28.5	+20.0	+3.4	+6.7	+3.9	+0.7	+0.3
Poverty head count	*-16.9*	*-19.6*	*-4.1*	*-4.7*	*-2.6*	*-2.0*	*-1.3*
Target group real income	*+34.3*	*+29.7*	*+9.0*	*+7.9*	*+5.0*	*+3.6*	*+3.3*
All hhds real income	*+17.5*	*+20.9*	*+4.4*	*+4.9*	*+2.7*	*+2.2*	*+1.3*
Maize consumption	*+19.6*	*+15.2*	*+4.9*	*+5.7*	*+3.3*	*+2.0*	*+1.5*
Maize area	-32.0	-26.3	+4.2	+2.5	+3.5	+4.6	+3.9
Tobacco area	+113.7	+113.7	-3.6	+12.6	+3.6	-6.4	-0.0
Real Rural GDP	*+18.9*	*+20.3*	*+2.1*	*+3.3*	*+1.7*	*+1.7*	*+1.1*
Real Agric GDP	*41*	*+63.9*	*+6.2*	*+6.7*	*+3.1*	*+7.9*	*+5.2*
Total cost excl. admin (mill MK)	*??*	*??*	*247*	*299*	*129*	*247*	*128*
Dynamic CGE model after 10 years (all shown as % change from base)							
Poor rural hhd (≤1 ha) real consumption	*4.1*	*2.5*		*0.1*	*-0.1*	*1.5*	*1.9*
Landless rural hhd (unskilled) real consumption	*4.1*	*2.8*		*0.5*	*0.1*	*2.1*	*2.0*
Poor urban hhd (unskilled) real consumption	*2.6*	*2.4*		*1.0*	*0.4*	*2.8*	*1.6*
All households real consumption	2.0	1.5		-0.2	-0.2	-0.7	-0.4
Unskilled wages	3.2	2.4		0.3	0.1	-1.6	-0.9
Smallholder Maize area	*-5.2*	*-3.0*		*-0.8*	*-0.1*	*-1.9*	*-1.0*
Smallholder Tobacco area	*9.4*	*7.2*		*7.8*	*3.6*	*-0.8*	*-0.5*
Agricultural GDP per capita	3.5	2.4		0.2	-0.1	0.7	0.4
Non-agric GDP per capita	-0.4	-0.4		-1.0	-0.5	-3.0	-1.7
Total GDP per capita	0.9	0.5		-0.6	-0.4	-1.8	-1.0

The broader structure of the Malawian economy is another reason for the limited policy simulation impacts with the CGE model; given that the economy's current domination by small-scale agriculture production, with cultivation of a limited number of major crops, constrains responsiveness to change. Demand responses are also limited, as the existing consumption shares of most Malawian households for food and agricultural products are large, and their responsiveness to changes in relative prices is limited (with low income elasticities on basic food products).

While these aspects of the CGE model's representation of the Malawian economy correctly represent its 'stickiness' and the limited impacts of policy simulations, other aspects of the CGE model may lead to under-estimates of policy impacts. First, rigidities in the supply-side of the economy may be over played to some extent by sector-specific production elasticities that represent only a certain degree of (imperfect) substitutability across different factors in proportionate rather than absolute terms, so that growth of factor use is particularly constrained for sectors with small initial factor shares. The foreign trade structure is also limited in its ability to adjust across sectors (imports in the model change relative to domestic supply according to sector-specific substitution elasticities, but the overall magnitude of a sectoral change is limited by the sector's initial import over absorption share). Similarly, export changes are modelled according to sector-specific transformation elasticities, and their overall changes depend on initial export shares.

Second, the CGE model does not adequately describe growing demand for unskilled labour services in the informal non-farm rural economy as a result of labour demanding technical change in agriculture; it therefore misses a major process driving rural poverty reduction in green revolution areas in Asia. This is explained by the fact that the CGE model probably overestimates unskilled labour mobility between the rural and urban sectors and does not allow sufficiently for differences between formal and informal service activities in the urban and rural economies. It is related to another aspect of structural change, namely that, despite the fact that the CGE model captures the negative 'involution' effects of increased population growth, neither of the models allow for the possible beneficial dynamics of institutional change and falling transaction costs that can arise with increased population density (the Boserupian hypothesis), although there is currently little evidence of such effects in southern Malawi where population density is highest.

Two important points arise from this discussion. First, for our immediate purposes, this consideration of the structural differences and relative strengths and weaknesses of the two modelling approaches suggests that reality probably lies somewhere between the two sets of results. More importantly, however, it demonstrates the need for substantial technical (productivity) and structural changes to overcome the large and deeply negative effects of population and labour force growth in an otherwise stagnant, rigid, economy.[46]

5.7. Conclusions and Policy Implications

We conclude this chapter by, first, briefly drawing out critical observations from the CGE simulations, and, second, broader conclusions on pro-poor policies and policy analysis. Specific observations we highlight are:

[46] These observations also pose an important research agenda: to develop analytical and modelling approaches that capture the strengths of the different approaches used here, and to use such approaches to identify the nature and scale of productivity and other changes necessary to outpace the negative impacts of population growth on unskilled wages and the livelihoods of the poor.

- Changes in activity and welfare of various household categories depend mostly on their factor endowment and, hence, source of income. In the context of the dominant pattern of population and unskilled labour force growth, households that are endowed with land and skilled labour live far better than those that are endowed with unskilled labour.
- In comparing the more realistic policy scenarios of cash transfers and input subsidies, none achieved pro-poor growth, namely that none stimulated wider growth across the whole economy. All were pro-poor, though, by redistributing economic opportunity in favour of poor households. The failure of these simulated scenarios to stimulate wider growth poses questions about the model's representation of some of the beneficial dynamics of the informal rural economy (as discussed above), and about the scale of technical change and productivity increases that policies must be able to stimulate if they are to be successful.

Broader policy lessons reiterate, but also take further, issues raised at the end of Chapter 4:

1. Growth that raises real wage rates is critical to sustained poverty reduction. The poor benefit from measures that reduce market labour supply, raise market labour demand, or stimulate grain supply and reduce grain prices.
2. In economies dominated by a large subsistence agriculture sector, very weak formal non-agricultural sectors, and rapidly growing populations; there is only limited scope for substantial pro-poor economic growth without major structural and technical change.
3. Both own-farm and non-farm activities, and the agricultural and non-agricultural sectors are critical to the welfare of the rural poor and to pro-poor growth. Longer-term tradable non-agricultural growth drivers are needed if substantial poverty reduction is to be achieved. Diversification within smallholder agriculture and out of smallholder agriculture are both important.
4. There are important potential synergies between safety net provision and growth, as welfare support can not only ease short-term seasonal capital constraints on poor households' agricultural productivity but also, when combined with measures promoting economic growth, promote balanced development in consumption and production, stimulating both supply and demand.
5. Where agro-ecological conditions can support labour-demanding agricultural productivity increases, major potential pro-poor growth benefits can be achieved from reduced transaction costs in agricultural output markets and from increased smallholder household liquidity.
6. Input subsidies that support labour-demanding technical change in smallholder agriculture can be pro-poor, their poverty reduction and wider economic growth impacts depending upon the scale of productivity increase that they are able to support and upon the costs and efficiency of their implementation. Their impact

probably also depends upon complementary investments improving access to seasonal finance and input and output markets.

Further points that have not been explicitly modelled or discussed above nevertheless are relevant to and emerge from this analysis:

7. Substantial and long-term external finance is needed to fund investments for growth and welfare support.

8. Good governance, good macro-economic management, and low real interest rates are critical to delivery of pro-poor and economic growth benefits for all policy scenarios considered.

6. PRO-POOR POLICY LESSONS FROM HOUSEHOLD AND INFORMAL RURAL ECONOMY MODELS IN ZIMBABWE

In this chapter we briefly describe the results from micro-economic modelling of rural households and of the informal rural economy in Zimbabwe. This work adopted very similar methodologies to those used in the work on Malawi described earlier in Chapter 4. Though, their development and application to the different livelihood systems in Zimbabwe, and to low potential areas in Zimbabwe, yielded further insights.

The chapter is structured in four sections. Following this introduction is a brief description of smallholder agriculture in Zimbabwe's communal areas and of critical issues facing policy with respect to these areas.[47] This sets the agenda for the development and application of farm/household models. Scenarios are chosen to illustrate the capacity of the models to shed light on the effects of alternative policy regimes on heterogeneous communal farm households in Zimbabwe.

6.1. Background and Policy Issues[48]

Poverty in Zimbabwe is primarily a rural phenomenon, although urban poverty rose alarmingly in the 1990s. In rural areas, poverty has historically been linked to the highly skewed distribution of land, with the majority of rural residents consigned by colonial governments to live in areas of low agricultural potential. However, the percentage of the population classed as poor showed a particular increase in the 1990s. Using the US$1 per day poverty line adopted by the International Development Targets, DFID 1999 estimate that there were around five million poor people in Zimbabwe (i.e. around 40% of the total population), with the high level of inequality in Zimbabwe producing much higher poverty figures than might be expected given average income levels for the country as a whole.

Poverty is most highly concentrated in the communal and resettlement areas. Its incidence increases as one moves into the lower potential agro-ecological zones (natural regions IV and V, according to the local classification).[49] More rural people live in natural region IV than in any other natural region, so consequently the largest number of rural poor is found in this region.

According to surveys conducted in the 1990s, poor households tended to be characterized by large household size, high dependency ratios, older or very young household heads, small land holding, and low levels of education. They also tended to be food crop farmers, migrant workers in communal areas or workers on commercial farms.

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[47] Our analysis relates to conditions up to 2000: we do not take into account the profound and rapid changes that have occurred since 2001.

[48] This chapter draws heavily from Poulton, Davies *et al.* 2002

[49] Land in Zimbabwe has been classified into five natural regions based on rainfall and type of agriculture. Communal farmers are not well represented in the higher potential regions that were (until recently) dominated by commercial agriculture.

Households with diversified income sources (especially having one or more members in wage employment) tended to be less poor and less vulnerable. Inequality is high even within the communal areas themselves. Livestock holdings are a key indicator of wealth (and a critical production asset) amongst smallholder households.

The incidence and impact of AIDS escalated dramatically in Zimbabwe in the 1990s. World Health Organization 2000 estimates that, at the end of 1999, around 1.4 million adults (i.e. 25% of the population aged 15-49) were HIV-positive, along with 56,000 children. There is, however, considerable variability between sites. Economically, rural households in which a member(s) contracts AIDS suffer both from loss of labour and also from reduced cash availability due to increased medical expenditures.

Agriculture provides employment and livelihoods for 70% of the population and in the 1990s, depending on annual weather conditions, contributed between 40% and 50% of total export revenues. Agricultural performance has varied dramatically year-to-year depending on the rainfall and these vagaries impact more powerfully on the lower potential areas (and consequently more on communal farmers than on commercial ones). After 1980, the general trend in production in both the commercial and the communal areas was upwards, with strong early gains following the end of the liberation war. However, since 1985-6, agricultural production growth has not kept pace with population growth in the communal and resettlement areas. This provides an important part of the explanation for the disappointing story on poverty alleviation.

The poor performance of smallholder agriculture in reducing poverty has prompted a number of suggestions as to priority actions to foster growth in communal areas, including greater emphasis on research, extension and input supply, further trade liberalization and a variety of land reform proposals. The latter have largely been overtaken by events on the ground since 2000. The poor road infrastructure and underdeveloped nature of transport services within Zimbabwe's communal areas also remain a key issue.

Table 15 provides comparable statistics for Zimbabwe to those presented for Malawi in Table 3. The 1998 figures are more reflective of the situation modelled below than those for 2002. The impact of the post-2000 economic crisis is clearly seen in the contraction in GDP, agricultural value added (as a result of the destruction of the commercial farming sector) international trade, the steep rise in inflation, and the collapse in FDI. As a reaction to political developments in Zimbabwe, aid per capita also fell between 1998 and 2002, despite the food crisis that began in 2001 and the undoubted rise in poverty.

The table shows Zimbabwe to have a similar population to Malawi, but a much more industrialized economy, with GNI per capita (current US$) more than twice as high, even in 2002. Zimbabwe attracted massively more FDI than Malawi in 1998 and was somewhat less dependent on aid. Zimbabwe has achieved greater literacy and lower infant mortality, but has a higher HIV prevalence and, by 2002, similar life expectancy. The 1996 poverty estimates quoted in the table are considered artificially high as a result

of the high prices for basic consumption items assumed in setting the "total poverty line" (especially for rural areas).

Table 15. Social and Economic Indicators for Zimbabwe

		1998	2002
Population	Total Population (million)	12.2	13.0
	Population Growth (annual %)	2.0	1.2
	Urban population (% of total)	-	35.3#
Health, malnutrition and poverty	Life Expectancy at birth (years)	-	39.0
	Mortality rate- under 5s (per 1,000 live births)	-	76.0
	HIV prevalence (% of females aged 15-24)	-	33.0*
	Malnutrition prevalence (% of children under 5)	-	-
	Poverty (% of pop. below national poverty line)	63.3^	-
Education	Illiteracy rates-adult (% of 15+)	12.9	10.0
	Illiteracy rates-adult females (% of 15+)	17.3	13.7
	Net Primary enrolment (% of school age population)	-	82.7*
Economy	GNI per capita-Atlas method (current US$)	560	480*
	GDP growth (annual %)	2.9	-5.6
	Inflation GDP deflator (annual %)	29.2	107.5
	Agriculture, value added (% of GDP)	21.8	17.4
	Industry, value added (% of GDP)	24.0	23.8
Trade	Exports of goods and services (% of GDP)	45.9	24.1
	Imports of goods and services (% of GDP)	47.8	21.8
	Tobacco exports (US$ millions)	471.1	328.2
	Food imports (US$ millions)	106.8	201.3
Technology and Infrastructure	Fixed lines and mobile phones (per 1,000 people)	23.0	55.1
	Paved roads (% of total)	47.4	-
Finance	FDI, net inflow (current US$ millions)	444.3	25.9
	Short-term debt outstanding (current US$ millions)	767.9	516.9
	Total debt service (% of exports of goods and services)	-	-
	Aid per capita (current US$)	21.5	15.4

^ 1996 figure, calculated against CSO "total poverty line"
 # 2000 figure
** 2001 figures*
Sources: http://www.worldbank.org/data/countrydata/countrydata.html; http://apps.fao.org; (Central Statistical Office 1998)

6.2. Development and Application of a Farm/Household Model of Rural Livelihoods

Farm/Household Model Structure

The structure of a Malawian farm-household model (Dorward 2003) was used as a base from which to develop the Zimbabwe model. There were two principal modifications to the Malawi model structure: the introduction of irrigated vegetable production as a cropping activity outside the main cropping period, and three classes of labour (skilled, semi-skilled and unskilled) with different potential off-farm wage rates but with identical on-farm productivity. Minor changes were also made to ways that different crops related to grain stocks, household food consumption and household types.

A different approach was also used in the development of the household typology. Two major agro-ecological zones were identified (Natural Regions 1 to 3 were grouped together into one zone, and Natural Regions 4 and 5 into another) and then a classification developed within each zone based on relations between access to land, household composition (affecting labour resources and consumption requirements, male- and female-headedness), education of workers (affecting the ability to gain skilled, semi-skilled and unskilled employment), cattle holdings (affecting access to draft power and hence timeliness of and returns to cropping activities), receipt of remittances, distance from major centres (affecting local prices), and ability to produce particular high return crops.[50] A total of 42 household types were identified: 19 in Natural Regions 1 to 3, and 23 in Natural Regions 4 and 5. Heterogeneity between households was modelled by varying resource access, consumption requirements and price and technical coefficients (see Poulton 2002 and Poulton and Dorward 2003 for further details).

Data Sources

Data were gleaned from a range of existing data sources. Particular difficulties were again faced with labour data. For these topics, and for others where data sources were limited or gave conflicting information, pragmatic judgments were made. For wage rates, for example, the effects of alternative assumptions were investigated as regards the balance between hiring in and out of labour in different household types.

Farm/Household Model: Base Results

Initial runs of the model showed very high returns to off-farm labour as compared to most cropping activities (with the exceptions of horticulture, cotton and high yielding maize activities), with consequent low participation in agriculture. These results demonstrated that non-market constraints on access to employment are important and that rural labour markets do not clear on the basis of wage rate adjustment - social ties may ration access to employment by determining who can and cannot get work at a socially

[50] Only a few household types were permitted to engage in horticultural and cotton production, reflecting 1) water availability and market access restrictions on horticultural crops and 2) geographic restrictions on cotton production opportunities, due to limited coverage of the main cotton companies (3 in 1996).

determined "fair" rate, which is actually above the rate at which the market would clear. These difficulties emphasized how little is known about rural labour markets in Zimbabwe (and indeed, in Africa as a whole), and the need for greater research on this. While labour supply and use are difficult to study, and wage rates are very variable; it is, nevertheless, remarkable that so little systematic information should exist on these topics, when labour markets and returns to labour are so important to the poor, to 'coping strategies' and to processes of poverty reduction. To allow for rigidities in the labour market, households' ability to hire out skilled, semi-skilled and unskilled labour was limited to half the available labour of each type in the household.

Table 16 presents the base scenario cropping pattern and production estimates from the model and compares them with CSO estimates for 1996 Central Statistical Office 2001.

Table 16. Base Scenario Crop Production Estimates

		Maize	G/Nuts	Cotton	Small Grains	Bambara Nuts	Sun-flower	Hortic.
Hholds Growing Crop ('000)	Model estimate	988	637	176	249	91	93	544
	CSO Estimate	958	400	112	400+	195	90	
	% Difference	+3.1%	+59.1%	+56.6%	-38.8%	-53.2%	+3.4%	
Area Planted ('000ha)	Model estimate	1,125	329	199	124	12	73	
	CSO Estimate	1,172	105	167	462	299	45	
	% Difference	-4.0%	+214%	+18.8%	-73.2%	-59.8%	+62.0%	
Average Yield (kg/ha)	Model estimate	1,427	432	949	250	300	475	
	CSO Estimate	949	471	819	250	365	416	
	% Difference	+50%	-8%	+16%	0%	-18%	+14%	
Production ('000 tonnes)	Model estimate	1,605	142	188	31	4	35	950
	CSO Estimate	1,113	49	137	115	11	19	
	% Difference	+44.3%	+188%	+37.7%	-73.2%	-66.9%	+85.1%	

This shows close agreement between model results and the CSO estimates concerning the number of households cultivating maize and sunflower, and cultivated area of maize (and to a lesser extent cotton). At the same time, there is considerable divergence between model and CSO estimates for maize yields (and therefore production), for groundnuts areas and production, and for areas and production of minor crops (although some informed observers question the reliability of the CSO estimates).[51]

[51] As an illustration of the uncertainty over the "real" figures, Ministry of Agriculture figures (taken from the Crop Forecasting Unit / National Early Warning Unit) show communal maize production for 1995/6 of 1,687,000 tons and an average yield of 1268 kg/ha. These figures are much closer to those generated by the models than to those quoted by CSO, but they do include resettlement farmers in the category "communal". CSO figures are based on an annual survey of 2850 communal households, during which enumerators measure crop area, then respondents provide production figures on a recall basis three months or so after harvest.

However, with the exception of small grains, the relative importance of the different crops is correct and, for the minor crops, large percentage divergences represent quite small absolute differences. Small grains are under-represented in the model cropping activities, as the model does not yet properly describe households' strategies for dealing with climatic risk, and small grains are planted at least in part as a strategy for coping with bad years.

Thirteen household types (representing 34% of communal households) are net maize sellers through the course of the year, whilst 29 (66% of communal households) are net maize buyers. The top three household types (8% of the communal population) sell 65% of all maize sold by communal households and the top third (thirteen household types) account for 98% of all maize sales. This is consistent with work by Jayne and Chisvo 1991, Weiner 1988 and others, which found that anything up to 70% of communal households were net maize deficit in a typical year and that the bulk of smallholder maize surpluses were sold by a relatively small proportion of better-endowed households in higher potential areas.

Turning now to income and poverty incidence estimates, agricultural income may be under-estimated by the model, as it ignores production of minor crops, such as pumpkins, scattered and mixed in with the field crops, and of livestock. Comparatively, crop production is generally higher than CSO estimates (as shown in Table 16). The extent of omitted income will vary between households, and will probably be greatest for better-off households with livestock. Poverty incidence was, therefore, estimated by first adjusting income upwards by 25% for each household type[52] and then assuming a log normal distribution for the distribution of household income within each household category, with a coefficient of variation of either 50% or 75%.

Using the poverty line used by Central Statistical Office 1998 for their "Poverty in Zimbabwe" report (based on the 1995/96 ICES survey), the model estimates 81% of communal households being classed as poor and 50-56 % being classed as very poor (depending on the coefficient of variation used in our calculations). This compares with the CSO's own figures of 82% of communal households being classed as poor and 57% being classed as very poor.

Sensitivity Analysis

Varying Maize Prices

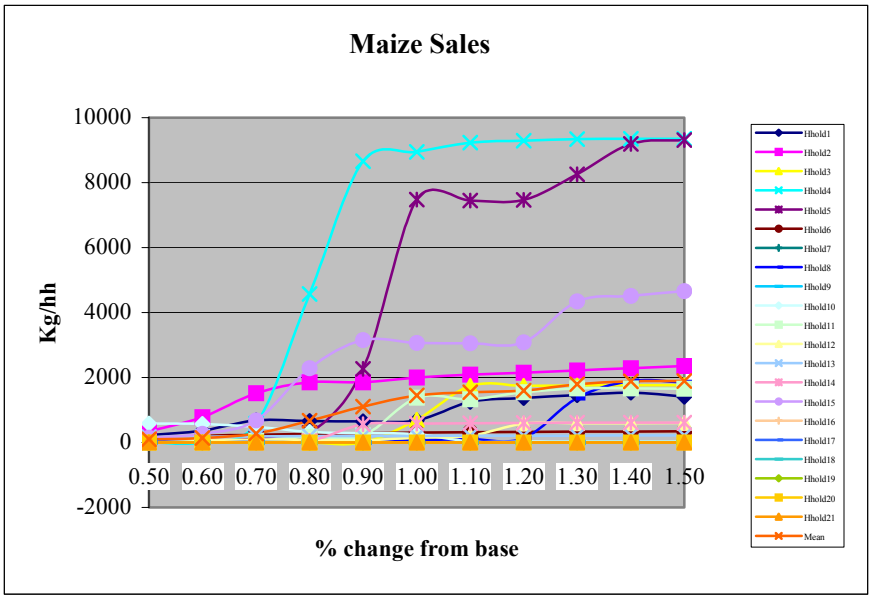
Starting from the base case described above, sensitivity analysis was performed, allowing maize prices to vary from 0.5 to 1.5 times those of the base case.

Within NR1-3 a number of household types increase their maize areas dramatically in response to increasing maize prices. A consequently large aggregate increase is seen in the volume of maize sales as the price rises from 0.5 the base price to the base price, followed by a slower growth in sales volume after the price passes the

[52] The 25% adjustment was chosen on the basis of experience from modelling in Malawi

base level (Figure 20).[53] These simulations suggest a positive maize aggregate supply response, with price elasticity varying across the price range studied, and with different responses by different households - poorer households face severe working capital constraints prior to harvest, constraints which are exacerbated by maize price increases.

Figure 20. Response of Maize Sales to Rising Prices (Natural Regions 1-3)



In NR4-5 mean maize area more than doubled over the simulated price increases reflecting lower yields in NR4-5 compared with NR1-3 and the need to make greater area adjustments to increase maize production. Rising maize prices are good for net income per capita in those households producing surpluses of maize, as they generate higher incomes. Rising maize prices is, however, detrimental to other households who are net buyers of maize. In NR1-3 five household types see net income per capita rise by 10% or more as maize prices rise from 0.5 to 1.5 times the base case, whilst seven types see net income per capita fall by 10% or more. Importantly, these are seven of the eight poorest types in NR1-3. Three household types fail to maintain their basic minimum consumption requirements as maize prices rise above the base level. In NR4-5 the consequences of rising maize prices are more uniformly negative, causing 8 households to reduce maize consumption below minimum required levels.

In NR1-3 as maize prices rise above the base, more household types begin to hire in labour. Total on-farm hired labour demand rises by 25% (and involves 10 households

[53] The reporting format used by the Zimbabwe modelling presents results for NR1-3 and NR4-5 separately. For this reason and because the larger number of households makes reading of figures more difficult, we do not reproduce as many figures here as in Chapter 4. Figure 20 is shown for illustrative purposes.

types) as maize prices reach 1.5 times the base level. At the same time three households types reduce their off-farm labour supply. In NR4-5 only two household types (two of the four cotton producers) hire in any agricultural labour, irrespective of the maize price.

From these simulations it appears that using higher maize prices to stimulate production through greater uptake of existing technologies will benefit almost exclusively better-off households, at least in NR4-5, whilst worsening the poverty and food security situation of (a larger number of) the poorest households. In NR1-3, the negative impacts on poorer households will be offset by "secondary" effects of greater maize production: the tightening of local labour markets through increased demand for hired labour and increased demand for non-tradable goods and services as the incomes of maize surplus producers rise - although the individual livelihoods modelled here cannot show if the positive or negative effects will be more significant for poor household types in NR1-3. However, it appears that efforts to promote maize intensification in NR1-3 should be based primarily on the generation and dissemination of new technologies that permit increased returns to labour at existing (or lower) maize prices. In NR4-5 the primary aim should be to assist households to achieve a greater degree of self-sufficiency. Expanded maize production is unlikely to provide much of a broader stimulus to growth in these areas.

Varying Unskilled Wages

A second set of sensitivity analyses allowed unskilled wages to vary from 0.75 to 1.25 times those of the base scenario. Broadly similar changes are observed in NR1-3 and NR4-5 simulations, with overall positive relationships between wages and labour supply, and negative relationships between wages and cultivated areas, maize production, labour demand and poverty. However, there are marked differences between households, with increased wages allowing some poor households to hire out less labour and to devote more of their labour to maize production on their own land. These results reiterate the importance of increasing wage rates in poverty reduction, although achieving sustainable increases in unskilled wage rates of the magnitude simulated here would take years of expanding economic activity.

Varying Commodity Prices

Finally, we explore the consequences of allowing all crop prices (including maize) to rise from 0.5 to 1.5 times the prices in the base scenario. In general, less poor households gain, as they are able to transfer resources into cash crop production as prices rise, while poorer households are unable to mobilize the resources needed to take advantage of these opportunities. Nevertheless, the direct effects of increased commodity prices are very positive in NR1-3 (a 50% increase in all commodity prices leads to an estimated fall in the poverty count from 49% to 43%), and further gains would be expected from tightening of labour markets (for farm labour and through consumption multipliers). Much smaller direct and second-round effects are estimated in NR4-5 because there are less attractive cropping opportunities, and because a greater proportion of households are constrained by poverty from responding positively to the potential

opportunities. As a result direct effects lead to an estimated fall in the poverty count from 56% to 52%, while on farm labour demand is hardly affected, and second- round gains from tightening labour markets are likely to be small.

Higher crop prices are, therefore, most likely to contribute positively to a strategy for pro-poor agricultural growth in higher potential areas where a significant proportion of households can benefit directly from the higher prices through increased production and sales. Even though these are unlikely to be the poorest households, if they hire in labour as output prices rise and/or invest more of their own labour on-farm, and use their increased income to purchase and consume more locally produced goods and services, it will contribute to a tightening of local labour markets, which in turn will benefit the poorest households, who gain much of their income from hiring out labour. These processes are much weaker in lower potential areas.

6.3. Household Farm and Non Farm Incomes and the Structure of the Rural Economy

As with the Malawi study, the results from the household models were aggregated up to provide information about the structure of the informal rural economy (see Figures 21 and 23).[54] Non-own-farm income is estimated to account for around 60% of total net income in NR1-3 and a little over 70% of total income in NR4-5 (with smallholder agriculture - including income from hired farm labour and from local marketing - accounting for 52% and 32% of total net income in NR1-3 and NR4-5 respectively).

Local non-farm labour demand accounts for just over 50% of the total labour market in NR1-3 in value terms and 64% of the total labour market in NR4-5.[55] This means that in NR1-3 labour 'exports' (remuneration for semi-skilled and skilled labour working, for example, as government, NGO or private sector employees in education, services, estate agriculture, food for work, or selling charcoal or firewood to urban people) account for around 18% of labour earnings and 7% of total income. Equivalent figures for NR4-5 are 26% of labour earnings and 13% of total income gained from labour 'exports'. Hired smallholder farm labour demand accounts for around 12% of the total labour market value in NR1-3 and only 3% in NR4-5.[56]

[54] As in the Malawian analysis, income from locally produced, non-tradable goods and services is considered together with income from exploitation of natural resources for own consumption, leading to some over-estimation of labour exchanges and income. Tradable goods are assumed to account for 75% and 60% of household expenditure in NR1-3 and NR4-5 respectively. A modification from the Malawi structure is an allowance for 25% of crop marketing margins to be retained in the informal rural economy as part of non-farm income.

[55] It should be noted that these proportions are in values, and the proportion of hired days used for farm labour would be considerably higher, due to its low wage relative to skilled and semi-skilled labour.

[56] The proportion of labour demand accounted for by farm labour demand will of course vary between seasons.

Figure 21. The Informal Rural Economy, NR1-3 (Income Flows in Million Z$)
(percentages of total income)

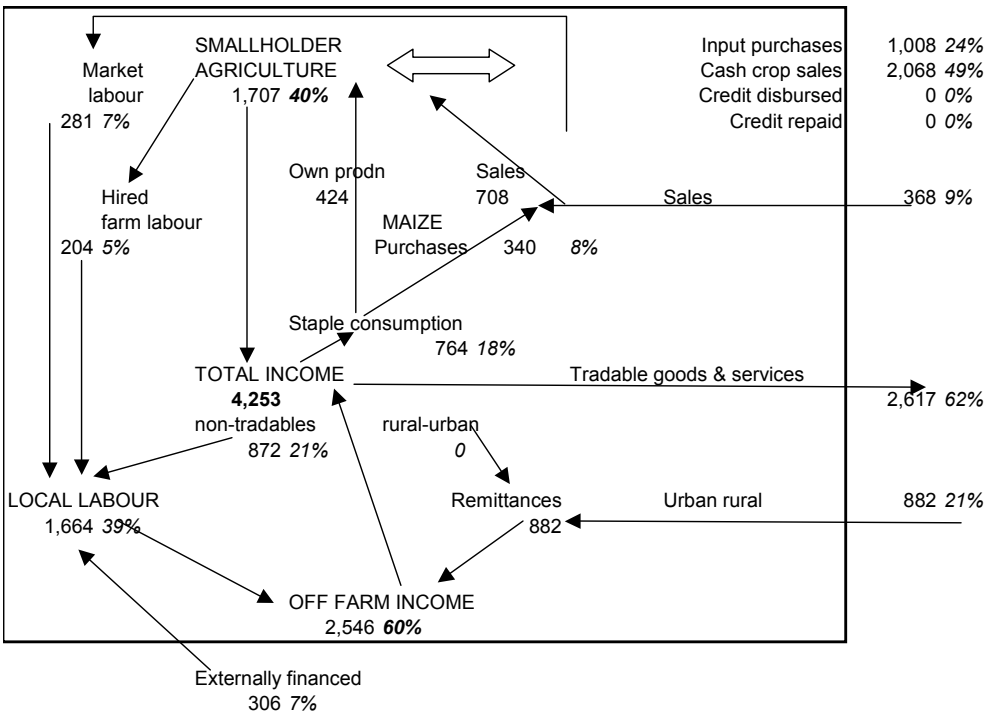
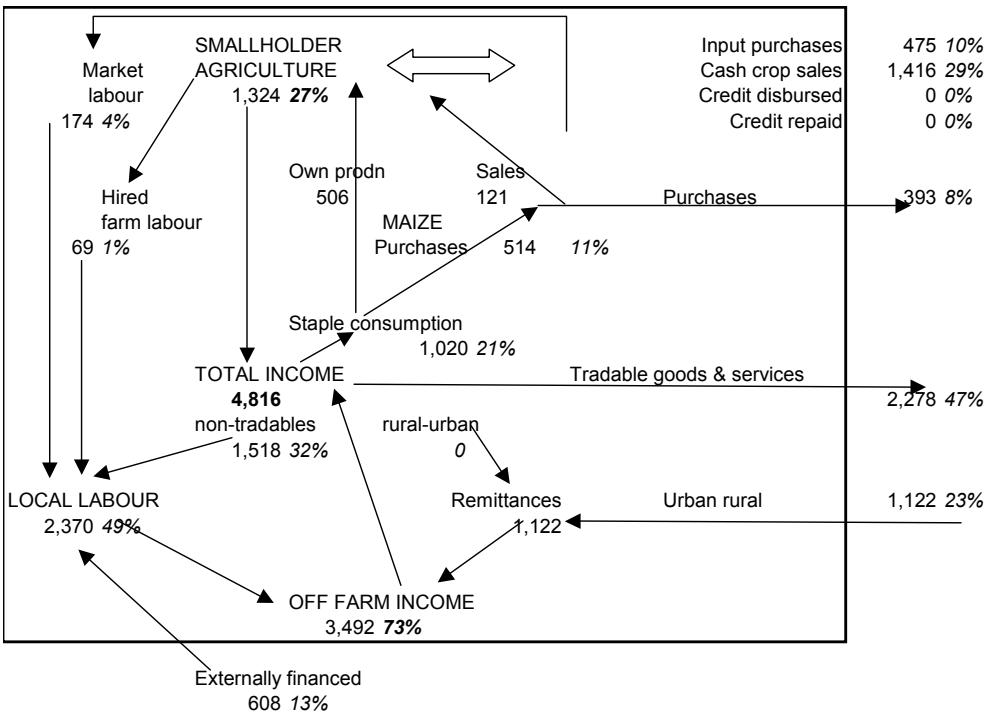


Figure 22. The Informal Rural Economy, NR4-5 (Income Flows in Million Z$)
(percentages of total income)



However, as in the Malawi analysis, these figures demonstrating the high proportion of income derived from non-farm sources do not provide a true picture of the importance of the agricultural sector for two reasons. First, the model does not attempt to include income from livestock production. This inclusion would raise the relative importance of agriculture. More fundamentally, however, much of the non-farm income is itself dependent on labour demanded in the supply of services to households who have derived a significant part of their income from agriculture. If we again apply the distinction between 'driver' and 'supporter' income sources to the data in Figures 20 and 21, 'driver' income (net farm income, agricultural marketing income, on-farm labour hire, labour exports and remittance income) accounts for just under 80% of total net income in NR1-3 and just under 70% in NR4-5. Smallholder agriculture accounts for around 65% of this driver income in NR1-3 but only 48% in NR4-5). The remaining driver income is derived from remittances and from labour 'exports', made up of formal and informal employment and transfers. The principal sources of employment will be commercial agriculture and rural non-farm enterprises producing tradable goods (firewood, charcoal, crafts, etc), and government and NGO activities. NGOs pay employees who provide services to and on behalf of these organizations and also provide transfer payments to the wider rural population. Increases in remittances, and government and NGO expenditure cannot be considered as *local* sustainable growth drivers in the rural economy. If, for the purposes of argument, 50% of the 'labour exports' is made up of employment in agricultural and non-agricultural enterprises producing tradable products, then smallholder farm income would account for around 90% and 80% of the potential growth stimulating income in NR1-3 and NR4-5 respectively.

Rough though these figure may be, they demonstrate even more dramatically than the Malawi analysis that even where farm income is a small proportion of rural incomes (30% to 40% estimated here), it does not mean that it is unimportant in the rural economy and in rural growth strategies. Smallholder agriculture may still be, by far, the dominant local activity with potential to drive economic growth. Taken together with earlier conclusions about the differing potential for smallholder agricultural growth in the NR1-3 and in NR4-5, this conclusion offers hope and a stimulus for greater efforts in promoting smallholder agricultural growth in NR1-3, whereas for NR4-5 it emphasizes the great difficulties in identifying strategies for growth and poverty reduction. Longer-term poverty reduction requires improved access for poorer households to other employment opportunities.

6.4. Principal Conclusions

The work described in this chapter complements and extends the micro-economic analysis on Malawi described earlier in Chapter 4, by investigating similar issues in a situation where livelihoods are structured slightly differently and, in NR4-5, where agricultural potential is lower.

Conclusions from the Malawi work that are supported by the Zimbabwean analysis include the need for pro-poor growth policies to address severe seasonal finance

constraints affecting the poor and their ability to respond to improved cropping opportunities, the importance of wages and maize prices to the poor, and the importance of both own-farm and non-farm activities to the livelihoods of the poor in both high and low potential areas. Thus, although non-own-farm income accounts for around 70% of most poorer households' incomes, smallholder agriculture is still the most important sector underpinning the rural economy, with remittances also of major importance, particularly in the lower potential areas. Smallholder agriculture plays a critical role in promoting household food security and in, directly and indirectly, tightening labour markets (holding up wages and employment opportunities).

In higher agricultural potential areas where there is a greater likelihood of second round wage effects from agricultural growth, promotion of institutional changes to assist uptake of labour demanding technology appears to be a viable poverty reduction strategy. In lower potential areas achieving such change is more challenging and will have more limited impact. In such areas agricultural development can and should play an important role in improving food security, although significant agricultural growth is unlikely. It is, however, difficult to identify alternative pro-poor growth drivers within the rural economy. Significant pro-poor growth is, hence, more likely to be achieved by policies that stimulate labour-demanding growth elsewhere in the national economy and improve access to national and international migrant labour opportunities.

7. CONCLUSIONS

The study described in this paper set out to enhance the understanding of the role of institutional, micro-economic, macro-economic, and international factors in determining the scope for pro-poor agricultural growth and to identify appropriate policy initiatives to address related constraints. This objective was approached by developing a number of hypotheses regarding (a) challenges and constraints to pro-poor agricultural growth in poor rural areas at the start of the 21st century, (b) general processes involved in and necessary conditions for pro-poor agricultural growth, and (c) policies needed to promote pro-poor agricultural growth.

A variety of different analytical techniques were developed and used to test these hypotheses: reviews of global and case study country experience with success and failure in achieving pro-poor agricultural growth; econometric analysis of changing impacts of different types of government spending over the last 40 years in India; and micro-economic and economy-wide modelling of more recent challenges and opportunities facing pro-poor agricultural growth in Malawi and Zimbabwe. Specific findings from these different parts of the study have been detailed in earlier chapters of this report. In this concluding chapter we draw these apparently disparate studies (using different analytical methods and approaches in different continents, contexts and time periods) together to demonstrate a coherent set of conclusions. We consider in turn lessons that they provide regarding (a) general processes of pro-poor agricultural growth, (b) necessary conditions for pro-poor agricultural growth, (c) policies for promoting pro-poor agricultural growth, and (d) challenges which such policies must overcome if pro-poor agricultural growth is to be achieved in today's poor rural areas.

7.1. General Processes of Pro-Poor Agricultural Growth

All five studies (reviews, Indian econometric study, Malawi livelihood modeling, Malawi CGE modeling, and Zimbabwe livelihood modelling) generate similar findings about the importance of smallholder agriculture development (with institutional support to labour demanding technical change) in driving growth in poor rural areas. They also highlight the limitations of such growth on its own in driving poverty reduction. In some areas, agriculture may not have the potential to drive much growth. Even where such potential exits, widespread and significant poverty reduction will only be achieved when this initial agricultural growth stimulates rapid growth in rural non-farm employment. This requires significant economic structural change and depends heavily upon second-round effects and growth multipliers in the local economy. These second-round effects and growth multipliers in turn depend critically on the loosening of staple grain markets and the tightening of labour markets. As noted in the Malawi and Zimbabwe studies, however, there is very little information about rural labour markets in Africa. Therefore, policy makers need to be better informed about the extent and policy implications of personalized rural labour relations and of inelastic labour supplies during periods of peak agricultural labour demand.

The recognition of the importance of second-round effects has implications for policy analysis and formulation, as it emphasizes differentiated micro-economic policies that will often offer direct, first-round benefits to less poor people. The policy context must then ensure that these occur in such a way (and on a sufficiently wide scale) that they either significantly tighten markets which the poor can supply into (for example unskilled labour markets) or significantly loosen markets from which they buy (for example staple food markets). Where policies have adverse impacts on these markets, then compensatory measures must be put in place.

7.2. Necessary Conditions for Pro-Poor Agricultural Growth

Three common factors emerge from the different studies as important elements for pro-poor agricultural growth:

- improved market access, which leads to reduced marketing margins allowing higher farm gate prices, and requires improved communications, institutional development, and higher traded volumes;
- technical change, which must have a significant impact, increasing both land productivity and labour demand, and which must be accessible to large numbers of producers; and
- transmission of the benefits of such change to the poor through production and consumption linkages that tighten labour markets. Strong consumption linkages will be promoted by rural people having high marginal budget shares for non-tradable goods and services with highly elastic supply and a large unskilled labour cost component. Strong production linkages will be promoted by upstream and downstream linkages with the same supply characteristics.

7.3. Policies for Promoting Pro-Poor Agricultural Growth

A clear theme running through the different elements of the project is the importance of structural change in the relations between the farm and non-farm sectors, and this requires policies that evolve to promote institutional development appropriate to different stages of growth. These policies should address the necessary conditions identified above. Policies must promote access not only to output markets but also to input markets and to credit services needed to purchase inputs. Technology development and extension also has a critical role to play. Careful sequencing, design and implementation of investments is also needed to (a) put in place critical base conditions (such as infrastructure, technology, and equitable and secure access to land), (b) ensure that complementary markets, services and conditions develop together, and (c) prevent policy implementation and benefits being subverted and captured by special interest groups.

Another theme that is picked up in different ways in the different studies is the extent to which growth and poverty reduction policy objectives are complementary or competitive. The Indian study showed that, with the very large productivity increases

achieved in the green revolution, there was a high degree of complementarily between poverty reduction and agricultural growth: investments that were 'good buys' for poverty reduction were also 'good buys' for stimulating agricultural growth (see Table 1). The Malawian livelihood models demonstrated a different sort of complementarily as poor households' liquidity problems during the hungry gap were shown to be both a major problem for poor households, an important contributor to low labour productivity, and a significant factor increasing off-farm labour supply and hence depressing wages. Measures that address this liquidity problem therefore have the potential to deliver a double bonus in growth and immediate welfare gains for the poor (see for example Tables 8 or 14). Feeding results from the livelihood models into the Malawian CGE model only partially captured the dynamics of this liquidity constraint, but despite this, and with only limited productivity increases available from technical change in rain fed maize production, all simulated policy scenarios, except for one, improved the welfare of poor households and increased agricultural GDP, though mostly at the cost of reduced non-agricultural GDP. Only for the two scenarios that involved very substantial (probably unrealistic) increases in productivity did the increase in agricultural GDP outweigh the fall in non-agricultural GDP (see Table 14).

The importance of structural change and second-order market processes in pro-poor growth demands change on a sufficiently large scale and time period to significantly change prices in unskilled labour markets. This poses many challenges, as large scale and long-term interventions and subsidies carry significant risks (of being ineffective, or even damaging, and of being subverted). They also have high fiscal opportunity costs (for example in reduced investment in education or health care) and risks (of, for example growing out of control and being fiscally damaging and unsustainable). These issues are particularly acute in small countries with permeable land borders. The need for large-scale structural change does not mean, however, that policies cannot be targeted. It is essential that expenditures are targeted on geographical areas and on economic actors and activities which will yield the highest pro-poor growth returns. Such targeting, however, faces both technical and political challenges, and must be accompanied by transparent measures and strategies to spread the benefits of growth, without diluting them.

7.4. Challenges to Pro-Poor Agricultural Growth

The discussions in the previous pages of the general processes of pro-poor agricultural growth, of necessary conditions for such growth, and of policies to promote it have highlighted a number of challenges, including the large scale of structural change and wide scope required (involving technical, infrastructural and institutional change; input, output, financial and labour market development; farm and non-farm growth); difficulties in getting technical change to deliver the productivity increases that are required to generate sufficient returns to the large investments required; technical and political issues in designing and implementing long term, targeted, transparent, efficient and flexible policies, particularly in small countries with limited resources. We now consider in more detail some of these challenges and others raised in different parts of the study.

First, a clear lesson from all the different elements of the study is that pro-poor agricultural growth needs technical change that will deliver substantial labour-demanding productivity gains. Such technical change underpinned the reduction in poverty achieved by the green revolution in Asia. The livelihood modelling in Malawi and Zimbabwe and the CGE modelling for Malawi all reiterate the fundamental need for large productivity gains to drive pro-poor agricultural growth. Yet as noted in Chapter 2, one of the reasons that today's poor rural areas have not undergone an agricultural transformation and are still poor is that they face much greater technical challenges in raising productivity. In this context, water management and the lack of irrigation are central issues. Developing technical solutions that deliver sufficient productivity gains and identifying what is a 'sufficient' productivity gain in different circumstances are pre-requisites for investment in pro-poor agricultural growth.

Another challenge that is highlighted particularly in the Malawi CGE analysis and in the discussion of poverty reduction in India is continued rapid population growth swelling the ranks of unskilled labour and, in the absence of more rapid growth, decreasing wages and increasing poverty.

Increasing openness of national markets offers substantial potential economic benefits in terms of consumer gains from lower cost and higher quality products, but it also reduces multipliers and linkages. The extent, to which rural and national multipliers may have fallen over the last 15 years, and the effects on growth of any decline in these multipliers, is under-researched. It is an important issue that needs to be considered in the design of pro-poor agricultural growth strategies. A related issue is the difficulties faced in introducing subsidies in small states with large permeable land borders with large potential cross-border leakages.

Many poor rural economies carry with them experience of failed agricultural growth strategies from the past. These often involved expensive subsidies and large agricultural parastatals, which were a major contributor to the fiscal crises of the 1980s, from which many have not yet recovered. This experience is a salutary warning to renewed attempts to introduce such policies without (a) ensuring that they serve the needs of viable technical change (as discussed above); and (b) devising new and effective mechanisms preventing the fraud, patronage, inefficiency and ineffectiveness of the previous systems. However, such experience can also give incentives to policy makers and analysts to write off policies needed to promote pro-poor agricultural growth, and encourage venal politicians and bureaucrats to push for a return to the old systems with their opportunities for personal gain and patronage.

The large-scale financial resources needed to achieve pro-poor agricultural growth is another major challenge. The costs needed for success are likely to be higher in today's poor rural areas as compared with the green revolution areas of the 20th century (as outlined in Chapter 2.2 and above), so the risks of failure are greater, and the opportunity costs (in terms of lost expenditure in health and education for example) higher.

What happens if these challenges cannot be met? Many of today's poor rural areas do not have the necessary base conditions (such as infrastructure, productive labour demanding technology, and equitable and secure access to land), which will require time to be developed. Some areas do not have the basic agricultural potential to support the productivity increases needed for agriculture to drive wider growth. Although agriculture may not be able to drive growth in the near or foreseeable future in such areas, in the absence of non-agricultural pro-poor growth drivers it still has a vital 'livelihood protection and enhancement' role to play: in supporting people's existing livelihoods—promoting food security, providing significant income flows, and holding up labour markets and the non-farm economy as outlined in Box 1—and in maintaining the natural resource base.

Policies and investment in this 'livelihood protection and enhancement' role for agriculture should not be so demanding as those required for pro-poor agricultural growth, in terms of minimum scale, impact, coordination or institutional capacity needed for success. Nevertheless, significant investments will still be needed to develop appropriate technologies, to facilitate coordinated service provision for smallholder farmers, and to encourage a more secure and favourable political and economic environment conducive to agricultural and rural investment. The returns to these investments need to be analyzed against the costs of livelihood and natural resource failure in these poor rural areas, and the human and fiscal costs of these rural communities' becoming increasingly dependent on long-term welfare support and emergency relief.

APPENDIX

$$MaxE \quad (U) = \sum_{s} P_s \prod_{j*m} (C_{jm} - \gamma_{jm})^{\beta_{jm}} \tag{1}$$

such that

for m = 1 to 2

$$-t_{jm} + t_{j(m+1)} + \sum_{ij} e_{ijm} x_i + C_{jm} \leq 0 \tag{2}$$

for m = 3 to 4

$$-t_{jms} + t_{j(m+1)s} + \sum_{ij} e_{ijms} x_{is} + C_{jms} \leq B_{jm} \tag{3}$$

for m = 4

$$-t_{j(m+1)s} = t_{j(m=1)} \tag{4}$$

where

m are periods within a year: m = 1 describes the 'cropping period' (November to January); m = 2 describes the 'pre-harvest period' (February and March) ; m = 3 describes the 'harvest period' (April to June); and m = 4 describes the 'post harvest period' (July to October).

s are alternative market conditions as regards end of season maize prices (in periods m= 3 and m= 4)

P_s are subjective probabilities of alternative market conditions s

C_{jm} represent total consumption of commodity/ resource j in period m

γ_{jm} are minimum consumption requirements for commodity/ resource j in period m

β_{jm} are the marginal propensities to consume commodity/ resource j in period m

t_{jms} represent transfers of commodity/ resource j from period m to period $m+1$ in market condition s

e_{ijms} are technical and price coefficients of use/ production of resource / commodity j by activity x_{is} in period m under market condition s

x_{is} are activities undertaken by the household. These include cropping activities, buying and selling of stocks and labour, and stock transfers between periods. For those activities which take place wholly in periods 3 or 4 these are distinguished according to the market condition s under which they are followed.

B_{jm} are supply constraints on commodity/ resource j in period m

Commodity/ resource j includes land, labour, cash stocks, maize stocks, purchased crop inputs, and post harvest cash crop stocks.

$j^* m$ is the subset of commodities/ resources directly consumed by the household and for which consumption is included in the objective function: cash consumption by period, consumption of maize (or calorific equivalents from other crops) by period, leisure ('slack' labour) by period, and end of season cash savings.

Equation 1 maximizes expected utility using a Linear Expenditure System (LES). Equations 2 and 3 describe constrained resource use and production opportunities in different periods, with buying and selling of commodities and resources for which there is a market, stock transfers between periods, and household consumption. Equation 3 allows for alternative stocking, market and off farm employment strategies to be followed under different maize price regimes in the harvest and post harvest periods, and to this extent allows for some embedded risk.[57] Equation 4 ensures that the model maintains the same opening and closing stocks from year to year and does not generate artificial windfall gains by portfolio changes.

The model also included upper bounds on some activities to represent practical constraints not allowed for in the general formulation, for example, the effects of limited maize storage capacity, of timing of activities within time periods (activities at the beginning of the cropping period cannot be supported by outputs from activities at the end of that period) and constraints on specific activities (for example transport, labour and market constraints preclude large scale sales of root crops).

[57] To reduce the complexity and size of the model it does not allow for uncertainty in yields, or the effects of, for example, sickness on labor and cash availability, although these are likely to be important considerations, particularly for poorer households ([Dorward, 1997 #53], [Dorward, 1999 #16]).

Table A.1. SAM Accounts Disaggregation

Main account	Level of disaggregation	Description of disaggregated accounts
Agricultural **Activities (8)**	AMAIZ	Maize production
	ATOBAS	Small-scale tobacco production
	ATOBAL	Large-scale tobacco production
	AOAGDOMS	Other domestic small-scale agricultural
	AOAGDOML	Other domestic large-scale agricultural
	AFISH	Fishing
	ALIVE	Livestock
	AFORE	Forestry
Manufacturing activities (8)	AMEAT	Meat processing
	ADAIR	Dairy processing
	AGRAI	Grain milling
	AOFOOD	Other food processing
	ATEXT	Textiles
	AWOOD	Wood manufacturing
	ACAPI	Capital goods
	AOMAN	Other manufacturing
Industrial Activities (3)	AMINE	Mining industry
	AELEC	Electricity generation industry
	ACNST	Construction industry
Service Activities (3)	ADIST	Distribution services
	APUBS	Public services
	APRVS	Private services
Commodities (20)	Agricultural (6)	Agricultural commodities
	Manufacturing (8)	Manufactured commodities
	Industry (3)	Industrial commodities
	Services (3)	Services
Factors (5)	LANDS	Small-scale land
	LANDL	Large-scale land
	LAB-SK	Skilled labour (with middle to high education)
	LAB-USK	Unskilled labour (with no or low education)
	CAP	Capital
Households (8)	HRAGR12	Rural agric. households with < 1.0 ha of land
	HRAGR34	Rural agric. households with 1-5 ha of land
	HRAGR5	Rural agric. households with > 5 ha of land
	HRNAG-USK	Rural non-agric. households with skilled labour
	HRNAG-SK	Rural non-agric. households with un-skilled labour
	HUAGR	Urban agric. households
	HUNAG-USK	Urban non-agric. households with un-skilled labour
	HUNAG-SK	Urban non-agric. households with skilled labour
Other Institutions (2)	GOV	Government account
	ROW	Rest of the world account
Taxes (5)	Export taxes	Export taxes
	Import taxes	Import taxes
	Sales taxes	Sales taxes
	Factor taxes	Factor taxes
	Direct taxes	Direct taxes

Table A.2. Economic Structure in 1998

Sector	Value-added share	Production share	Employ-ment share	Export share	Export-output share	Import share	Import-demand share
Maize	8.7	6.4	22.8	0.5	1.9	7.6	27.3
Tobacco	5.7	7.8	8.2	55.6	99.4		
Fishing	0.5	0.4	2.0	0.0	1.9	0.0	2.9
Livestock	1.0	1.3	3.0			0.0	0.7
Forestry	1.2	0.9	4.6				
Other agric.	18.4	14.3	48.1	15.8	23.9	0.4	1.7
Mining	1.3	0.9	0.3				
Meat	0.7	1.5	0.1	0.0	0.4	8.4	63.2
Dairy	0.6	0.6	0.1			0.5	25.4
Grain milling	2.9	10.6	0.3	0.2	0.5	5.3	14.0
Other food	3.2	3.4	0.3	7.5	41.1	3.3	35.1
Textile	1.0	2.0	0.1	7.6	89.5	9.6	94.2
Wood	1.0	1.6	0.2	0.7	10.3	1.6	28.3
Capital goods	2.1	2.8	0.3	1.9	14.7	17.9	71.4
Other manufac.	4.8	6.1	0.3	1.6	5.9	23.6	57.1
Electricity	1.5	2.3	0.1				
Construction	2.1	3.8	0.2				
Distribution serv.	16.0	11.6	3.2				
Public services	9.2	6.6	2.4				
Private services	18.0	15.0	3.4	8.4	12.6	21.7	33.8
TOTAL	100.0	100.0	100.0	100.0	17.4	100.0	28.2
Total agriculture	35.7	31.0	88.6	72.0	36.4	8.1	11.1
Total non-agric.	64.3	69.0	11.4	28.0	8.8	91.9	32.2

Source: Calculations from 1998 Malawi SAM.

Table A.3. Unskilled Labour—Activity Demand And Wages

	BASE	CASH52	CASH100	WEDG50	WEDGCRD	INPSUB20	INPSUB10
Labour demand by activity							
Maize	*1.5*	0.987	0.978	0.968	0.968	1.002	1.005
Small-scale tobacco	*2.7*	0.994	0.988	1.055	1.053	1.075	1.036
Large-scale tobacco	*3.1*	0.979	0.963	1.036	1.025	0.977	0.989
Small-scale other agric.	*1.5*	1.013	1.022	1.012	1.017	0.998	0.997
Large-scale other agric.	*1.8*	0.999	0.998	0.996	0.988	0.987	0.993
Use (intensity) maize[1]		-1.3	-2.2	-3.2	-3.2	0.2	0.5
Use (intensity) tobacco[1]		-0.6	-1.2	5.5	5.3	7.5	3.6
Economy-wide wage[1]		-0.9	-1.6	2.4	3.2	0.3	0.1

Note: The BASE column shows annual growth rates 1998-2008 (%). The other columns show the ratios between terminal year (2008) variable levels for the simulation in question and for the BASE. (I.e., for maize and the scenario WEDGCRD, a value of 0.969 indicates that in 2008, the level for this variable is 3.1% lower under this scenario than for the BASE.)

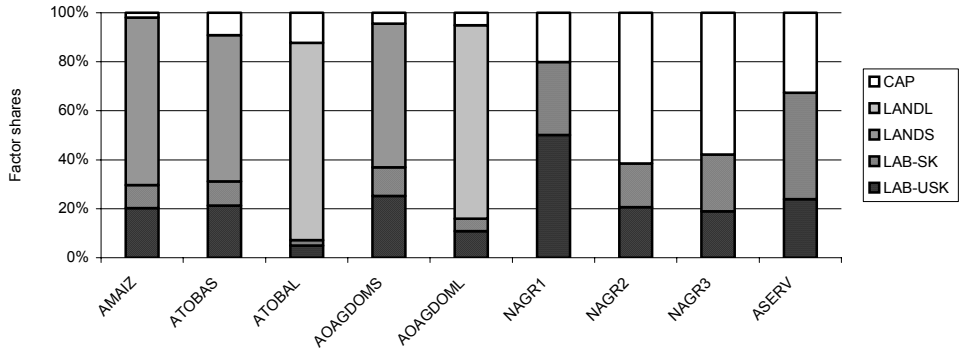
[1] %age change, last period of simulation as compared to last period of the base scenario.

Table A.4: Small-Scale Land Demand by Activity

	BASE	CASH52	CASH100	WEDG50	WEDGCRD	INPSUB20	INPSUB10
Maize	*-0.05*	0.990	0.981	0.970	0.948	0.992	0.999
Small-scale tobacco	*1.07*	0.995	0.992	1.072	1.094	1.078	1.036
Small-scale other agric.	*-0.07*	1.014	1.026	1.029	1.056	1.000	0.997

Note: The BASE column shows annual growth rates 1998-2008 (%). The other columns show the ratios between terminal year (2008) variable levels for the simulation in question and for the BASE. (I.e., for small-scale tobacco and the scenario WEDGCRD, a value of 1.043 indicates that in 2008, the level for this variable is 4.3% higher under this scenario than for the BASE.) Total small-scale and large-scale land areas used are constant over the simulation period 1998-2008.

Figure A.1. Activity Factor Shares in the Base



Note: ***CAP*** *= Capital;* ***LANDL*** *= Land large-scale;* ***LANDS*** *= Land small-scale;* ***LAB-SK*** *= Labour skilled;* ***LAB-USK*** *= Labour unskilled*
NAGR1 *(Non-crop agriculture) = Fishing, Livestock, and Forestry, also including Mining;*
NAGR2 *(Food processing) = Meat, Dairy, Grain milling and Other food;*
NAGR3 *(Other industry) = Textile, Wood, Other manufacturing, Electricity and Construction;*
ASERV *(Services) = Distribution, Public, Private*

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