

Bhutan

Agricultural sector review

Volume 1

Issues, institutions and policies



FAO INVESTMENT CENTRE

COUNTRY HIGHLIGHTS





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TABLE OF CONTENTS

Acknowledgements	iv
Acronyms	v
Executive Summary	vi
1 Introduction	1
2 Sources of agriculture sector growth	6
3 Agricultural markets – constraints and opportunities	15
4 Farm input supply – public or private?	27
5 Rural labour markets and migration	37
6 Research and extension – priorities and linkages	43
7 Policy and planning issues	57
8 Conclusions and implications for future planning and investment	64
References	67



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This publication is composed of two volumes. Volume 1 looks at the issues, institutions and policies involved in the agricultural sector of Bhutan (Author: Garry Christensen); whereas Volume 2 consists of two working papers that review the marketing and labour situation (Author: Aidan Gulliver) as well as the research, extension and input supply systems (Author: Turi Fileccia) of the RNR sector.



ACRONYMS

ABSD	Accelerated Bhutan Socio-Economic Development
AMC	Agricultural Machinery Centre
AI	Artificial insemination
BAFRA	Bhutan Agriculture and Food Regulatory Authority
BDFC	Bhutan Development Finance Corporation
BEA	Bhutan Exporters' Association
CA	Commission agent
CoRRB	Council for RNR Research of Bhutan
CPS	Country Partnership Strategy
DAMC	Department of Agricultural Marketing and Cooperatives
DSC	Druk Seed Corporation
DoC	Day old chicks
DRDP	Decentralized Rural Development Project (World Bank)
EA	Extension agent
FAO	Food and Agricultural Organization of the United Nations
FCB	Food Corporation of Bhutan
FYP	Five-Year Plan
GDP	Gross Domestic Product
GNH	Gross National Happiness
IFPRI	International Food Policy Research Institute
MHV	Mountain Hazelnuts Venture
MoAF	Ministry of Agriculture and Forestry
NPPC	National Plant Protection Centre
NSB	National Statistics Bureau
NSC	National Seed Centre
OGTP	One geog three products
OSS	One-stop shops
RC/RDC	Research Centre/Research and Development Centre
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources [sector]



EXECUTIVE SUMMARY

Bhutan's ability to increase Gross National Happiness (GNH) is highly dependent on the performance of its Renewable Natural Resources (RNR) sector, of which agriculture is a major component. Food security, employment, export earnings, poverty reduction and the welfare of rural people are all heavily influenced by RNR sector growth and development. Keenly aware of the RNR sector's importance, the World Bank has agreed with the Royal Government of Bhutan (RGoB) to actively support the sector's development as part of its Country Partnership Strategy (CPS) for 2011-2014.

This support, which will involve a combination of investment and policy analysis, was initiated in January 2011 with a review of key agricultural issues. The objectives of the review are to: contribute to the debate associated with the mid-term review of the 10th FYP, identify issues that warrant attention in the next (11th) FYP, and to identify potential areas of World Bank support for discussion with the RGoB. Given the government's considerable experience with strategic planning and its strong ownership of the planning process, the review is reflective rather than prescriptive and is intended to serve as the basis for discussing how best to direct World Bank support.

Slow aggregate growth disguises significant structural change

Bhutan's RNR sector continues to grow slowly, despite its potential for high-value fruit and vegetable production and exports, proximity to large, readily accessible export markets and extensive support from government institutions. Annual growth averaged 2.2% in real terms from 2000-2009. The main sub-sectors (crops, livestock, and forestry) grew at similar rates and there was little variation between years.

A better understanding of the determinants of growth emerges when reported crop sector growth is broken down into commodity groups. Strong, positive growth occurs among the high value fruit and vegetable crops that dominate commercial agriculture and agricultural

exports, versus a decline in the cereal crops that account for staple food production. Further decomposition by commodity shows that citrus and potatoes have been the main sources of growth due to their high growth rates and high contribution to crop sector gross domestic product (GDP). High value vegetable crops such as chilli, cardamom, mustard, pulses and ginger have also grown strongly, although their contribution to overall crop sector growth is modest due to their low share of crop sector GDP. In contrast, the GDP contribution of maize, paddy, wheat and barley – the main food staples – has declined substantially and this decline has accelerated since 2007. As these cereal commodities together account for approximately 40% of crop sector GDP, their weak performance has severely compromised overall crop sector growth rates.

Rural roads are a necessary but insufficient condition for growth

Investment in rural roads is a large and critical component of the 10th FYP. The differing production trends for cereals versus fruit and vegetables show that farmers do respond to the increased market opportunities for cash crops created by the expansion of rural roads, while cereal production does not increase in response to better access to markets. Most cereal is produced for on-farm consumption. In fact, the incentive to raise cereal production and generate a market surplus may be reduced by the strong competition from low-priced rice imports from India.

As the rural road network expands, this divergence in the growth trajectories of cereal crops versus fruit and vegetable production will widen. More farmers will have access to markets for fruit and vegetables, and low price rice imports will penetrate deeper into the rural areas. This divergence needs to be given greater weight in future policy and planning. As the production of low value cereal crops such as maize and rice is largely for on-farm consumption, research and extension activities should put more emphasis on ways to make it easier for farmers to produce an adequate food supply through measures to reduce the high crop losses caused by wild animals and other pests and diseases, and to reduce high post-harvest losses. Equally important, these results highlight the need to resolve the serious disease problems that currently threaten key

cash crops such as citrus, potatoes and cardamom, as well as the need to strengthen agricultural markets. In other words, much more attention should now be focused on the “second order” constraints that limit the response to investment in farm roads.

Weak marketing institutions limit the growth of commercial agriculture

Of the various “second order” constraints, weak marketing institutions are among the most important. Bhutan’s small, dispersed rural population, mountainous terrain and subsistence-oriented farming systems render the development of competitive production and marketing systems difficult. At the domestic level, market infrastructure and wholesale systems are largely absent. Although the 10th FYP recognizes the need to address this constraint, it continues to rely heavily on the marketing activities of public agencies such as the Food Corporation of Bhutan (FCB). Private sector activity is weak, and dominated by foreign buyers and assemblers where it does exist. Recent RGoB initiatives to promote farmer cooperatives and contract farming have yet to make an impact.

These constraints are slowing the commercialization of agriculture. A limited number of farmers is engaged in market activity, with 10% of farmers accounting for 73% of all crop sales in 2008. The market surplus for cereals and the fruit and vegetable crops produced for domestic markets is very low at 3.6% and 5-10% respectively. A much higher market surplus (50%-70%) is observed for the major export crops: potatoes, oranges, apples, spices and off-season vegetables. But the growth of export crop production and sales could be much higher given better marketing systems and lower post-harvest losses.

Numerous opportunities for increased sales of agricultural commodities

There is significant potential for commercial agriculture, particularly for exports. First, Bhutan’s climate facilitates the production of off-season fruits and vegetables for sale to India. Crops produced during May to October are readily sold in India as this period coincides with the Indian monsoon, when temperatures at lower latitudes

are too high for temperate crops. Second, Bhutan benefits from an almost completely open trade regime with its two neighbours and trading partners, India and Bangladesh, which affords ready access to two huge markets. These trade agreements also render Bhutan open to competition from imports, however, particularly from November to April when low cost Indian fruit and vegetable commodities dominate the market. Indian rice imports also account for approximately 50% of total rice consumption.

The domestic market is a small, challenging place to do business, as indicated by the low market surpluses of fruit and vegetables. Of the total population of 696,000 people, 70% live in rural areas and produce most of what they consume. The remaining 215,000 people who live in urban centres are thus the main source of demand. Moreover, while Bhutanese products account for most of the fresh fruit and vegetables sold for the six months from May to October, low-priced Indian imports become a major source of competition during November to April. Demand on domestic markets is growing nevertheless due to rising disposable incomes and an increasing consequent demand for higher value fruit, vegetable and animal products, and for rice.

Farm input supply – public or private?

There are two quite different components of the farm input supply system: a large, well developed system of public agencies with stagnant or declining input distribution and a small but rapidly growing private sector. The poor performance of the public agencies that currently dominate farm input supply contributes to the low use of modern farm inputs and low consequent agricultural productivity.

Public agencies are responsible for the sale and distribution of fertilizer, plant chemicals, seeds for field crops and seedlings. Inorganic fertilizer use is low and declining. Some 37% of households reported the use of chemical fertilizers in 2008, but reported application rates are very low at 4.6 kg N, 0.5 kg P and 0.7 kg K per hectare in 2005. Sale of the main fertilizers, urea and suphala, declined by 24% and 13% respectively, from 2005-2006 to 2009-2010. Only 16% of farmers used pesticides in 2008. The use of plant protection chemicals is increasing, however, due to their relatively low cost, ease of transportation and high impact

– especially for fruit and vegetable production. The public distribution and sale of seed and seedlings is also low and declining, with the sale of cereal and legume seed falling by 19% from 2005-2006 to 2009-2010. Although this decline is due to poor management of the (former) seed multiplication and distribution system, even at its peak the national system for seed production supplied less than 10% of the total seed requirement for the country due to limited capacity.

The public agency responsible for promoting agricultural mechanization and distributing farm machinery has also had limited success, despite over 20 years of support from the Japanese government. Approximately 8% of farmers reported using a power tiller in 2008, and only 3% owned one. The majority of farmers continue to rely on bullocks. Such low adoption rates after more than 20 years of support suggest the need for vigorous review of the mechanization programme, especially given that further Japanese support is unlikely after 2012. Nevertheless, the Ministry of Agriculture and Forestry (MoAF) has recently begun to trial group power tiller ownership schemes. Evidence from other countries suggests that the use of mechanized cultivation tends to be wider and more sustainable where it is based on increased access to private hire services provided by individual contractors. There may be more potential to promote the mechanization of small-scale food processing.

A small but dynamic private farm input supply sector has evolved recently in response to the growth of commercial farming and the limitations of the public input supply agencies. Currently it is concentrated around the production and sale of animal feed, vegetable seeds and breeding stock for poultry and pig farms – activities where public agencies are either absent or unable to meet the demand from commercial farmers. There is a clear need for increased private sector activity to fill the gap created by the weak performance and capacity of public input supply agencies. However the RGoB will need to promote the private sector's role more explicitly and public agencies will need to scale back their activity in areas such as fertilizer supply in order to create a more conducive environment and more space for the private sector.

The MoAF's response to this challenge has been cautious to date. The newly formed National Seed Corporation (NSC) has been established as a purely public agency, for example, with a continued

mandate to supply all fertilizer and seed. Yet the centralized procurement of fertilizer limits the scope for private sector activity, and its current capacity for seed supply is minimal. Proposals for one-stop shops (OSS) and group machinery ownership schemes are limited, community-level responses that do little to encourage private sector activity on a larger scale. Recent indications that the MoAF is promoting private sector activity more actively are a welcome sign in this regard.

Farm labour constraints – causes and implications

Inadequate farm labour is widely viewed as a constraint to agricultural production. When farmers were asked to state their main constraint in the agricultural census of 2008, approximately 16% listed labour shortages – the fourth ranking constraint after crop damage by wild animals, pests and diseases, and inadequate irrigation. Rural out-migration is the underlying cause of this constraint. The rural population grew at an annual rate of only 0.6% from 1985-2005, compared to an urban population growth rate of 6.1% (Population Census, 2005). In a study of rural-urban migration in 2004, almost half of rural households (47%) reported that one or more family members had migrated. Moreover, as nearly 60% of migrants were male, and mostly young, rural migration has changed the gender and age balance in urban and rural areas. Out-migration has also occurred during a period when labour-intensive fruit and vegetable production has increased, raising the demand for labour at a time of falling labour supply. Although rural migration now appears to have slowed considerably, its impact will influence the size and composition of the rural labour force for some time to come. The ability to resolve this constraint is restricted by current labour policy, which prevents the employment of low-wage migrant labour from other countries in agricultural production.

The limited available information on rural labour markets shows that the total size of the rural work force actually increased slightly from 2001-2010. Most of this increase is due to the increased participation of rural women, who now account for 56% of the rural work force. This increased reliance on female labour may be the underlying cause of rural labour shortages, given that women are now expected to work more on the farm in addition to their traditional household

and family responsibilities. There are also indications that the rural labour force is ageing faster than that in urban areas, further restricting labour supply. In addition, it appears that access to labour is constrained on the demand side by the inability of farmers to pay the wage rates required to compete with urban employment.

This analysis provides a plausible explanation of the reasons for inadequate farm labour and its implications. The increased role of female labour and the consequent increase in the labour burden women carry appears to be a major factor and suggests a greater role for mechanized food processing to reduce their time constraints. It also appears that both demand and supply side constraints influence access to paid labour, and that the demand side constraints may be highest for smaller, low income farmers trying to commercialize their operations. Further study of both the demand and supply side constraints to farm labour use is required, including a better understanding of the influence of wages and rural-urban wage differentials.

Research and extension – priorities, linkages and technology transfer

The need for a strong research and extension system has long been appreciated in Bhutan and the MoAF has gradually built a comprehensive network of research centres and an effective extension system. The low use of modern farm inputs and improved management systems shows that technology transfer is weak, however, despite the institutional resources available. Several measures to improve technology transfer have been implemented by the MoAF during the 9th and 10th FYPs, with a focus on rendering the research system more responsive to the needs of the farming community.

Within the MoAF the poor performance of the research system is attributed to an over-emphasis on research at the expense of research-based efforts to work directly with farmers. To address this issue the mandate of the research centres has recently been extended from “research” to “research and development”, in order to make the research centres directly responsible for technology transfer. Within the research system on the other hand, the low rates of technology transfer are attributed to inadequate human

resources. The MoAF is also completing a comprehensive reform of research and extension policy with the aim of improving the impact of the research and extension systems – including measures to strengthen coordination between them.

In contrast, this review concludes that the underlying cause of weak technology transfer is the disparity between the current research agenda and the real needs of farmers. Ultimately, technology transfer is low because too much of the technology being developed is not what farmers want. Prime examples of this include the low priority given to research on measures to reduce crop damage by wildlife despite the fact that farmers have reported it as their main constraint for the last 20 years, and the inadequate response to the diseases that currently threaten key export crops such as citrus, potatoes and cardamom. Less than 1% of the RNR budget for the 10th FYP is allocated to these two problems. A more effective system for setting research priorities is required, based on a critical assessment of the problems farmers face. The extension system needs to be more assertive in this regard as their close contact with farmers makes them very aware of what these problems are.

In this context the review is concerned that the recent institutional reform of the research centres and the associated policy reforms of research and extension have not addressed the key underlying constraint to increased technology transfer. The new “development” mandate accorded to the research centres will dissipate the current research output by shifting research resources to “development”, a role which should be implemented by extension. More importantly, it does not alter the research agenda and thus the kinds of technology being developed. Similarly, the reform of research policy appears to be based on a detailed description of the current research agenda, rather than a clear specification of the criteria to be used in deciding research priorities and setting a research agenda. The proposed measures to strengthen the links between research and extension are supported, however.

Policy and planning issues

Two broader, cross-cutting issues also emerged, which are relevant to the mid-term review of the 10th FYP and preparation of the 11th FYP. Human resource constraints, the first of these issues, were

emphasized repeatedly. Most RNR sector public agencies are calling for more staff and more training for existing staff. A genuine desire to improve the quality of public service delivery partly explains this request, but it is also due to an expanding mandate for public service delivery.

The response to these demands should reflect two considerations: (i) the extent to which public service delivery can be improved by making better use of existing human resources, and (ii) the extent to which responsibility for service delivery can and should be transferred to the private sector. A clearer distinction between public and private sector roles and responsibilities will be critical in this regard. Public institutions should focus on doing better the things that only government can do, and avoid doing things that would impede work that should be done by the private sector.

The need for a more balanced approach to investment in rural roads also emerged as a major cross-cutting issue. The high priority accorded to rural road construction in the 10th FYP has reduced investment in other key areas such as irrigation, and the community level initiatives envisaged to support the one geog three products (OGTP) programme. This tension is now even more pronounced following the decision to raise the technical specifications and so the unit costs of rural roads. Fewer roads can now be built with the same budget.

A more rigorous and objective basis for screening and selecting rural road projects is now required to ensure that the best geog and community-level investments are supported – farm roads or otherwise. Criteria to be used in such an analysis would include: the agricultural potential of the community, existing access to social services, the capacity to maintain the road, the capacity to respond to the economic opportunities created by a farm road, and the economic return to a farm road versus other potential investments.

Implications for future planning and investment

The divergent growth pathways of traditional cereal crops versus non-cereal, cash crops have important implications for future planning, policy and investment. Policies and programmes that emphasize poverty reduction are likely to be more relevant for the rural households engaged in traditional, subsistence agriculture; while measures to promote growth will be more relevant to the rural households currently or potentially involved in commercial agriculture. A more balanced assessment of the need for rural roads versus other forms of investment is also pertinent in this context.

But while the focus may differ, the underlying causes of the problems faced by these two groups are likely to be the same – particularly where they result from inadequacies in public and private institutions. Policies and investments to resolve these institutional constraints will thus be required in both cases. These common, underlying issues are as follows:

- The need to reform and refocus the public institutions involved in research, extension and input supply;
- The need to develop appropriate technology packages for different types of farmers, with particular attention to the needs of resource poor farmers;
- The need to strengthen private sector engagement in input and output markets, through both direct support and a phased withdrawal of the public sector from these markets.

For purposes of investment project design this broader set of issues can be addressed within a regional framework or by focusing on a commodity or commodity group with potential for pro-poor growth and employment generation.

Chapter 1 – Introduction

Bhutan's ability to increase GNH is highly dependent on the performance of its RNR, of which agriculture is a major component. Food security, employment, export earnings, poverty reduction and the welfare of rural people are all heavily influenced by RNR sector growth and development. Keenly aware of the RNR sector's importance the World Bank has agreed with the RGoB to actively support the sector's development as part of its CPS for 2011-2014.

This support, which will involve a combination of investment and policy analysis, was initiated in January 2011¹ with a review of agricultural issues in the following general areas:

- policy framework;
- rural labour markets;
- agricultural commodity markets;
- research and extension; and
- agricultural inputs.

The objectives of the review are to: contribute to the debate associated with the mid-term review of the 10th FYP, identify issues that warrant attention in the next (11th) FYP, and to identify potential areas of World Bank support for discussion with the RGoB. Given the government's considerable experience with strategic planning and its strong ownership of the planning process, the review is reflective rather than prescriptive; and is intended to serve as the basis for discussing how best to direct World Bank support. The review was implemented by Turi Fileccia (FAO), Aidan Gulliver (FAO) and Garry Christensen (Senior Agricultural Economist). Preliminary observations and conclusions were discussed with the Ministry of Agriculture and Forestry (MoAF) at the end of the field mission in January 2011.

¹ The mission in January 2011 was composed of Aidan Gulliver, Turi Fileccia (both of the FAO Investment Centre) and Garry Christensen (Senior Agricultural Economist). This report was authored by Garry Christensen, drawing heavily from sector-specific studies prepared by Aidan Gulliver and Turi Fileccia.

The remainder of this chapter summarizes the principal objectives and strategies that currently guide overall RNR sector development. Chapter II analyses agriculture sector growth since 2000, highlighting the disparate growth paths of different commodity groups, and considers the implications of this disparity for future policy and investment. Progress towards the commercialization of agriculture is reviewed in chapter III, followed by an analysis of agricultural input markets in chapter IV. A brief review of migration and rural labour markets is presented in chapter V, which examines the causes and implications of the shortage of rural labour. Chapter VI considers the current reform of Bhutan's agricultural research and extension institutions and its implications for their impact on technology adoption. The implications of the issues reviewed for future policy and planning are reviewed in chapter VII, plus some broader, cross-cutting issues of strategic importance. Chapter VIII sets the stage for future sector analysis and investment under the CPS by discussing the broad implications of the review for project support.

The 10th FYP

Strategic planning in Bhutan is based on successive FYPs, the first of which was launched in 1961. The preparation of each FYP begins with a wide-ranging debate of the issues at all levels of government, which is then translated into a set of objectives, associated policies and programmes, and a monitoring system. Progress with implementation is formally reviewed half way through each FYP. The findings of this mid-term review are also used to identify issues to be addressed in the future, and thus are a critical input into preparation of the next FYP.

The RNR sector objectives for the current, 10th FYP (2008-2013) are:

- (i) to enhance sustainable rural livelihoods;
- (ii) to conserve and promote sustainable utilization of forest and water resources;
- (iii) to promote sustainable utilization of arable agriculture and pasture land resources; and
- (iv) to enhance food security.

These objectives continue the goals of the previous, 9th FYP, although there is more emphasis on sustainable resource management and less on employment generation. The 10th FYP seeks to increase rural employment through initiatives to improve infrastructure in rural areas and to increase the commercialization of agriculture, rather than through support for a distinct set of employment generating activities. The strategy recognizes that poverty is concentrated in rural areas and rural poverty reduction is a fundamental, implicit objective for RNR sector development.

The strategies for achieving these objectives are based on the “Triple Gems” of: efficient and effective marketing, improved access to rural areas and enhanced production. A wide range of measures is being used to strengthen marketing as a means to promote and support the shift from subsistence farming to commercial agriculture. Investment in farm roads both enables this shift and improves access to social services. Production is to be raised by boosting yields through increased technology adoption and by developing the amount of land under cultivation. To link central and local level development programmes the MoAF has initiated the OGTP approach, in which geogs choose one to three commodities on which to focus for production and marketing, based on comparative advantage for production and access to markets.

The axes identified as the basis for achieving the 10th FYP objectives for the RNR sector are as follows:

- (i) create an enabling policy and legal framework;
- (ii) strengthen compliance to policy and legal frameworks;
- (iii) improve planning and management of the programmes;
- (iv) improve information management and dissemination;
- (v) improve research services;
- (vi) provide basic services (i.e. farm inputs);
- (vii) deliver of extension services;
- (viii) create an enabling financial environment;
- (ix) farm mechanization;
- (x) strengthen agricultural marketing;
- (xi) develop an adequate level of vital infrastructure;
- (xii) diversify the economic base of the sector;
- (xiii) enhance the integrity of natural resources;
- (xiv) promote economic growth and alternative employment;

- (xv) strengthen human resources and capacity; and
- (xvi) improve programme monitoring and evaluation.

The RGoB is currently finalizing its mid-term review of the 10th FYP. For the RNR sector, progress towards programme targets was analyzed and discussed by the MoAF from November 2010 to January 2011. A further round of discussions took place at district level during February to March 2011 to elicit debate from rural areas. Debate has been open and rigorous and a better understanding has emerged of the issues affecting sector development.

Accelerated Bhutan socio-economic development

The RNR sector is one of the “national priority” areas² included in the Accelerated Bhutan Socio-Economic Development Programme (ABSD), which aims to accelerate socio-economic development by improving the effectiveness of public service delivery and enhancing job creation. Prepared with the support of McKinseys, the ABSD was initiated in July 2009 and will continue until the end of the 10th FYP in 2013.

The main conclusions and recommendations of the diagnostic study of the RNR sector, completed in July 2010, are summarized in Table 1 below. The relevant programmes are now being incorporated into the 10th FYP, and senior officials of the MoAF have recently signed a series of “Charters” in which they assume responsibility for various initiatives and for achieving the relevant target outcomes.

While there is general agreement that the challenges identified in the ABSD are legitimate constraints to RNR sector development, there are differing views on both the approach to resolving these constraints and the feasibility of resolving them in the proposed timeframe. These issues are discussed in chapter VII.

² The other national priority areas included in the ABSD are: education, health, tourism, construction, culture industry, ICT and public service delivery.

Table 1. ABSD: RNR sector diagnostic summary

Challenges	Programme Responses	Projected Outcomes (2008-2013)
<ul style="list-style-type: none"> • Limited aggregation in production and marketing • Poor availability and application of inputs leading to low productivity • Limited linkages to international markets to drive exports of high value products at scale • Fragmented service delivery to drive last mile implementation of national strategy 	<ul style="list-style-type: none"> • Contract farming and exports (apples, oranges, pomegranate, asparagus, potato, walnut, mushroom, passion fruit) • Promote cooperatives and farmer groups to improve farmer access to input and output markets • Increase rice productivity in selected zones • Improve irrigation and water management • Promote organic farming • Increase wood availability and wood processing • Financial inclusion • Improve service delivery (extension) 	<ul style="list-style-type: none"> • Increased rice production (48,000 mt to 57,000 mt) • Increased agricultural GDP (10,200 million Ngu to 15,000 million Ngu) • Increased export revenues (950 million Ngu to 2000 million Ngu) • Increased income of rural households (10,800 to 17,000 Ngu/month) • Increased employment in agriculture (195,000 to 215,000) • Increased area under organic farms (400 ha to 2000 ha)

Chapter 2 – Sources of agriculture sector growth

Bhutan's RNR sector continues to grow slowly, despite its potential for high value fruit and vegetable production and exports, proximity to large, readily accessible export markets and extensive support from government institutions. Annual sector growth averaged 2.2% in real terms from 2000-2009 (Table 2). The main sub-sectors (crops, livestock, and forestry) grew at similar rates and there was little variation between years. The contribution of each sub-sector to overall growth was thus roughly equivalent to its share of agriculture GDP.

The formidable constraints to infrastructure development posed by Bhutan's mountainous terrain are widely viewed as the fundamental impediment to growth and rural poverty reduction. Poor road access isolates a high proportion of rural people from agricultural markets and social services and limits their livelihood to

Table 2. Trends and Characteristics of Agriculture Sector GDP

	2000	2003	2006	2009	Average Annual Growth %
Million Ngultrum (Real Prices 2000=100)					
Agric Sector GDP	5289.4	5854.1	6196.1	6458.0	2.21%
Crops	2516.0	2765.6	2898.1	3064.3	2.18%
Livestock	1468.4	1642.2	1765.3	1864.2	2.70%
Forestry	1305.1	1446.3	1532.7	1529.4	1.72%
Share of Agricultural GDP (%)					
Crops	47.5%	47.2%	46.8%	47.4%	–
Livestock	27.8%	28.1%	28.5%	28.9%	–
Forestry	24.7%	24.7%	24.7%	23.7%	–
Contribution to Sector Growth (%)					
Crops		46.9%			–
Livestock		33.9%			–
Forestry		19.2%			–

Source: National Statistics Bureau, Bhutan.

subsistence agriculture. Government and donors have responded to this constraint by constructing over 1500 kilometres of farm roads and tracks since 2003. The proportion of rural people within a one hour walking distance of a road head increased from 40.2% in 2000 to 53.0% in 2008 as a result; and the proportion within a six hour walking distance increased from 83.5% to 90.0% (Agricultural Census 2009).

There is good evidence of the link between improved road access and the commercialization of agriculture, including a recent study by Tobgay and McCullough³¹, which found that a one hour decrease in walking time to the nearest road point corresponded with a 33% increase in the probability of selling farm output. Yet the low growth rates for agriculture suggest that the aggregate response to this investment has been weak. Further research shows that improved “connectivity” as a result of farm road construction is a necessary but not sufficient condition for agriculture sector growth⁴². The challenge now is to understand and respond to the second order constraints that limit farmers’ ability to take full advantage of their improved connectivity.

Growth decomposition analysis is a simple technique for disaggregating the sources of growth by commodity, prices, production and region – data permitting. It is used in this chapter to show that (i) slow aggregate growth of agriculture GDP masks high positive growth rates for some commodities and negative growth rates for others, and (ii) that where growth in agriculture GDP has occurred it is due to increased production rather than increased prices.

Data for this analysis were drawn from statistics used by the National Statistics Bureau (NSB) to determine agriculture sector GDP for the period 2000-2009. For the crop sub-sector these data cover the 15 main commodities and commodity groups. Both production and producer price data are available, allowing closer analysis of their relative impact on growth. This is obtained by first holding prices constant and calculating growth based solely on recorded production; and then holding prices constant and calculating growth based solely on observed price changes. An

3 Linking Small Farmers in Bhutan with Markets: The Importance of Road Access.

4 Technology Adoption, Agricultural Productivity and Road Infrastructure in Bhutan. Policy and Planning Division, Ministry of Agriculture and Forests. August 2010.

implicit price deflator is used to calculate these changes in real terms. The determinants of production growth can be further decomposed into yield and area effects, given the relevant data, but these data were not available for the RNR sector.

Lack of data precluded a comparable analysis for the livestock sub-sector. The contributions of the major livestock products were discerned for the period 2000-2008, but lack of price and production data precluded any further decomposition of the sources of growth. The reliability of such an analysis would also have been questionable due to the difficulty of collecting data on livestock numbers and productivity, and the heavy consequent reliance on standardized estimates of animal productivity and off-take rates.

Crop sub-sector growth

A better understanding of crop sub-sector growth emerges when reported growth is decomposed by commodity groups. Strong, positive growth occurs among the high value fruit and vegetable crops that dominate commercial agriculture and agricultural exports, versus a decline in the cereal crops that account for staple food production (Figure 1).

Further decomposition by commodity shows that citrus and potatoes have been the main sources of crop sector growth due to their high growth rates and high contribution to crop sector GDP (Table 3). High value vegetable crops such as chilli, cardamom, mustard, pulses and ginger have also grown strongly, although their contribution to overall crop sector growth is modest due to their low share of crop sector GDP. The growth in value-added of these vegetable crops has also accelerated since 2007.

In contrast, the real value added by maize, paddy, wheat and barley – the main food staples – has declined substantially. This decline has accelerated since 2007 (Figure 1). As these commodities together account for approximately 40% of crop sector GDP, their weak performance has severely compromised overall crop sector growth rates.

Figure 1. Composition of growth in crop GDP

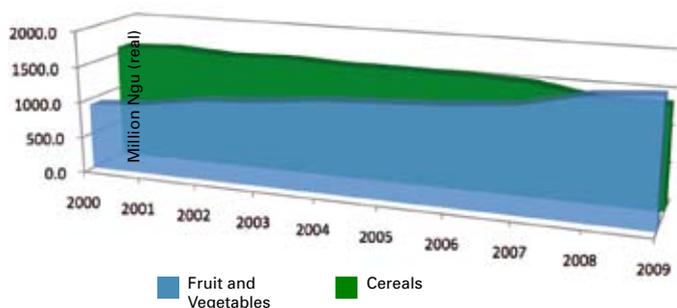


Table 3. Crop sector growth by commodity (2000-2009)

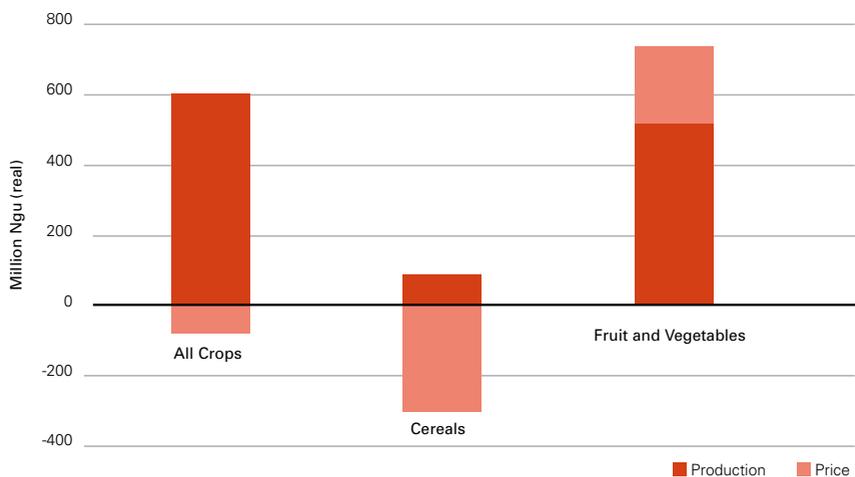
	Total growth 2000-2009 (million Ngu)	% Growth (2000-2009)	Contribution to crop GDP growth (%)	Share of crop GDP 2009 (%)
Citrus	403.4	131.8%	73.6%	23.3%
Potatoes	211.8	86.3%	38.6%	14.9%
Chilli	57.1	85.4%	10.4%	4.0%
Pulses	31.5	138.9%	5.7%	1.8%
Cardamom	21.7	51.6%	4.0%	2.1%
Apple	19.1	23.2%	3.5%	3.3%
Buckwheat/Millet	18.9	23.1%	3.4%	3.3%
Mustard	16.1	73.4%	2.9%	1.2%
Ginger	11.1	132.3%	2.0%	0.6%
Other Fruit	1.5	10.0%	0.3%	0.5%
Other Vegetables	0.0	0.0%	0.0%	0.9%
Wheat/Barley	-6.4	-12.0%	-1.2%	1.5%
Arecanut	-10.5	-13.2%	-1.9%	2.3%
Paddy	-18.1	-2.5%	-3.3%	23.3%
Maize	-208.8	-28.6%	-38.1%	17.0%
Total	548.3	21.8%	100.0%	100.0%

Source: Derived from data provided by National Statistics Bureau.

Analysis of the relative impact of prices versus production provides further insight. The strong growth of fruit and vegetable production has been driven by a combination of production and price increases, with increased production accounting for two-thirds of the overall growth (Figure 2). There has thus been a marked production response to improved access to markets. In contrast, a modest 6% increase in the volume of cereal production from 2000-2009 was offset by a 15%-20% decline in real producer prices, resulting in a 13% fall in the overall real value of cereal production. In the next chapter, further analysis will show that these divergent trends were largely the result of a switch of land from dry land cereals to fruit and vegetable production, which was partially offset by increased yields of rice.

Note that there was also a decline in the real producer prices of many fruit and vegetable crops; but this decline does not appear to have inhibited production (Figure 3). The production of ginger, mustard, pulses, chilli and cardamom all increased by more than 75% during this period, despite a 10%-15% decline in real producer prices, suggesting that these crops were still profitable even at lower real producer prices.

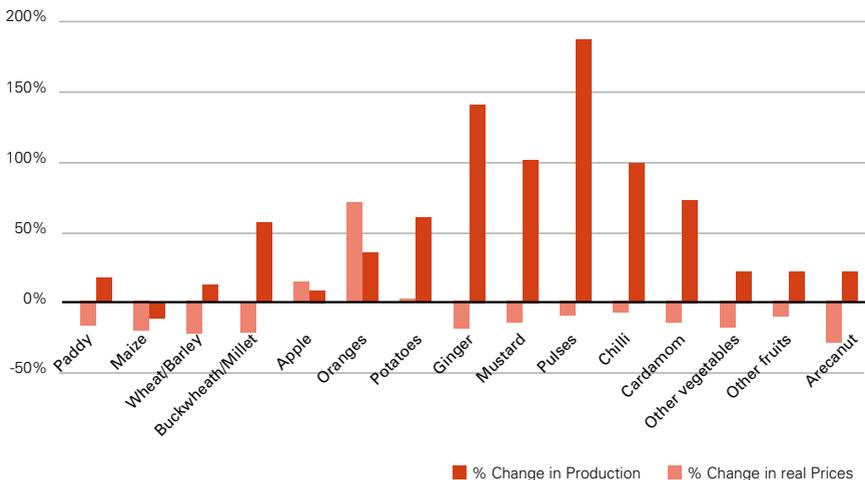
Figure 2. Decomposition of crop GDP by price and production



The differing production trends for cereals versus fruit and vegetables also show that while farmers do respond to the increased market opportunities for cash crops created by the expansion of rural roads, cereal production does not increase in response to better access to markets. Most cereal is produced for on-farm consumption. In fact the incentives to produce a marketed surplus of cereals may be reduced by the strong competition from low priced rice imports from India.

As the rural road network expands further it is likely that this divergence in the growth trajectories of cereal crops versus fruit and vegetable production will widen. More farmers will have access to markets for fruit and vegetables, and low price rice imports will penetrate deeper into the rural areas. This divergence needs to be given greater weight in future policy and planning. As the production of low value cereal crops such as maize and rice is largely for on-farm consumption, research and extension activities should put more emphasis on ways to make it easier for farmers to produce an adequate food supply through measures to reduce the high crop losses caused by wild animals and other pests and diseases, and high post-harvest losses. Equally important, these results highlight the need to resolve the serious disease problems that currently

Figure 3. Change in real prices and production by crop: 2000-2009



threaten key cash crops such as citrus, potatoes and cardamom. Unless the advance of these diseases is halted, Bhutan will lose the most important drivers of agriculture sector growth.

Livestock sub-sector growth

Dairy products are the major driver of livestock sub-sector growth (Table 4), particularly butter and cheese, which are staples of the Bhutanese diet. Poultry production is also increasing, not only for eggs but also for meat production. Strong negative growth is observed for goat meat, wool and pork, but these are a small component of livestock GDP and so have little impact on overall sub-sector growth. As these figures are based on numerous assumptions they should be interpreted with care. The dominant impact of dairy products is consistent with observations in the field, however, as is the observed growth of the poultry industry.

In contrast with the high growth commodities in the crop sector, there is probably less long-term potential for continued, high growth for livestock GDP. Growth will be driven by demand on Bhutan's small domestic market. Bhutanese dairy products are unlikely to be competitive on export markets, particularly given the strength of the Indian dairy sector. Indeed, imported Indian dairy products are likely to be a major source of competition on domestic markets.

Trends in productivity

Available data suggest that labour productivity has increased modestly, as measured by real GDP per capita of rural population (Figure 4). Average annual growth for 2000-2009 was 1.4% for RNR sector GDP, 1.35% for crop GDP, 1.8% for livestock GDP and 1% for forestry GDP. These trends reflect the low levels of technology adoption and the predominance of subsistence agriculture.

Trends in land productivity, as measured by crop yields, are disappointing. Of the major field crops, only rice shows a consistent increase in yields for the period 2000-2009⁵ (Figure 5). Maize and

5 Analysis is based on a comparison of 3 year averages to adjust for inter-annual variability (no data for 2001). Data for chilli and mustard available for 2005-2009 only.

Table 4. Livestock sector growth by commodity (2000-2008)

	Total growth 2000-2008 (million Ngu)	% Growth (2000-2008)	Contribution to livestock GDP growth (%)	Share of livestock GDP 2008 (%)
Cheese	236.0	43.6%	47.0%	34.1%
Butter	231.1	25.9%	46.1%	49.3%
Milk	44.0	30.6%	8.8%	8.2%
Eggs	8.7	20.6%	1.7%	2.2%
Beef	6.8	19.6%	1.3%	1.8%
Cattle Skins	3.1	26.1%	0.6%	0.7%
Goat Meat	-1.5	-3.5%	-0.3%	1.8%
Wool	-3.4	-53.7%	-0.7%	0.1%
Pork	-23.2	-37.0%	-4.6%	1.7%
Total	501.6	28.2%	100.0%	100.0%

Source: Derived from data provided by National Statistics Bureau.

potato yields increased initially but have declined since 2004-2006, together with pulses and chilli. These trends are consistent with crop area data that show that most of the observed increase in crop production has been driven by area expansion rather than productivity increases. There are no suitable data for comparing fruit tree yields. Lack of data also precluded analysis of trends in the land productivity of livestock and forestry.

Agricultural productivity is further reduced by the high proportion of unused, fallow land. Approximately 23% of rural households report that some of their land is fallow, with the result that 26.3% of Bhutan's scarce agricultural land is unused. The proportion of fallow land is highest for dryland (30.9%), but a large proportion of high potential wetland (17.3%) and cash crop land (13.3%) is also idle (Table 5).

In the Agricultural Census of 2009, the inability to protect crops from wildlife damage is reported as the major reason that farmers leave land idle (33.9% of farmers), followed by the distance of this land from their homes (28.6%). Other reasons include lack of irrigation (16.3% of farmers), and the fact that this land is either unusable (15.3%) or unproductive (13.7%). While not all of these constraints can be remedied, the problems caused by wildlife damage and inadequate irrigation can be resolved.

Figure 4. Trends in real per capita GDP (rural population)

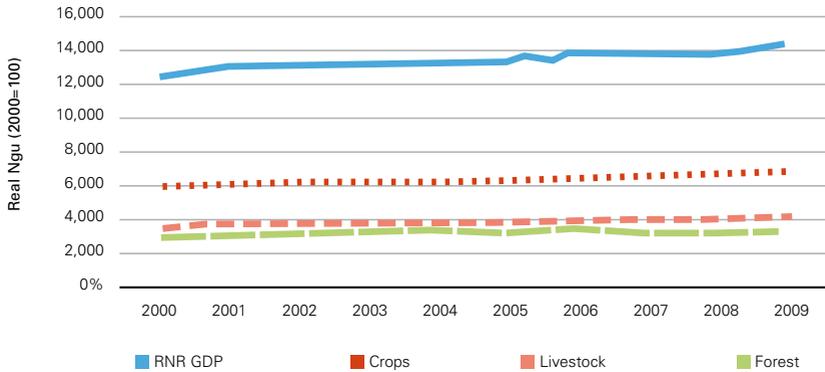


Figure 5. Crop yield trends

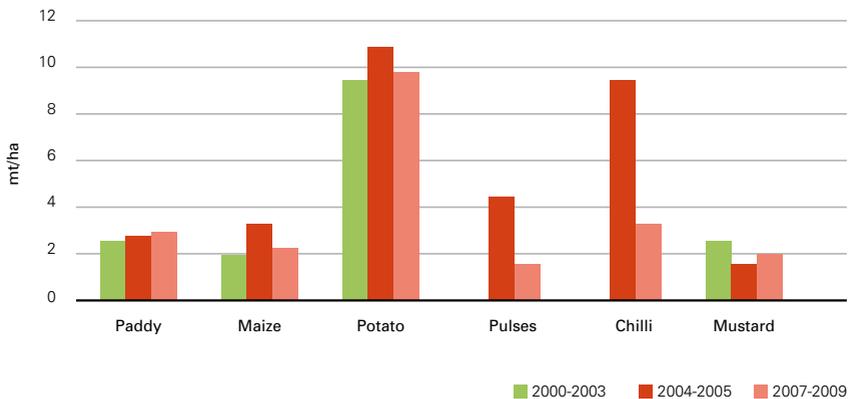


Table 5. Land types and land use (hectares)

Land type	Total land	Cultivated land	Fallow land	Fallow as %
Dryland	65,665	45,359	20,307	30.9%
Wetland	19,523	16,147	3,376	17.3%
Cash Crop/Orchard	9,714	8,423	1,292	13.3%
Total	94,903	69,828	24,975	26.3%

Source: Agricultural Census, 2009.

Chapter 3 – Agricultural markets – constraints and opportunities

There are numerous challenges to the development of agricultural markets in Bhutan. But if these challenges can be overcome, there are also numerous opportunities to expand the sale of agricultural commodities in both domestic and export markets. Available evidence suggests that the constraints to market expansion have yet to be adequately addressed, however, with the marketed surplus for most commercial crops growing slowly despite strong demand in both domestic and export markets.

Trends in the commercialization of agriculture

Bhutan's small, dispersed rural population, mountainous terrain and subsistence-oriented farming systems render the development of competitive production and marketing systems difficult. At the domestic level, market infrastructure and wholesale systems are largely absent. There is significant potential for commercial agriculture, nevertheless, and particularly for exports. First, Bhutan's climate facilitates the production of off-season fruits and vegetables for sale to India. Crops produced during May to October are readily sold in India as this period coincides with the Indian monsoon, when temperatures at lower latitudes are too high for temperate crops. Second, Bhutan benefits from an almost completely open trade regime with its two neighbours and trading partners, India and Bangladesh, which affords ready access to two huge markets. These trade agreements also render Bhutan open to competition from imports, however, particularly from November to April when low cost, Indian fruit and vegetable commodities dominate the market. Indian rice imports also account for approximately 50% of total rice consumption.

Recent research by the MoAF and the International Food Policy Research Institute (IFPRI) provides a good understanding of the degree of commercialization of agriculture in response to these

factors⁶. The key findings of this research are as follows:

- There has been a gradual shift to commercial crops since 2000, with a commensurate increase in the value of cash crops and a decline in the value of cereal production. Production of the staple cereal crops (maize and rice) still dominates land use nevertheless, with 65% of the total area cultivated.
- The land allocated to the major export crops accounts for 18.5% of the total area cultivated. Most of this is lower potential dry land.
- Most of the limited, high potential wetland area of 19,500 ha is used for rice production. Its use for high value vegetable crops is low.
- The commercialization of agriculture is higher among the richer and better-connected geogs, and among larger farmers.
- A limited number of farmers are engaged in market activity. In 2008 10% of farmers accounted for 73% of all crop sales.
- The marketed surplus for cereals and the fruit and vegetable crops produced for domestic markets is very low at 3.6% and 5-10% respectively (Table 6).
- A much higher marketed surplus is observed for the major export crops (potatoes, oranges, apples, spices and off-season vegetables). Recent growth in production and sales has been modest, however, due to the increasing impact of plant disease and the slow development of marketing systems.

Production patterns have thus changed in response to increased commercialization, with less land dedicated to cereals (especially maize) and more to vegetables. The area planted with fruit trees has stayed more or less the same. Cereals accounted for 79.1% of cropland area in 2000 and 64.5% in 2008, while the area allocated to vegetables increased from 8.9% to 21.7%. Rice production has increased due to increased yields, but marketed surplus remains very small at 3.6% of production. Although it is the most important crop by area, with 28% of the total area harvested, maize is very thinly traded.

The marketed surplus is high for most export crops (Table 6). Available evidence also shows that farmers have increased production and the volume of marketed surplus for all crops except apples and oranges. But measured as a percent of production,

⁶ Agriculture Commercialization and Diversification in Bhutan. PPD, Ministry of Agriculture and Forestry. August 2010.

marketed surplus declined from 2000-2008. It thus appears that while farmers are producing more in response to export opportunities, they are unable to sell a high proportion of their additional output. Weak marketing systems and high post-harvest losses have certainly contributed to this. The Bhutan Exporters' Association (BEA) estimates that packing losses on oranges commonly reach 40%, of which 10% was due to poor transport and the remainder derived from poor on-farm selection of produce.

The domestic market is a small, challenging place to do business, as indicated by the low and declining marketed surpluses of fruit and vegetables (Table 6). Of the total population of 696,000 people, 70% live in rural areas and produce most of what they consume. The remaining 215,000 people who live in urban centres are thus the main source of demand. Note also that while Bhutanese products account for most of the fresh fruit and vegetables sold for the six months from May to October, low-priced Indian imports then become a major source of competition during November to April. Demand on domestic markets is growing nevertheless, due to rising disposable incomes and an increasing consequent demand for higher value fruit, vegetable and animal products, and for rice.

A decline in the real prices of most agricultural commodities may also have contributed to the limited growth of marketed surplus (Table 7). Major export commodities such as oranges, apples and spices have been hit particularly hard. These crops still appear to be profitable nevertheless, and profitability could be increased even further with higher yields, lower post-harvest losses and improved marketing efficiency. The increase in rice prices reflects the influence of the global food price crisis in 2008.

International trade

Agricultural imports and exports are dominated by trade with India (Table 8), due not only to its proximity but also to Bhutan's good political relations and longstanding free trade agreement with its huge neighbour. An exchange rate policy that fixes the Ngultrum to the Indian rupee (1:1) further facilitates trade flows. This high concentration of trade with India is especially apparent for agricultural imports, with Indian products accounting for 95% of

Table 6. Trends in crop production and commercialization

Commodity	2000			
	Production (mt)	Marketed surplus (mt)	Marketed surplus (%)	Sales revenue (million Ngu)
Cereals				
Paddy	68,500	794	1.2%	32
Maize	77,300	513	0.7%	4
Other Cereals ^{a/}	12,699	90	0.7%	1
<i>Total Cereals</i>	158,499	1,397	0.9%	37
Fruit and Vegetables - Export Markets				
Potatoes	35,000	19,400	55.4%	203
Oranges	29,616	27,200	91.8%	678
Apples	5,113	4,763	93.2%	142
Areca Nut	1,327	1,199	90.4%	60
Chilli	2,846	926	32.5%	93
Cardamom	509	482	94.7%	55
Ginger	1,268	448	35.3%	13
Carrots	149	96	64.4%	3
Peas	622	405	65.1%	8
Fruit and Vegetables - Domestic Market				
Fruit ^{b/}	2,954	527	17.8%	13
Vegetables ^{c/}	7,783	809	10.4%	14
Pulses ^{d/}	3,745	350	9.3%	8

a/ Wheat, barley, buckwheat, millet.

b/ Pear, plum, peach, walnut, guava, other.

c/ Eggplant, tomato, radish, turnips, cassava, other.

d/ Soyabean, rajmabeans, beans, mustard, other.

Source: MoFA. Agricultural Commercialization and Diversification in Bhutan, August. 2010.

2008

Production (mt)	Marketed surplus (mt)	Marketed surplus (%)	Sales revenue (million Ngu)
77,214	2,743	3.6%	106
66,592	–	–	0
17,816	90	0.5%	1
161,622	2,833	1.8%	107
52,967	26,495	50.0%	268
37,758	25,987	68.8%	661
5,531	3,927	71.0%	120
3,847	2,546	66.2%	129
7,283	1,807	24.8%	179
1,017	693	68.1%	80
3,129	1,615	51.6%	49
363	117	32.2%	3
798	267	33.5%	5
3,561	388	10.9%	9
14,705	632	4.3%	17
8,797	741	8.4%	16

all agricultural imports in 2009, up from 85% in 2004. Agricultural exports are less dependent on India due to the sale of most citrus to Bangladesh, a trading relationship also facilitated by a bilateral free trade agreement. But the lower dependence on India as an export market (64% in 2009) does little to mitigate the very high overall concentration of Bhutan's agricultural trade.

The high concentration of agricultural trade is also apparent in Bhutan's dependence on a relatively small number of export commodities. Potatoes, oranges, apples, cardamom and ginger accounted for 68% of all agricultural exports in 2009, up from 47% in 2004. The recent growth of *cordyceps sinensis*⁷ (Chinese caterpillar) exports is a positive development in this context as it broadens both the commodity base and the market base for agricultural exports. Declining exports of cardamom are due to disease problems. Although high recent export prices for cardamom have offset the loss of production, there is a real risk that trade in this lucrative commodity will be lost.

Imports are characterized by a wider array of fresh and processed commodities, and a growing volume of trade. Rice is the most important agricultural import, as would be expected, with 19% of the total value of agricultural imports in 2009. The strong growth of imported animal products and processed food attests to the

⁷ Used widely in East Asia as a medicinal product when infected by a parasitic fungus.

Table 7. Trends in real prices^{a/} for crop commodities (2003-2008)

Commodity	2003	2005	2008	% Change
Maize	9.3	8.7	7.3	-21.1%
Rice	20.8	23.1	25.2	21.3%
Wheat	9.0	7.5	9.1	1.3%
Potatoes	8.8	7.8	8.3	-6.1%
Oranges	35.8	26.8	18.7	-47.7%
Apples	45.4	44.2	35.4	-22.0%
Spices	34.6	35.1	28.7	-17.0%
Vegetables	23.9	19.5	22.1	-7.6%
Other Fruits	29.4	26.0	17.4	-40.9%

a/ Deflated by the Food CPI (2003=100).

Source: MoFA. Agricultural Commercialization and Diversification in Bhutan. August 2010.

Table 8. International trade for key agricultural commodities

Commodity	2004		2009		% Change
	Value (USD'000)	% India	Value (USD'000)	% India	2004-2009 (USD'000)
EXPORTS					
Oranges	4,789.7	5.8%	7,996.9	9.0%	67.0%
Potatoes	2,462.7	100.0%	8,308.5	100.0%	237.4%
Apples	947.5	19.9%	1,940.3	65.1%	104.8%
Cardamom	1,919.4	52.9%	1,871.7	44.8%	-2.5%
Ginger	169.9	100.0%	463.7	100.0%	172.9%
Areca Nuts	n.a.	n.a.	221.4	100.0%	n.a.
Cordyceps	n.a.	n.a.	1,529.9	0.0%	n.a.
Total Ag. Exports	21,826.0	69.2%	30,381.2	63.5%	39.2%
Main 5 commodities ^{a/} as % Ag. Exports	47.1%		67.7%		
Ag. Exports as % Total Exports	12.1%		20.3%		
IMPORTS					
Cereal Products	10,792.5	100.0%	19,351.4	99.9%	79.3%
Rice	6,923.8	97.2%	14,919.5	100.0%	115.5%
Wheat	3,060.5	95.6%	1,087.1	100.0%	-64.5%
Maize	0		866.8	100.0%	n.a.
Animal Products	10,024.0	100.0%	20,524.4	99.2%	104.8%
Dairy	5,155.9	100.0%	9,649.9	99.8%	87.2%
Eggs	1,451.9	100.0%	762.6	92.5%	-47.5%
Meat	1,491.7	100.0%	7,559.7	100.0%	409.5%
Processed Food	6,910.8	81.4%	12,006.9	91.2%	73.7%
Total Ag Imports	47,994.4	84.9%	79,873.2	95.6%	66.4%
Main 5 commodities ^{b/} as % Ag Imports	37.7%		42.6%		
Ag Imports as % Total Imports	11.8%		15.1%		

a/ Potatoes, Oranges, Apples, Cardamom, Ginger.

b/ Rice, Wheat, Dairy products, Eggs, Meat.

Source: Bhutan Trade Statistics 2004 and 2009. Department of Revenue and Custom. Ministry of Finance.

growing wealth of Bhutanese consumers and the limited capacity of Bhutanese producers and agro-processors to respond to this demand. The free trade agreement with India is a double-edged sword in this respect as it assures a stable food supply and ready access to low-cost food, but also results in strong competition.

Institutional infrastructure

A range of institutions has been established to support marketing, indicative of the commitment by the government to the commercialization of agriculture. The emphasis has been on building public institutions, however, resulting in only a few private sector marketing organizations, most of which have limited capacity. The structure and role of these various institutions is summarized below.

Department of Agricultural Marketing and Cooperatives (DAMC)

The DAMC was accorded full departmental status by the MoFA in 2009 as the vehicle for increased support to the commercialization of agriculture. Its principal mandate is to increase the linkage between producers and the marketing system, including the promotion of marketing infrastructure and support for the development of farmer associations. Eight commodities have been prioritized for support: apple, orange, pomegranate, asparagus, mushroom, potato, passion fruit and rice.

Recognizing the need to strengthen private sector institutions, the DAMC has focused on the organization of farmer groups, with a heavy emphasis on cooperatives. The aim is to improve economies of scale in both input and output marketing. As of early 2011, 28 cooperatives had been registered, with a target of 500 by the end of 2013. Cooperative members will receive technical and management training from MoAF and preference for loan financing from the Bhutan Development Finance Corporation (BDFC). Further initiatives include the establishment of geog level OSS to market both agricultural inputs and outputs (see chapter IV). The DAMC is also helping to promote a series of contract farming ventures proposed in the ABSD.

A shortage of staff relative to its nationwide responsibilities for marketing and cooperative development, currently limits the activities and impact of the DAMC. With an establishment of 40 staff, but only 10 staff in the field, it also has a limited capacity to operate outside Thimphu.

Food Corporation of Bhutan (FCB)

The FCB was established in 1973 as a centralized grains procurement agency for RGoB. It was incorporated in 1992, with 100% government ownership, and has since assumed a number of additional responsibilities including: the operation of auction markets in southern Bhutan; the operation and management of food shops throughout Bhutan that seek to ensure access to low-cost food staples; the distribution of food aid for donor agencies; the provision of training in marketing, storage and post-harvest operations; and the maintenance of strategic food stocks. This combination of public and private activities is funded from the profits generated by its commercial activities. The FCB's headquarters are in Pheuntsholing.

The five auction yards trade potatoes, ginger, areca, peas, cauliflower, cabbage, carrots, beetroot and chilli. Annual throughput ranges from 24,000-30,000 tons, with trading heavily concentrated in the September to October off-season when horticultural products are most in demand in India. There is strong demand for this service and FCB is seeking to expand the Pheuntsholing auction site. The FCB's food shops operate in 21 districts. It also has warehouses for rice, oil and sugar in 7 locations, which act as both distribution centres and strategic reserves. FCB estimates that it handles 20% of the national rice trade, on which it loses money⁸, but profits from the auctions allow it to offset these losses. Strategic reserves are estimated to include 1,400 MT of rice, 160 MT of wheat, 58 MT of vegetable oil and 200 MT of sugar. All stocks are procured in India as it is less expensive than in Bhutan.

The FCB's diverse responsibilities and awkward mix of public and private sector activities limits its capacity to operate effectively. Privatization of its commercial activities would broaden and strengthen the base for private marketing, and render the agency more able to fulfil its public obligations.

8 Rice trading losses are currently estimated at Nu. 4-5 million per annum.

Bhutan Agriculture and Food Regulatory Authority (BAFRA)

BAFRA was established in 2000 to regulate the marketing of food and agricultural products, including implementing legislation related to food quality and safety and meeting international commitments. It has plant, livestock and food inspectors in each district and operates border quarantine facilities. It also regulates agricultural inputs and issues phyto-sanitary certificates, but is not responsible for certificates of national origin. It is not yet active in traceability recording for foodstuffs or organic certification. Human resource constraints and a lack of district level laboratory facilities are its two most pressing problems. All food, seed, animal feed and veterinary testing is carried out in a National Quality Control Laboratory Complex close to Thimphu.

Bhutan Exporters' Association (BEA)

Established in 2003, the BEA provides a bridge between exporters and RGoB. Its members (including both companies and cooperatives) are involved in the export of minerals, cash crops, herbs and spices, steel billets and industrial products. (Potatoes are generally sold through the FCB's auction system). There are 125 registered corporate members of BEA and 60 cooperatives. BEA services to members include organizing trade fairs maintaining a register of known buyers of export items, including importers and hotels; creating contacts with the Indian and Bangladeshi Chambers of Commerce; and assisting members in export licensing procedures.

Private sector activity

With the exception of the quasi-commercial FCB, private sector activity in agricultural commodity markets is extremely limited. Domestic markets are characterized by a lack of commercial wholesaling systems, commercial storage and refrigerated transport. Retail agricultural markets exist in larger centres and along main transport routes, but these markets are supplied directly by local producers. The small number of larger farmers who account for most of the marketed surplus appear to operate independently, rather than selling to a private sector assembler at the farm gate, or establishing a producer or marketing association. A well organized, private wholesale system appears to operate for the import of rice and horticultural products from India, but these agents do not

work with local producers. There are thus significant gaps in the marketing chain, which the private sector has yet to fill.

The marketing chains for export crops are somewhat better developed. Wholesale markets exist, on or close to border crossing points into India, particularly for potatoes, although the buyers are largely foreign. An assembly process exists for citrus, but it is also driven by foreign buyers who advance seasonal credit as a means to secure supply, then buy the crop on the tree and pick and grade it themselves. Bhutanese market agents are conspicuously absent in these activities.

Together with cooperatives, contract farming is now being promoted under the 10th FYP as a means to strengthen market systems through private sector activity. The agricultural sector was opened to foreign direct investment in 2009. A new Land Act permits leasing of land by foreign companies for a period of up to 30 years, with the possibility of renewal. No internal or export taxes are levied on agricultural production: all agricultural inputs are free of tax and agricultural income is not subject to income tax.

The first major investment in contract farming in Bhutan involves hazelnut production. The Mountain Hazelnut Venture (MHV) has begun operations in the east of the country, but plans to expand to central areas over time. No financing or preferential treatment is being provided by RGoB. MHV will supply hazelnut seedlings to contracted growers for planting on degraded, slope or fallow land and guarantees to buy all production from its contractees at a floor price established in consultation with MoAF. A gross income for farmers of over 1,000 USD per acre is projected once full production is achieved. Eventually, the company anticipates that as many as 15% of all rural households in the country will be involved in hazelnut production. The output of the project – estimated at 40,000 MT per annum when all 10 million trees are in full production - will be sold initially to China and later to Europe. Initial sales will be in shell, requiring only a grading and packing plant in Gelephu, 40 km from the nearest Indian railhead, but a shelling plant is scheduled for development. Some 25% of project profits will be placed in a trust fund for eastern Bhutan, to be managed in conjunction with MoAF.

Other potential contract farming arrangements are currently being pursued by the MoAF, as proposed by the ASBD, including a coffee production enterprise targeting 500-1,000 acres in the south-central region of the country. Contract production on a much smaller scale is also underway through Bio-Bhutan, a company established in 2005 to market lemon grass. The programme now covers four districts in the east of the country and provides organic certification, but the quantities involved are very small, totalling only four MT in the current season. Bio-Bhutan also handles honey, spices and tea, and is trying to enter the marketing of bio-soaps and cordyceps, but in all cases the volume of these products handled is very limited and may not be commercially viable.

Chapter 4 – Farm input supply – public or private?

There are two quite different components of the input supply system: a large, well developed system of public agencies with stagnant or declining input distribution and a small but rapidly growing private sector. Both are examined in this chapter to elicit a better understanding of how best to promote input use and so increase productivity.

Public agencies and public input distribution

Agriculture input supply is dominated by the following public agencies:

- The National Seed Centre (NSC) is responsible for seed and seedling multiplication and distribution, and the procurement and distribution of fertilizer and rice herbicide. It was formed in 2010 to replace the Druk Seed Corporation (DSC), a publicly owned corporation previously responsible for seed and fertilizer distribution.
- The National Plant Protection Centre (NPPC) procures and distributes pesticides and herbicides (for crops other than rice).
- The Agricultural Machinery Centre (AMC) promotes and supports farm mechanization through the procurement and subsidised sale of machinery and spare parts, and through training and research.
- The MoAF also has a number of livestock breeding farms that provide breeding stock and artificial insemination (AI) services to the farming community.
- The BAFRA regulates the input supply system and monitors input quality.

The distribution of seed, fertilizer and pesticide/herbicides to farmers is coordinated by the MoAF extension system. Farmers place their orders with Extension Agents (EAs) who collate and report these orders to MoAF district coordinators. The district coordinators then forward the orders to the relevant agencies. The

NSC procures the requested seed and fertilizer and distributes it through a network of private commission agents (CAs), who sell these inputs on a 'cost plus fee' basis (a flat 10% charge) to farmers. Transport costs to the district offices are borne by MoAF. Pesticides and herbicides ordered and procured by the NPPC are delivered to the Dzongkhags and distributed directly to farmers by the EAs rather than through the CAs. This allows the NPPC to retain tighter control of herbicide and pesticide use in order to avoid misuse. All inputs are obtained in India, allowing farmers to benefit from Indian subsidies. There are no taxes or import duties on farm inputs. The acquisition and distribution of animal breeding stock and AI services are also coordinated by EAs.

The performance of this system has been very mixed, with a decline in the volume of fertilizer and seeds distributed and an increase in the use of pesticides and herbicides (Table 9). Farmers are critical of the system. Late delivery of inputs is a frequent complaint, plus poor service by the CAs – especially in the more remote areas. The CAs in turn cite inadequate financial incentives to deliver the requested inputs, especially where road access is poor.

The MoAF attributes the decline in fertilizer and seed distribution to poor performance by the NSC's predecessor, the DSC, which was set up in 1995 to provide inputs on a commercial basis. Although the DSC's poor performance appears to be the result of mismanagement rather than constraints to commercialization, MoAF still believes that fully commercial input supply is infeasible. The NSC has been established as a public (budget-funded) agency for this reason.

This high dependence on public agencies limits the scope for private sector involvement in input supply. The MoAF has stated that it will facilitate commercial activity where opportunities exist, but it may need to be more pro-active in creating space for private sector activity.

Seed and planting material

Seed and seedling material for multiplication is provided by the regional research centres. Their release of new seed varieties has slowed considerably since 2002 (see chapter VI). Only three new varieties of maize have been released, the last in 1999. The leading variety of rice (IR 64) was released in 1988. Of the 28 listed varieties

Table 9. Trends in public agency farm input supply and distribution

	2005-2006	2007-2008	2009-2010	% Change
FERTILIZERS (mt)				
Urea	1610.75	1399.27	1219.28	-24.3%
Suphala	964.85	1042.23	838.08	-13.1%
SSP	450.60	602.35	411.55	-8.7%
MoP	14.66	29.15	9.75	-33.5%
Butachlor	264.62	266.02	279.79	5.7%
SEEDS (mt)				
Cereal and Legumes	107.31	111.04	86.95	-19.0%
Potato seed	229.70	120.62	n.a.	n.a.
Vegetable seed	7.45	2.86	2.44	-74.3%
PLANT CHEMICALS (kg)				
Fungicides	2515	4100	3423	36.1%
Herbicides	809	5380	3004	271.3%
Insecticides	2521	7734	4875	93.4%

Source: Countrystat. MoAF.

for field crops, the last release was in 2006, eight date from 2002, seven have been listed since 1999, and 12 since 1994 or before. Vegetable varieties are also dated with only nine out of 72 varieties released since 2006, further releases in 2002 and 2004, and a long list from the 1990s. Better progress has been made for new fruit varieties, with most from 2002-2007. Most of the 24 new varieties of feed and fodder crops were developed during 2001-2004. This heavy reliance on older varieties reduces plant vigour and limits farmer access to new, higher potential varieties. The research system also lacks the capacity to produce an adequate supply of high purity breeders' seed for multiplication, which reduces the quantity and quality of certified seeds available for farmers.

Major supply side constraints also exist for seed multiplication. Even at its peak, the national system for seed production supplied less than 10% of the total seed requirement for the country. DSC ran down the limited capacity for seed multiplication and conditioning, further contributing to the declining distribution of improved varieties from 2005-2009 (Table 9).

The NSC has thus inherited a poorly performing system and a weak resource base. It faces a huge challenge to restore seed production and processing capacity – even to its former, modest level. Without increased private sector activity, most farmers will continue to lack access to good seed. The future emphasis should be on establishing a broader system of seed supply, from both NSC and the private sector.

Fertilizers, herbicides and pesticides

The use of inorganic fertilizers is low and declining. Some 37% of households reported the use of chemical fertilizers in 2008 (Agriculture Census, 2009), but reported application rates are very low at 4.6 kg N, 0.5 kg P and 0.7 kg K per hectare in 2005 (DSC, 2005 unpublished). Use rates increase for farmers closest to road heads, for larger, more commercially oriented farmers and for those growing potatoes, irrigated rice, spices and other vegetables. Organic fertilizer, used by more than 65% of households, is the main source of soil nutrients with annual use of about 78,000 tons per year (approximately 0.8 tons/ha). Its use is highest for those farmers farther from road heads and with more livestock (MoAF/IFPRI, 2010).

Unlike other inputs, the use of plant protection chemicals is increasing (Table 9). This growing demand is attributed to their relatively low cost, ease of transportation and high impact – especially for fruit and vegetable production. Approximately 16% of farmers use pesticides, with higher use rates observed for larger, more commercial farmers close to roads and those growing irrigated rice, potatoes, other vegetables, apples and oranges (MoAF/IFPRI). The MoAF is working with FAO and the European Commission to spread the use of Integrated Pest Management (IPM) technology, especially among horticulture producers. This is in line with Bhutan's aim to develop organic farming. The real need, however, is to strengthen plant protection through targeted research and extension, with particular emphasis on obtaining more resources⁹ for surveillance and protection against citrus HLB, blast disease in rice, and late blight in potato.

9 To this end, the planned integration of the World Bank supported DRDP would provide resources to: (a) develop and strengthen pest surveillance; (b) capacity development for EAs in IPM implementation; and (c) identification of crop protection issues in potato, rice and maize.

Animal breeding

The MoAF runs a number of farms to provide breeding stock for pig, poultry, cattle (local and improved breeds) and fish production. As these farms are operating at full capacity, increased access to breeding stock can only come from the private sector. The National Livestock Breeding Programme is also responsible for providing materials for AI, which are distributed to farmers by EAs and community workers. The AI programme needs to become more efficient, however, through improved farmer participation in oestrous synchronization and wider use of mobile services.

Farm mechanization

Measures to promote farm mechanization began in the early 1980s, with the establishment of the AMC funded by Japan. Continued support for this programme by Japan has resulted in the import and distribution of over 2,500 power tillers and associated spare parts, and support for around 6,000 small processing enterprises (oil seeds, rice mills, rice threshers, maize shellers, vegetables and fruit dryers). A small number of complete rice mechanization packages have also been provided comprising transplanters, weeding implements and power reapers for mechanized harvesting. Power tillers are allotted to farmers by district, with some account taken of district coordinator and EA requests.

AMC research shows that power tillers can reduce rice production costs by approximately 50%, and reduce labour requirements to one quarter or even one fifth of the requirement for cultivation by bullock¹⁰. When trailers are used, power tillers also improve mobility and transport capacity, a major advantage where farm roads exist. Power tiller use is also spreading on dryland where the slope permits, although intercropping (mainly potato and maize) can restrict dryland use. Further incentives to purchase power tillers include high subsidies (60-70 percent)¹¹ and favourable loan terms from the BDFC (2-7 years at 12% interest).

Despite these advantages and incentives, only 8% of farmers reported using a power tiller in 2008, and only 3% owned one (Agricultural Census, 2009). The majority of farmers continue to rely on bullocks. Recent research (MoAF/IFPRI) shows that the

10 AMC unpublished data.

11 Actual price paid by farmers is around 140,000 Nu compared to the real price for a Kubota power tiller of 450,000 Nu.

ownership of power tillers increases among larger farmers who are close to a road head, and who cultivate potatoes and other vegetables. Lower rates of ownership are associated with higher ownership of livestock, the cultivation of maize and irrigated rice and high levels of crop damage by wild animals. Hence, despite the demonstrated reduction in rice production costs, power tillers are less likely to be used on wetland. The AMC attributes this low adoption rate to a lack of spare parts and repair services, and inadequate farmer training and has recently set up regional workshops to meet these needs. A quality and safety programme has also been started.

The low adoption rates for power tillers, despite more than 20 years of support, raises questions as to whether this is an effective use of public resources – government or donor. This is particularly pertinent given that further Japanese support to the AMC after 2012 is unlikely. The DAMC has recently begun to trial group power tiller ownership schemes, despite their lack of success elsewhere. The expansion of mechanized cultivation tends to be wider and more sustainable where it is based on increasing access to hire services provided by individual contractors. The current market for machinery hiring services appears to be weak, however, with both supply constraints and irregular demand. According to AMC, there is also a general perception among farmers that power tiller hiring is expensive even though observed hire rates suggest the opposite¹². Ultimately, there may be greater potential to use mechanization for small-scale food processing.

Ultimately, the real nature of demand for farm machinery may become apparent through private sector activity. Indian-made power tillers are becoming available in Bhutan at a price close to that of subsidised Japanese machinery. Transplanters and reapers from Viet Nam, India and Thailand can also be found at affordable prices. Provided that credit is available to finance these machines, farmers and contractors will buy them if they are a viable investment.

12 See also Survey on Farm Mechanization in Bhutan; AMC, 2010.

Private sector input marketing

The growth of commercial farming has created several opportunities for private sector input marketing. The response is demand driven, however, with the focus on sales rather than “distribution”. It is also strongest where public agency activity is either weak or absent. Three areas of activity are particularly strong.

Vegetable seed

Bhutan Alpine Seed¹³ has become the major producer of vegetable seeds. It has a small acreage that it uses to maintain parent material (sourced through the research centres) of open pollinated varieties, and uses a network of 60-70 growers for seed multiplication. Seed processing and germination trials are performed at its headquarters, with inspection and certification through BAFRA. All vegetable seeds are produced but the main demand is for off-season varieties for the export trade to India. Some 70% of marketed seeds are produced locally and the balance is imported from India. The eventual aim is to meet all demand from domestic production and seed exports are being considered. Current capacity of 250,000 (10 gram) packets per year is enough to grow about 2,500 acres. This compares with the capacity of DSC for 500,000 packets, which was lost through mismanagement. It is unclear whether NSC will restore this capacity for vegetable seed.

Seed growers for the company use about 0.5 acres for seed multiplication. They produce on an outgrower basis with seed, other inputs and technical assistance provided by the company. Payments are made after germination trials, and are generally settled within 15 days of seed delivery. Average gross income is a respectable 50,000 Nu per farmer per cycle. Retailers are either commission agents or vegetable market sellers. Expansion is possible by increasing the number of growers but Bhutan Alpine Seed wants to phase its growth based on actual demand. The company has also expressed its interest to buy up the vegetable seed production capacity of NSC.

¹³ Established in 2000, it is the first private seed company in Bhutan. It is engaged in the production and marketing of vegetable seeds, horticultural planting material and ornamental flower seeds and plants.

Animal feed

Karma Feeds is the sole producer of animal feed in Bhutan. Located near Phuentsholing it has recently expanded its capacity from 100 tons/month to 1,000 tons/month – indicative of the growth in domestic demand. Most raw material is imported from India, with some ingredients brought in from Nepal, USA and Europe¹⁴. All types of feed are produced, for all stages of livestock production. Feed composition and quality standards are set at high levels by MoAF, and all produce is certified by BAFRA. This results in high feed prices relative to imported Indian manufactured feed, due to the less rigid quality standards applied in India. There is thus scope for the manufacture of lower specification, lower priced feeds suited to the management systems and financial situation of lower income Bhutanese farmers.

Approximately 65% of output is poultry feed sold largely in the southern Dzongkhags (mainly Tsirang and Sarpang) where both layer and broiler enterprises are concentrated. A further 25% of output is for dairy production in Paro, rural Thimpu and Trashingang. The poultry industry is also the fastest growing source of demand, although its erratic growth creates marketing problems. The inadequate capacity for production of day old chicks (DoCs) and pullets often causes poultry producers to delay their feed purchases and deliveries, which results in a build up of stock at the feed plant. Karma plans to establish a network of depots throughout Bhutan to improve the cost-effectiveness of distribution. Most feed is marketed through private agents who price their sales on the basis of ex-factory prices plus a 5% commission, plus transport costs.

Breeding stock

Public animal breeding farms lack the capacity to meet the growing demand for DoCs, pullets and piglets from the increasing number of poultry and pig farms in the southern districts. Several large private hatcheries¹⁵ have been established in response to this demand and now satisfy 2%-5% of the market (1000-2500 DoCs/day). A growing number of medium size poultry farms are also entering the market.

¹⁴ Of the 500 tons of maize purchased every month, less than 10% is sourced in Bhutan. Domestic maize is more expensive than Indian maize (15-20 Nu/kg versus 11 Rupees/kg).

¹⁵ SATARA in Geliphu is a hatchery of 30,000 birds, and GURU in Chukka has 20,000 birds.

One-stop shops

To promote private sector input supply the DAMC plans to establish OSS that will sell agricultural inputs and rent equipment for cultivation (power tiller, thresher, etc) and processing (rice/flour mill, oil press, etc). They will be operated as commercial enterprises and run by a full time manager. The DAMC will select the locations for each shop and the managers. It will also set up a revolving fund to finance an initial stock of agricultural inputs, with repayment after sale. Charges for services by the OSS, including equipment hire charges and the mark-up for sale of agricultural inputs have yet to be defined.

Three management options are being tested for operation of these shops: youths, farmer groups, and small entrepreneurs such as commission agents. Infrastructure will be provided by local government, initially on a rent-free basis. Pilots¹⁶ have been established at three locations and their performance is being monitored by DAMC.

Responding to RNR sector change

The growing importance of commercial agriculture and simultaneous decline in the performance of DSC have created a vacuum in the capacity for farm input supply. Commercial farmers need assured access to fertilizer, high quality seed, plant protection chemicals, animal feed and spare parts and repair services for machinery. Bhutan's public input supply agencies struggle to provide this level of service due to their reliance on centralized procurement and their limited capacity for seed production and animal breeding. A small number of private agri-business enterprises are responding to the opportunities created by this vacuum, but there is a need for greater private sector activity. Public sector input supply will need to be lower and more highly targeted in the future to create space for this increased private sector activity.

The importance of increased private sector in the RNR sector is clearly recognised in the 10th FYP. MoAF's response to this challenge for farm input supply has been very cautious however.

¹⁶ In Kaling with a Commission Agent, in Shemang with a Farmers' Group, and in Mongar with a youth couple. Investment amounts to about USD1,500 per each pilot.

The NSC has been established as a purely public agency, for example, with a continued mandate to supply all fertilizer and seed. Yet the centralized procurement of fertilizer limits the scope for private sector, and its current capacity for seed supply is minimal. The proposed OSS and group machinery ownership schemes are limited, community-level responses that do little to encourage private sector activity on a larger scale

Clear policy statements that show MoAF's willingness to reduce its role in fertilizer and seed provision would be a useful first step in this direction. Associated changes to the roles and activities of public input supply agencies would add substance and credence to this process of change, as outlined in Box 1 below.

Box 1. Changing public and private sector roles for input supply

Private	Public
Vegetable Seed: Bhutan Alpine Seed's proposed takeover of the vegetable and cash crop seed component of the NSC (including infrastructure and production means) should be reviewed positively. Any takeover should be pursued through a transparent competitive bidding process, however, and be open to other interested private sector enterprises.	Seed and planting material: genetic resources and parent planting material production to keep with the RCs; but a wider use of imported new varieties should be facilitated. Field crop seed production retained by NSC until there is private sector interest in this activity.
Animal breeding stock: Shift to layer and broiler DoC and pullet production by large and medium-scale private hatcheries. Strengthen and expand AI service provision by community workers.	Animal breeding stock: Continued large animal breeding by public farms; Breeding of DoC/pullets to be downscaled as the private sector capacity increases.
Retail of Fertilizer and Seeds: Increased sale of seeds/planting materials, fertilizers and feed through private wholesalers and retailers including Commission Agents, One-stop-shops, and farmer groups.	Herbicide and pesticide purchasing and distribution to be retained by the NPPC pro-tempore. Fertilizer distribution by the NSC to be scaled down as private sector activity increases.
Machinery services: All new farm machinery to be provided by private sector importers. Promote private sector repair services and spare parts sales. Facilitate group ownership schemes for farm machinery use and ownership.	Machinery services: Continue AMS provision of technical assistance and training services, and collaborative programme with the CNR and RDTC. Increase promotion of mechanization for food-processing.
Certification: Outsource inspection and compliance certification services for farm input supply to private entities.	Regulation: Continued regulation and supervision by BAFRA.

Chapter 5 – Rural labour markets and migration

Inadequate farm labour due to rural out-migration is widely viewed as a constraint to agricultural production. When farmers were asked to state their main constraint in the agricultural census of 2008, approximately 16% listed labour shortages - the fourth ranking constraint after crop damage by wildlife, pests and disease, and inadequate irrigation. This chapter reviews available information on the level and causes of migration and trends in the farm labour force to improve understanding of the causes and implications of this issue.

Rural out-migration

Rural-urban migration has had a profound impact on Bhutan. The rural population grew at an annual rate of only 0.6% from 1985-2005, compared to an urban population growth rate of 6.1% (Population Census, 2005). In a study of rural-urban migration in 2004, almost half of rural households (47%) reported that one or more family members had migrated (Rural-Urban Migration in Bhutan. MoAF 2006). As 59% of migrants were male, this migration also altered the gender balance in both urban and rural areas.

Migration has also altered regional populations. The Population and Housing Census of 2005 showed that internal migration has been characterized by the movement of people from the poorer, eastern regions towards the west and southwest. In the western region, net migration (after adjusting for out-migration) increased the population by 10%.

Significantly, the driving force for rural-urban migration has been improved access to education, social services and jobs (Table 10). Almost half (46%) of migrants surveyed moved to get better access to education. The lower incomes in rural areas were not a major influence. Indeed all factors related to agriculture together accounted for fewer than 20% of the reasons cited for migration.

Table 10. Determinants of rural-urban migration

Pull Factors		Push Factors	
	Percent		Percent
Education	46%	Moved after getting a job	33%
Job-search or lack of off-farm work	17%	To live with parents	25%
Inadequate services	15%	To live with spouse	24%
Small land holdings	7%	Religious pursuits	9%
Drudgery of farm work	5%	Access to business opportunities	4%
Labour contribution to public	3%	To live with relatives	3%
Non-remunerative agriculture	3%	Resettlement	2%
Crop damage by wild animals	3%		
Natural calamities	1%		

Source: Rural-Urban Migration in Bhutan. MoAF 2006.

The educational levels and subsequent professions of migrants also indicate that they are disproportionately wealthier and better educated. Only 2% of migrants to urban areas were working as labourers, whereas 31% were employed as civil servants.

The main perceived negative effect of rural-urban migration has been the reduction in agricultural manpower, cited by 47% of rural households and 30% of the rural (geog) administrations surveyed. Urban-rural remittances were seen as an important offsetting positive effect, however, with 54% of urban migrants sending a proportion of their income to rural relatives. Some 59% of geog administrations also cited urban-rural remittances as the main positive factor arising from out-migration.

Recent evidence suggests that rural-urban migration has now slowed considerably, with net rural-urban migration less than 0.5% per annum in 2010. The rate of rural-rural migration was only slightly lower than rural-urban migration and people were also moving from urban to rural areas (Table 11). These changes may be due to the improved access of rural people to social services in response to investment in farm roads. Increased connectivity may be reducing the impact of the major "pull" factors driving rural-urban migration, and out-migration may be less of an issue.

Table 11. Bhutan internal migration 2010

Migration Direction	Number	Percent per Annum
Rural to rural	3,000	0.6
Rural to urban	4,100	0.85
Urban to urban	7,800	1.6
Urban to rural	2,000	0.4

Source: Labour Force Survey Report 2010.

Implications for agricultural labour

Aggregate trends in rural population and farm labour supply run counter to farmer claims of labour shortages. Data from the National Labour Force Survey show that the agricultural work force increased by almost 80% from 2001-2010, considerably higher than the 43% increase reported for the total economically active population (Table 12). By 2010, the agricultural workforce accounted for 51% of the total work force, up from 41% a decade earlier. Closer analysis indicates that farm labour constraints may be due to changes in the composition of the agricultural work force.

The explanation for the seeming contradiction between out-migration and a larger agricultural work force may lie in an increased labour force participation rate in rural areas, particularly among women. The labour force participation rate in rural areas increased from 52% to 69% from 2001-2010, while the urban participation rate remained largely unchanged at 67% (Table 12). This increased participation in rural areas is due largely to increased female participation. While the proportion of the rural male population (over 15 years of age) active in agriculture has risen from 22% to 37%, the proportion for women has jumped from 21% to 65%. Women now significantly outnumber men in the rural work force. Hence they bear a much higher share of the farm workload, in addition to their traditional household and family responsibilities.

Trends in paid employment in the rural work force provide further insight. Although the total rural work force increased from 2001-2010, the number of permanent paid workers declined by 19%. Changes in paid female employment are even more striking. Permanent female employment in rural areas increased by 31%,

while female casual labour rose by nearly 1,000% (although the actual numbers are very low). Women may not be available for more than occasional paid work due to their family and household responsibilities.

The apparent decline in access to permanent labour has occurred during a period when commercial agriculture has expanded, particularly the commercialization of labour-intensive fruit and vegetable production. As this commercialization is most advanced among larger, wealthier farmers it may be that these are the only people with the means to employ the scarce available permanent labour, leaving the remaining, smaller farmers with minimal access to hired staff. Evidence from the 2008 agricultural census supports this view. Smaller farmers are much more vulnerable to labour shortages with 20% of farmers in the lowest quintile reporting this as their major constraint, versus 12% in the highest quintile (Table 14). Hence, many smallholders may simply lack the financial resources to employ workers on more than an occasional basis.

Wage rates will also influence the extent to which demand side factors constrain access to farm labour. Unfortunately, good rural wage data are not available. Anecdotal evidence suggests that rural wages are high relative to urban wages¹⁷, although this disparity may be due to the influence of foreign migrant workers on urban labour markets¹⁸. Current legislation also forbids the employment of foreign migrants in agriculture, depriving farmers of a potential source of plentiful, low-cost labour, although its use is said to occur in southern Bhutan.

Finally, the impact of rural out-migration on the age distribution of the working population may also have affected farm labour supply. Only 2.2% of those engaged in agriculture in 2001 were over 60 years of age, in contrast to a national average of 4.9%. By 2010, while the proportion of the population over 60 had increased to 9.2%, the proportion among the agricultural workforce had climbed to almost 11%.

17 The Director General of the Department of Labour estimated that rural wages are higher than urban rates, citing figures of around Nu. 220/day for rural labour (including the provision of food and drink) compared with urban wage rates of Nu. 150-200/day.

18 An estimated 37,000 foreign workers are employed in Bhutan (mostly unskilled or semi skilled Indian labourers). Most are engaged in construction and road building on wages estimated at Nu. 150/day, compared to R60-65/day in West Bengal.

Table 12. Rural labour force characteristics 2001 and 2010

	2001		2010		Change	
	Number	%	Number	%	Number	%
Total Population	647,003		696,500		49,497	7.7
Rural Population	450,874		482,000		31,126	6.9
Rural Population as % of Total		69.7		69.2		-0.5
Total Economically Active Population ^{a/}	232,203		331,900		99,697	42.9
Total Labour Force in Agriculture	94,794		170,200		75,406	79.5
Agricultural Work Force as % of Total		40.8		51.3		10.5
Urban Labour Force Participation Rate		66.4		67.0		
Rural Labour Participation Rate		51.7		69.3		
Male Agricultural Work Force ^{b/}	48,452		83,900		35,448	73.2
As % of Rural Male Population (15+ years)		35.2		51.9		
Female Agricultural Work Force ^{b/}	46,342		94,900		48,558	104.8
As % of Rural Female Population (15+ years)		32.7		53.5		20.8
Urban Females Economically active	43,905	62.3	39,100	52.3		
Permanent Paid Agricultural Workers ^{c/}	2,584	2.7	2,100	1.1	-484	-18.7
Male paid workers	2,125		1,500		-625	-29.4
Female paid workers	459		700		241	52.5
Paid Agricultural Workers as % of Rural Work Force		3.6		2.9		-0.6
Rural Workers over 60 years of Age	3,111	2.2	24,200	10.6		

a/ Includes employed, unemployed seeking work and self/family employed.

b/ Includes all persons over 15 years of age.

c/ Excludes casual labourers, piece rate workers and paid apprentices.

Source: National Labour Force Surveys, 2001 and 2011. Department of Employment, Ministry of Labour and Human Resources, Thimphu.

Although indicative, this analysis provides a plausible explanation for inadequate farm labour and its implications. The increased role of female labour and the consequent increase in the labour burden they carry certainly warrants increased attention. A greater emphasis on improving access to mechanized rice threshers and maize shellers would reduce the labour burden they now face, for instance. It also appears that both demand and supply side constraints influence access to paid labour, and that the demand side constraints may be highest for smaller, low income farmers trying to commercialize their operations. A relaxation of current restrictions on the use of foreign migrant labour for agriculture would address this constraint, but this is a politically contentious issue. Further study of both the demand and supply side constraints to farm labour use is warranted, including a better understanding of the influence of wages and rural-urban wage differentials.

Chapter 6 – Research and extension – priorities and linkages

Agricultural research was initiated in the 1960s together with demonstration farms as the main vehicle for extension. A major re-organisation and strengthening of the research and extension system was implemented in the early 1990s, in association with the decentralization of government and the adoption of an integrated “renewable natural resource” approach to sector development. Four regional research centres were established and the mandate of the extension service was changed to knowledge dissemination rather than the distribution of farm inputs and credit. Further institutional reform has been implemented during the 9th and 10th FYPs (2002-2008 and 2008-2013) with the aim to improve the level of technology transfer to farmers.

This chapter reviews progress towards the goal of increased technology transfer. The policies, priorities and resources of research and extension are reviewed separately, but considerable emphasis is also placed on the links between research and extension.

Research and technology transfer

The mission of the RNR research system is to generate appropriate and innovative technologies for increasing productivity and profitability, contributing to the enhancement of food security and rural income through sustainable use of RNR. Most research is implemented by four regional research centres¹⁹ (RC), each with a core national mandate and a regional, farming systems mandate (Box 2). This network reflects the agro-ecological diversity of Bhutan. The overall structure is coordinated by the Council for RNR Research of Bhutan (CoRRB), which is organized around three divisions: Research (field crops, horticulture, livestock, and forestry), Research Communication (extension support, technology packaging, information communication, agriculture school), and

¹⁹ The National Post-Harvest Centre, the AMC and the NPPC also conduct research.

Farming Systems (climate change and agro-meteorology, water and soil management, socio-economics).

As of 2010, the total staff of the CoRRB and the four research centres was 368 people. Research and technical work is carried out by 29 staff with M.Sc. or higher degrees, 30 with B.Sc. degrees and 62 with Diplomas. An estimated 180 additional researchers and scientists have been requested by the RCs to implement the activities envisaged under the 10th FYP.

The budget allocation for RNR research in the 10th FYP is 219.85 million Ngu (Table 13), double the allocation in the 9th FYP. It accounts for 6% of the total 10th FYP budget of 761.8 million Nu for the RNR sector and represents 0.7% of RNR GDP, which is low by international standards²⁰. Research activities receive 73% of the budget, outreach activities 20.6% and the remaining 6.4% is for operations. The high research allocation to horticulture indicates the importance that RGoB gives to this sub-sector.

²⁰ A research budget of 2% of agricultural GDP is viewed as the norm.

Box 2. Regional research and development centres

- (a) Yusipang. Located in Thimpu district and covers the five western Dzongkhags (Thimpu, Paro, Ha, Samtse, Chukha). Responds to a national mandate for forestry research, and a regional mandate for horticulture, livestock and field crops. Research sub-stations in Darla and Chukka.
- (b) Bajo. Located in Wanguphodarang and covers the five western central Dzongkhags (Wangdue, Gasa, Punaka, Daga Tsirang). Responds to a national mandate for field crop research, and a regional mandate for forestry, livestock and horticulture.
- (c) Jakar. Located in Bumthang and covers the four east-central Dzongkhags (Trongsa, Bumthang, Zhemang, Sarpang). Responds to a national mandate for livestock research, and a regional mandate for field crops, horticulture and forestry. Research sub-stations in Bhur and Sarpang.
- (d) Wengkhar. Located in Mongar and covers six eastern Dzongkhags (Mongar, Lhuentse, Trashy Yangtse, Trashingang, Pemagatshel, Sandrup Jonkar). Responds to a national mandate for horticulture research and a regional research mandate for livestock, forestry and field crops. Research sub-stations in Lingmithang and Khangmang.

Table 13. RNR research budget 10th FYP (2008-2013)

Research/Activity	Budget (Ngu million)	%
Field Crop Research (RC Bajo)	36.100	16.5%
Forestry Research (RC Yusipang)	31.950	14.5%
Livestock Research (RC Jakar)	35.300	16.1%
Horticulture Research (RC Wengkahr)	57.000	25.9%
Information and Communication Services	16.200	7.4%
Coordination and Partnership Programme for Research	4.500	2.0%
Agriculture School (educational work in schools)	20.000	9.1%
Research Communication	5.300	2.4%
Plant and equipment	3.500	1.6%
Professional Services	5.000	2.3%
Vehicles	5.000	2.3%
Total	219.850	100.0

As part of the ongoing re-organisation of research and extension, the research agenda is now set on the basis of input from annual meetings at regional and national level. Regional Review and Planning meetings are convened and coordinated by the respective regional centres to decide sectoral and district-specific needs and priorities. They are attended by relevant regional and district level RC and MoAF representatives and are an essential input to the subsequent National Research Coordination and Extension meetings. This meeting is convened and coordinated by the CoRRB to finalize research priorities and set the research agenda. Stakeholders include MoAF national and district level staff and RC representatives.

Research centre achievements

CoRRB records report the following research achievements during the 8th and 9th FYPs:

Field crops:

- Release of new varieties²¹ : Rice 9, Maize 2, Millet 2, Pulses 2.
- Impact assessment of maize and rice research showing that improved varieties are grown on 50% and 35% of the total area, respectively.
- Thirty improved RNR technologies packaged and distributed.
- 29 field crop and vegetable varieties de-notified.

²¹ Based on the current list of released crop varieties, MoAF. 2011.

Horticulture:

- Release of new varieties: Apple 3, Orange 2, Other Fruit 19, Potato 1, Other Vegetables 6.
- Demonstration orchards established.

Livestock:

- Release of 24 grass fodder varieties (sub-tropical and temperate).
- Report on genetic resources of domestic animals.
- Milk protein analysis quantifying influence of the Mithun cattle breed.
- Alternative pasture mixtures.
- Fodder seed production technology.

Forestry:

- Characterisation and silviculture of main conifer species.
- Forest fire risk mapping.
- Sustainable management and conservation of *Cordyceps sinensis*.
- Study of gradational forest change.
- Study of shifting cultivation.
- Study of lemon-grass/bamboo and cattle grazing systems within a forestry area socio-economic production framework and their impact.
- Resource identification and assessment of major non-wood forest products.

Outreach activities in the 9th FYP include the School Agriculture programme that supported agricultural education in 125 schools in Bhutan, and the training of 550 farmers through study tours and field days. EAs were trained in orchard management, temperate fruit crop management, nursery production and vegetable and citrus production technology. Seven new rice varieties have been released so far in the 10th FYP, and seven new fruit tree varieties.

Relative to the problems facing the sector and its potential for growth, these are modest results. Farmers have reported crop damage by wild animals as their major constraint for over 20 years, but the research system has yet to develop a viable solution (see Box 3). The limited response to the serious disease problems affecting citrus, potatoes, cardamom and maize is a further concern given the major contribution of these crops to RNR sector output and growth. The rate of new varietal release by the RCs has slowed considerably, with 42 releases in the 8th FYP, 29 in the 9th FYP and 14 so far in the 10th FYP. Maize receives little attention relative

to rice, despite the fact that it is the crop with the largest area. Although 50% of the maize area is sown to “improved varieties,” the most recent maize variety was released in 1999.

Following the recent mid-term review of the 10th FYP, the RNR research programme is to be realigned around three major outcomes and five related outputs:

- Outcome 1: Improved varieties for cereal crops, cash crops and fodder in order to enhance food security and cash income;
- Outcome 2: The development of sustainable management practices and technologies to enhance productivity; and
- Outcome 3: Enhanced access to information to improve agriculture production and service delivery.

To achieve these outcomes the RCs will focus on: forestry (silviculture, broadleaf species monitoring); livestock (productivity, feeding, health, yak herding); field crops (varietal selection for productivity and resistance/tolerance to stress); horticulture (varietal selection of temperate fruit/apples, subtropical fruit/citrus, pest/disease resistance potato/chilli varieties); and sustainable management practices (silvicultural conifer practices, organic farming, SRI technology).

A long and incomplete reform process

Concern at the performance of the research system is not new. The mid-term review of the 8th FYP noted its low technology transfer and attributed it to the lack of a development focus. This resulted in formation of the CoRRB in 2003 to strengthen coordination of agricultural research and extension activities and improve technology transfer to farmers. But MoAF departments continued to perceive a poor link between their respective development mandates and the work carried out by the research system, particularly for research at regional level. In addition, technology transfer by the RCs was considered to be ineffective and research output was viewed as unresponsive to the actual needs of the farming community.

These concerns resulted in the assignment of an additional ‘development’ mandate to the RCs in December 2009, in order to increase their contribution to technology transfer. The research centres are now known as “Research and Development Centres”

(RDCs). To improve accountability, research activities will continue to be prioritized and coordinated by the CoRRB. In addition, both the research and development functions of the RDCs will be subject to oversight by relevant departments in the MoAF. The MoAF will also retain control of the RDC budget.

In reality, the 'development' mandate assigned to the RDCs includes a mix of technology transfer (technology promotion to farming communities, seeds and planting material transfer, plant protection-soil nutrient-water management services) and conventional regional development (support to OGTP and RNR programme implementation, regional development proposals, farm enterprise promotion, etc.). They have been assigned a major additional role, for which they have neither the human resources nor the expertise. Given that the RDCs already view staffing as inadequate relative to their research function, there is a high risk that both research and development activities will be compromised as a result of this new structure. There is also a lack of clarity as to how the various roles and responsibilities will be shared between the RDCs, CoRRB, MoAF departments and District government. It may be difficult for the RDCs to respond to a research mandate set by one entity (CoRRB) and a development mandate set by another (MoAF Departments).

The MoAF also initiated a review of research policy in 2010. A draft document²² has been finalized with FAO's support and assistance²³ and final discussion with stakeholders is in process. The draft policy document viewed by the mission presents an objective situation analysis and outlines the guiding principles for research policy, in line with Bhutan's GNH philosophy. The vision, mission and goals are sound. The aim to strengthen relationships with the international agricultural research system and increase partnerships with the private sector is well conceived, and the envisaged funding mechanisms are appropriate.

However, the draft would benefit from further thought in a number of key areas. Rather than describing the basis for discerning research priorities, the document presents a very detailed research agenda.

22 RNR Research Policy of Bhutan. Final Draft 6.5, January 2011.

23 This exercise was undertaken by a government Task-Force, including MoAF and the Gross National Happiness Commission. Mr Samm Musoke, Economist, consultant to FAO with Maniram Muktan, a PhD scientist of CoRRB, have assisted in preparing the current final draft.

The need for clear guidelines on how to prioritize research and ensure that it responds to key sector issues, a fundamental weakness of current research policy, is thus not addressed. By presenting a detailed list of research topics as official research policy, the draft policy also risks “freezing” the research agenda. The emphasis should be on prescribing the basis for defining research priorities, and then describing how to choose research areas that respond to these priorities. A clearer specification of the roles and responsibilities of the various stakeholders (CoRRB, MoAF Departments, Programmes and National Centres, RDCs) is also required, together with a more detailed and comprehensive statement on how to link research and extension. Finally, there is no mention of the need for economics/ socio-economics as areas for research.

Prerequisites for improved technology transfer

Throughout this internal process of reform the underlying concern has been that the research system is not responding adequately to the major issues facing the RNR sector. This disappointing performance is attributed to the following factors:

- An inappropriately prioritized research agenda that does not reflect the key constraints and opportunities of the RNR sector;
- The generation of outdated or inappropriate technologies, which respond poorly to the needs of farmers; and
- A weak capacity to transfer available technologies due to poor research-extension linkages.

At the farm level, the major constraints faced by farmers are well known and were confirmed by the agricultural census of 2008 (Table 14).

Of these animals constraints the two most important are crop damage by wild animal and crop damage by insects, issues which have yet to be adequately addressed despite the major economic implications of the losses incurred at both farm and sector level (Box 3). At the sector level recent research confirms that productivity is constrained by the low use of inputs and low use of improved technology²⁴. High post-harvest losses (as much as 40% of the citrus delivered for export is rejected by traders) further limit the competitiveness of Bhutanese products.

24 Technology Adoption, Agricultural Productivity, and Road Infrastructure in Bhutan. Policy and Planning Division of MoAF, August 2010.

Table 14. Reported constraints faced by farmers, by farm size

	Farm Size					Total
	Q1	Q2	Q3	Q4	Q5	
Crop damage by wildlife	23.9	26.3	24.5	23.4	24.7	24.6
Crop damage by insects/ diseases	20.2	21.5	20.6	18.4	18.4	19.8
Insufficient irrigation supply	9.2	11.9	15.5	21.0	22.8	16.0
Labour shortage	20.0	17.4	15.7	13.5	12.0	15.7
Shortage of land	13.3	9.9	9.8	8.2	5.3	9.3
Limited access to markets	4.2	4.8	6.0	7.5	9.3	6.4
Unproductive land	2.5	2.0	2.5	2.9	3.2	2.6
Hail storm/wind	2.7	2.4	1.3	0.9	0.9	1.6
Drought	1.1	1.2	1.3	1.1	0.7	1.1
Land slides/soil erosion	0.9	1.0	0.9	1.0	1.2	1.0
Lack of feed and fodder supply	0.7	0.7	0.6	0.7	0.5	0.6
Wildlife attack on livestock	0.8	0.5	0.6	0.6	0.4	0.6
Excessive rain	0.4	0.5	0.6	0.7	0.5	0.5
Livestock diseases	0.3	0.1	0.2	0.2	0.2	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Technology Adoption, Agricultural Productivity and Road Infrastructure in Bhutan. MoAF. August 2010.

A more appropriate set of research priorities might be based on a response to the following set of issues, ranked in order of importance:

- Reducing crop damage by wildlife²⁵;
- Reducing pest, disease and post harvest related losses;
- Understanding and mitigating the fallow land issue;
- Developing more efficient production systems and practices (based on technical and socio-economic research) for the major cash earning commodities, with particular emphasis on more efficient use of labour, water and farm inputs; and animal feeding and health; and
- Ensuring concrete productivity gains and improved food security in the poverty pockets of the country.

²⁵ A good starting point is considered The Human Wildlife Conflicts Strategy (<http://www.moaf.gov.bt/moa/downloads/downloadFiles/MoADownload5lv1595os.pdf>), developed in 2007. This strategy was supposed to be implemented in the 10th FYP but none of the 29 RNR programmes seem to cater for its implementation.

Box 3. Crop damage by wild animals

Crop damage by wild animals (boars, monkeys, deer, porcupines and wild elephants in the southern dzongkhags) is a major problem for farmers in Bhutan. In addition to direct crop losses it is also the major cause of land left fallow. In a country where arable land is so scarce, the fact that 26% of agricultural land lies fallow is a major concern. The estimated cost of cereal (paddy and maize) losses by farmers due to wildlife damage are in the order of 4-5 million USD per year. Lost output from fallow land is even higher at 13 million USD (paddy equivalent) for wetland and about 44 million USD (maize equivalent) for dryland¹.

Three potential solutions are being studied. Electric fencing affords control against most animals with low risk to humans and animals. The Wengkhar RC has developed low cost energizers and fencing materials from locally available materials to improve farmer accessibility to this approach. A prototype device that produces intermittent shrill sounds and bright light has been developed by the National Post Harvest Centre (NPHC) in Paro. Both systems have proven effective in on-farm experimental trials. The use of bay and catch hunting dogs is also being investigated.

IFAD's MAGIP project will provide resources to enable further trials of these three approaches in the six Eastern Dzongkhags. The trials will be managed by Wengkhar RC (electric fencing), the NPHC (sound and light), and Jakar RC (dog control).

¹ Calculations are based on RNR Census (2009) data for fallow land and paddy and maize yields, farm gate prices for 2010 (May-November), and an exchange rate of 44.7 Nu = USD 1.

The research institutions themselves view lack of resources as the main reason for their low performance, particularly the shortage of qualified staff, rather than inappropriate research focus. Less than 17% of their staff holds a degree and only 8% hold a Masters or higher qualification. Hence, the RDCs have requested a threefold increase in the number of researchers and scientists in order to meet the challenges of the 10th FYP. While a human resource development assessment is beyond the scope of this review there is clearly a shortage of qualified researchers. As noted above, there is also no capacity for economic or socio-economic research. The addition of a development mandate to the research institutions will further strain human resources.

There is scope to rationalize staff numbers and share resources through better coordination between the RDCs and other national institutions. Stronger links with the extension system would certainly improve the level of technology transfer to farmers.

More could also be done to draw on the resources and expertise of the international research centres, following the example of the successful recent collaboration with IFPRI. Different national institutions also appear to be working on the same issue, such as the research on Citrus HLB (Greening)²⁶ by the NPPC and RDC (Wengkhar). The NPPC is working on vector control via pesticide treatment, an approach regarded as very costly by the CoRRB. The RDC (Wengkhar) on the other hand is trying to promote citrus cultivation in higher altitude areas (1,000-1,700 m asl) as the psyllid is considered to be less active above 900 meters. Similarly, research on wild animal control measures is being implemented by the RDCs in Wengkhar and Jakar and the National Post Harvest Centre (Paro).

Ultimately, MoAF and the RDCs will need to be much more realistic about what can be achieved with the available resources, and much more discerning about how they prioritize and focus the research agenda. The reality is that human and financial resources are limited and the research programme should be scaled accordingly. The recent decision to broaden the mandate of regional research institutions, and the long list of research projects in the draft research policy document suggest that this reality has yet to be accepted.

Extension – advocating and responding to farmer needs

The MoAF has invested significantly in the physical infrastructure and human resources needed to ensure that Bhutan's farmers have reasonable access to extension services. An RNR centre has been established in each of the 205 geogs, and most are staffed with one EA per sector²⁷ who operates under district-level sector coordinators. Office and housing infrastructure and staff mobility have also been

26 Citrus Greening Disease (CGD) - also known as Huanglongbing (HLB) or yellow dragon disease - causes trees to produce predominantly green (worthless) fruit that fails to ripen and has a bitter-salty flavour when processed. CGD is caused by an unnamed bacterium. The vector is the Asian citrus psyllid (AsCP), *Diaphorina citri* Kuwayama. There is no cure for citrus greening and infected trees must be cut down. Effective biological control measures of the vector are yet to find a scientifically acknowledged protocol. All species of citrus are susceptible, regardless of rootstock and scion variety. According to NPPC, of 160 geogs where citrus is grown 28 are seriously affected and 50 are considered as psyllid affected.

27 As of January 2011, Extension staff (Dzongkhag and geog) is: 393 (DOL), 282 (DOA) and 238 (DOFPS). Details on District staff distribution are not available but each geog is nominally equipped with one EA per sector, who are answerable to their respective District sectoral heads (Agriculture, Livestock and Forestry).

improved²⁸ although more investment is required. EAs interact more frequently with farmers located in geogs and villages that are better served by farm roads and are well equipped with service infrastructure (RNR office, research sub-stations, etc.).

Ideally, extension activities would be coordinated separately by each Department, but there is no operational focal point at MoAF headquarters. Instead, an Extension Coordination Committee (ECC)²⁹ chaired by CoRRB, has been set up to coordinate cross-cutting extension related policies, strategies, methodologies and programmes amongst the various departments and agencies of MoAF.

Most of the EAs are young, motivated and working as best they can with the farming community. Many have a degree from the College of National Resources, while others have a diploma. These agents are the frontline for implementing MoAF development programmes and district RNR plans in farming communities. In addition to these national and district level initiatives they are also responsible for implementing the OGTP programmes of the 10th FYP at geog level. Unfortunately the current planning process does not consider how national, regional and geog level plans and programmes are to be implemented at community level, leaving the EAs to cope as best they can. For instance, preliminary results from the mid-term review of the 10th FYP suggest that the allocation of finance at District level has been overwhelmingly skewed towards the construction of farm roads, leaving little finance for other development activities.

Current review and reform of extension policy

As with the research system, there is an ongoing review of the extension service. A recent internal review by MoAF in 2010³⁰ emphasises the need to centrally coordinate the research and extension systems in order to reduce duplication of activity, improve coordination and increase technology adoption rates. However it provides no recommendation on where this central coordination structure should be located. Additional issues identified in this review include:

28 The World Bank's Decentralized Rural Development Project has also supported this process.

29 The ECC meets twice a year, plus on an as needed basis. It comprises: CoRRB director (chair), NSC, DOA, DOL, DLO-Thimphu, DOFPS, DFO-Paro, DAMC, PPD, ICS, BAFRA, HRMD, AFD, CNR, and secretary from CoRRB.

30 BN Bhattacharai, Principal Extension Officer, DOA, in Journal of RNR Bhutan, CoRRB, June 2010.

- The disconnect between FYP programmes and the extension activities required to implement them;
- Uncertain MoAF coordination mechanisms, with low accountability;
- The minimal finance and resource allocation for extension relative to its wide range of required activities;
- The outdated nature of the one extension worker (per sector)–one geog policy;
- The current multi-task nature of extension impedes the ability of EAs to focus on action;
- The technologies generated by the research system are seldom consistent with the actual needs and capacity of farmers, especially for smaller, resource-poor farmers;
- Information flow and linkage mechanisms between the extension service and the central level (programmes, centres) are inadequate and appropriate ICT investment and systems should be developed;
- Extension coordination, monitoring and back up services should be designed and established with the RCs; and
- The extension service should have its own human resource development plan.

Preparation of a new extension policy, to replace the current policy prepared in 1995, has been under way since 2003. The latest draft strategy paper³¹ is based on modern principles and international best practices including: client orientation and participation, the decentralization of service delivery, outsourcing of service delivery, and co-financing by beneficiaries. It recommends that extension should be viewed as a multi-institutional network of knowledge and information support for rural people aimed at helping farmers help themselves, rather than a supply-driven public service. It also recognizes the need for a more sophisticated and differentiated set of services tailored to the needs of Bhutan's diverse farming communities.

The proposed new system would comprise frontline extension staff based in the geogs and Dzongkhags with institutional support that includes research and other knowledge and input centres. Its mission would be to create an enabling environment for enhancing production, accessibility and marketing in a sustainable manner through relevant, efficient and timely extension service delivery.

31 National RNR Extension Strategy, Working Draft. CoRRB (EEC).

The overall goal would be to alleviate poverty, increase incomes and improve livelihoods and farm productivity/returns to farming through appropriate strategies by addressing the following constraints:

- Low productivity of labour, land, forest and livestock;
- High losses during the growing season due to pests;
- High losses in post harvest handling, and
- Lack of incentives to produce beyond subsistence level, particularly in remote areas.

This set of priorities is a much more accurate reflection of farmer needs than that which currently guides the research system. As they work closely with rural people, EAs are in the best position to know what farmers need, what research is relevant, and what technology packages farmers respond to. The challenge is to use this insight and experience more effectively in setting research priorities and formulating the research agenda.

The draft policy's recommended approach to extension service delivery is farmer-centred, demand driven and participatory. The proposed system foresees the use of a range of tools and approaches including geog Extension Centres, Focus villages, Farmer Groups, Farmer Field Schools, Volunteer Extensionists and Commodity-based Extension.

Further recommendations

The recommendations included in the recent MoAF review and the approach outlined in the current draft extension policy is supported by this report. There is a critical need for a permanent coordination mechanism within MoAF that links extension-related activities and needs of the Departments, RNR-MoAF programmes, National Centres, RNR-District programmes, and the Research Centres. The ECC has not been able to ensure the required coordination.

Finalization of the revised extension policy should be accelerated to coincide with finalization and adoption of the revised research policy. Preparation of these two policy documents should be coordinated to ensure that they are consistent with respect to: research–extension linkages, roles and responsibilities, farmer–extension feedback mechanisms, and the basis for establishing research priorities and setting the research agenda.

The Extension Service should be more assertive in advocating farmers' needs within MoAF, the research system and the national planning process. Their close working relationship with rural communities gives them a unique insight into the technologies and programmes most likely to raise productivity and improve rural livelihoods, and this insight should be used more actively.

Given the importance of extension agents to the successful implementation of RNR programmes, the FYP planning process should ensure that the extension system has adequate guidelines and resources for programme implementation.

Continued investment is required to enhance the capacity of the extension service, including additional physical infrastructure and ICT. This investment should not compromise the financial and operational resources required for extension delivery.

The policy of OGT EAs should be reviewed. Staff capacity, positioning, deployment and facilities should be assessed and re-organized based on actual programme needs.

Extension outreach should be broadened, particularly in remote areas, by enhancing direct farmer involvement. The potential for increased use of Farmer Field Schools should be actively considered in this context.

Continued investment in EA training and capacity building is essential, based on a needs assessment that takes into account overall RNR sector development priorities and farmer needs. Indicative training priorities include:

- Pest, diseases and wildlife crop damage management;
- Mitigation of post-harvest losses;
- Priority technologies and practices (resulting from RC packages and technology development);
- Sustainable land management and climate change adaptation/mitigation;
- Contract farming;
- Farm level business and enterprise management;
- Groups and cooperative organization;
- Irrigation and water management; and
- Resource-poor farmers' specific approaches.

Chapter 7 – Policy and planning issues

Cross-cutting issues from the mid-term review

Two cross-cutting issues have emerged from the first phase of the mid-term review: broad agreement on the need to reconsider the approach to rural roads, and a widely perceived shortage of human resources for public service delivery. Both sets of issues have significant implications for future policy and planning. While there is a strong consensus on the need to extend the network of rural roads, there is also broad agreement on the need for higher quality construction and better maintenance of these roads. There has thus been considerable discussion on this issue, not only because it requires significant public investment, but also because of the longer term social and environmental consequences of road construction for rural areas. Most government agencies report that limited human resources severely constrain their ability to expand and improve the services they provide to rural people. The broader question of public versus private service delivery needs to be given a higher profile in this debate, however, as the private sector is weakly developed in Bhutan. It will thus be important to ensure that any expansion of public service delivery does not crowd out nascent private sector activity or increase the high, existing dependence of rural people on free public services.

Rural roads – prioritizing investment

Rural road construction has been a strategic priority since the ninth FYP (2002-2006). Improved “connectivity” is viewed as a powerful catalyst for economic activity in rural areas and a means to improve access to social services for rural people. Approximately 800 km of farm roads and 173 km of power tiller tracks were constructed during the 9th FYP and a further 750 km of farm roads are to be built under the 10th FYP. The objective is to reduce the proportion of the rural population living more than a one hour walk from a road head from 40% to 20% by 2013.

A comprehensive review of the rural road programme in 2008 led to critical changes that raised the technical specification and cost of farm roads, rationalized the basis for road maintenance, and eased the eligibility conditions for finance. Cheaper, lower specification power tiller tracks are no longer constructed in order to build roads that are more durable. Only higher specification farm roads are now supported, at a cost not exceeding three million Ngu/km (excluding bridges). Provision has also been made to include bridges in road design. Responsibility for maintenance now lies with the Dzongkhag or geog during the first two years after construction. Routine maintenance that can be performed with hand tools and labour is then transferred to community Road User Groups, but responsibility for all other maintenance remains with the Dzongkhag or geog. Earlier eligibility requirements that set a maximum length of 10 km, excluded roads requiring bridges, and required the road to connect at least ten households/km were also relaxed and replaced with the requirements listed below.

To be eligible for finance and technical support, these roads must now comply with the following requirements³²:

- road must connect not fewer than seven households/km; and
- walking time to nearest road head, not less than or equal to 60 minutes.

The decision to build higher specification roads and allocate more of the maintenance responsibilities to local government will result in better roads and better road maintenance, with higher consequent social and economic returns to rural people. More rural communities will also be eligible for rural road investment due to the less stringent eligibility requirements. These changes will substantially increase the unit costs of construction and the public costs of maintenance, however, and increase the overall demand for investment by increasing the number of rural communities eligible for support. Finance will also be needed to upgrade the power tiller tracks built under earlier investment programmes.

The overall demand for finance will increase significantly in response to these changes, although the budget allocation for rural roads in the 10th FYP remains the same. The issue of how to choose farm

³² Guidelines for Road Development, 2009. Ministry of Agriculture.

road projects for financial and technical support will thus become increasingly important. Where there are more requests for rural roads than there is funding available, some form of rationing will occur – implicit or explicit. Under the present administrative system applications are initiated and prepared at geog level and submitted to the Dzongkhag. Hence, rationing probably occurs through differences in the leadership, organizational and political skills of community and geog leaders.

Communities that are better endowed with these skills are likely to have better access to rural roads. These attributes do not necessarily indicate the underlying agricultural potential of the community, the degree of access to social services or the capacity to ensure adequate maintenance of the new road once it is complete. Yet these are the factors shown to determine the impact of rural roads in developing countries, as acknowledged in the MoAF's "Guidelines for Farm Road Development" (2009). Where funding is limited relative to demand, and some communities must wait longer than others, then more thought is needed on how to prioritize access to support.

One way to do this would be to accord a greater emphasis to the three factors noted above (underlying agricultural potential of the community, the degree of access to social services and the capacity to ensure adequate maintenance of the new road once it is complete) when screening applications at Dzongkhag level. These indicators could be scored, weighted and combined into a single index as the basis for ranking applications for funding. Other potential indicators include: the potential contribution of these roads to regional transport networks, the need for roads relative to other investments in physical infrastructure (schools, water supply, irrigation canals, etc.), and the capacity of rural communities to respond to the economic opportunities created by improved road access.

Human resource constraints to public service delivery

Most RNR sector public agencies are calling for more staff and more training for existing staff. A genuine desire to improve the quality of public service delivery partly explains this request, but it is also due to an expanding mandate for public service delivery. A new Department of Agricultural Marketing and Cooperatives has been created with a very broad set of responsibilities and limited staff,

the regional research institutions have been given a “development” mandate in addition to their research role, and the former agricultural input supply system (DSC) has been brought back under MoAF control as the NSC.

The response to these demands should reflect two considerations: (i) the extent to which public service delivery can be improved by making better use of existing human resources, and (ii) the extent to which responsibility for service delivery can and should be transferred to the private sector. Relative to its size, the RNR sector already has a large, well-trained public service system with very broad responsibilities. Farmers have also grown accustomed to a wide range of free or subsidized public services, limiting the scope for private sector service delivery.

The research and extension system is an example of an institutional structure that could improve service delivery through better use of existing human resources. It is currently characterized by well run institutions with capable staff, but weak research-extension links that compromise the effectiveness of both sets of institutions. Improved coordination between research and extension would significantly increase technology transfer to farmers, without an increase in personnel. Better coordination would also improve the capacity of the research institutions to respond to their new “development” mandate. At present the research institutions are trying to respond to this new mandate by making their research staff responsible for technology transfer – at the expense of their research activities.

A clearer distinction between public and private sector roles and responsibilities could also contribute to improved public service delivery, without increasing human resources. Public agencies such as the FCB currently engage in an awkward mix of public and private sector activities, some of which could be transferred to the private sector. Government has tried to reconcile this mix of public and private sector activities by giving these institutions corporate status, and requiring them to use commercial profits to finance public services. But both sets of activities are compromised as a result, irrespective of whether the agency is public or corporate. The solution lies in a clearer distinction between public and private sector responsibilities, and a stronger commitment to transfer commercial

activities to the private sector. Public institutions should focus on doing better the things that only government can do, and avoid doing things that impede or should be done by the private sector.

Accelerated Bhutan socio-economic development programme

As noted in Chapter 1, the RNR sector is one of the “national priority” areas included in the Accelerated Bhutan Socio-Economic Development Programme, which aims to accelerate socio-economic development by improving the effectiveness of public service delivery and enhancing job creation. Prepared with the support of McKinseys, the ABSD was initiated in July 2009 and will continue until the end of the 10th FYP in 2013.

The main conclusions and recommendations for the RNR sector are summarized in Table 1. The broad conclusions of the proposal on challenges to sector development reflect current thinking. But a sharper focus would have shown that the highest priority is the need to raise agricultural productivity in order for the RNR sector to be competitive. Ultimately, the future of the sector depends on its ability to address a stark, underlying reality: Bhutan is a very small, very open economy, which faces unrestricted trade for almost all agricultural commodities due to the free trade agreements (FTAs) that govern trade with India and Bangladesh, its main trade partners. While these FTAs create numerous attractive opportunities for agricultural exports, they also mean unfettered competition from imports – including “strategic” food commodities such as rice. The lower wages, higher agricultural productivity and larger scale economies of agro-processing in these countries also mean that Bhutanese agro-processing (for export or domestic markets) will need to be highly competitive in order to succeed. In the short to medium-term, the competitive advantage of Bhutanese agriculture will continue to depend on its ability to produce off-season fruit and vegetable crops. A wider set of opportunities will only emerge when productivity rises and competitiveness improves.

These observations lead to a somewhat different view of the priorities for sector development, with a much higher emphasis on addressing the causes of low agricultural productivity. Given

adequate resources, farmers will raise productivity where there are adequate incentives to do so – incentives to increase output on the farm, and incentives to sell more of this output. As a high proportion of Bhutan’s farmers lack the incentive to raise farm output, they derive limited benefit from measures to increase the commercialization of agriculture.

The preceding analysis has highlighted the fact that crop damage by wild animals and crop damage by insects/diseases are the most widely reported on-farm constraints to increased farm output. These two critical sources of crop loss are a strong disincentive to raise output for many farmers. They also appear to be more important impediments than resource (labour and water) constraints or access to markets (Table 13). Yet the financial and human resources allocated to developing solutions to these two sources of crop damage are minimal. This is particularly true of crop damage by wildlife. It has been the most widely reported farmer constraint since farm surveys began, has received very limited research funding and still lacks a viable solution. The failure to find solutions to these two basic problems may also partially explain the low adoption rates for the improved technology that is available. Why grow higher yielding varieties and use more fertilizer if the crop will be lost to wildlife or disease? Equally important, the long-term future of profitable cash crops such as cardamom and citrus is now seriously threatened by the inability to control plant disease. The aim to promote contract farming for citrus is unlikely to elicit much interest without a credible solution to citrus greening disease.

The ABSD makes no reference to these farm-level constraints and the 10th FYP allocates less than 1% of the RNR sector budget to pest control and wildlife crop damage³². Instead the focus of both is on improving farmer access to markets through rural roads, strengthening market assembly through farmer groups and cooperatives, and building links to export markets through contract farming and foreign direct investment. While there is wide agreement on the need to promote the commercialization of agriculture, a failure to improve farmer incentives to increase output will inevitably limit the extent of commercialization.

32 Integrated Pest Management Programme. 30 million Ngul.

Some caveats are also warranted on the ABSD's approach to enhancing the commercialization of agriculture. In particular it will be important to ensure that farmers have choices when it comes to buying inputs and selling output. This means minimizing any adverse consequences of monopsonistic contract farming operations, and ensuring that Bhutanese private sector market agents operate on a level playing field relative to cooperatives and contract farmers. These agents also have a legitimate role to play in both input and output markets, including a contribution to the assembly process. The targeted subsidies and special support programmes advocated for farmers groups and cooperatives should thus be avoided, not only because they discourage activity by other market agents but also because international experience shows that such incentives are ultimately counter-productive. Groups will form in order to get access to this support, rather than to meet more fundamental marketing objectives, and will tend to collapse quickly once the support is removed. The heavy bias towards Indian enterprises for contract farming advocated by the ABSD is also questionable, and government should be careful to avoid long-term agreements that lock farmers into low-return contracts – irrespective of which country the external partner comes from.

Finally, an element of caution is suggested on the very ambitious targets set for the various components of the ABSD, and the basis for rationalizing these targets. Too much of the diagnosis that underpins these targets was based on best-case outcomes in countries that have little relevance to Bhutan. A more realistic assessment of expected outcomes and targets would have used the experience from countries with a similar level of development and agro-climatic conditions. This would have elicited a range of potential outcomes, both high and low. Rather than simply highlighting the upper range to investment outcomes, the diagnostic study should also have provided more insight into why comparable investments were successful in some cases and not in others. One of the key messages of the World Bank Development Report (2008) on Agriculture was that there are seldom any quick fixes in agriculture, and promises to the contrary should be treated warily.

Chapter 8 – Conclusions and implications for future planning and investment

The slow growth of the RNR sector disguises two divergent sub-sector growth paths: strong, positive growth for commercial agriculture, driven by fruit and vegetable export commodities such as potatoes, citrus, spices and off-season vegetables; and low or negative growth for cereal crops, particularly rice and maize. These disparate growth paths have considerable implications for future policy and support to RNR sector development.

First these trends indicate that the current focus on investment in rural roads as the key to sector growth has probably had much higher returns for commercial crops than for cereal crops. Increased connectivity has few advantages for crops that are consumed on the farm. Indeed the expansion of farm roads may ultimately become a disincentive to raise cereal production, as lower priced Indian rice imports will become more readily available in rural areas. In contrast, current indications that the rate of rural migration is falling suggest that farm roads have had a strong return in social terms, by reducing the incentives for rural-urban migration.

Second, low current rates of technology use and adoption and low consequent productivity – even among commercial farmers – strongly suggest that improved connectivity is a necessary but not sufficient condition for the commercialization of agriculture. There is a wide range of second round constraints that prevent commercial farmers from responding fully to the opportunities created by improved connectivity. Chief among these constraints is the crop damage by wild animals, high production losses due to pests and disease, inadequate irrigation and inadequate labour. It also appears that resource poor farmers receive a much smaller share of the benefits of commercialization, even where they are close to markets.

The limited progress towards resolution of these second round constraints is attributed first to the inability of the research and extension system to develop appropriate technology packages, due

to inadequate research on these issues and poor linkages between research and extension. Second, input supply is weak due to the reliance on poorly performing public sector agencies and the limited efforts to promote private sector input supply. Third, marketing institutions remain weak in Bhutan. The private sector has yet to expand in response to growing export trade, and measures to reform or strengthen public agencies have been ineffective. Finally, it appears that the labour shortages affecting agriculture are due to the increased role of women in the rural labour force, in response to outmigration by male workers. The women who now dominate the rural labour force must cope with the burden of increased work on the farm in addition to their traditional household and family responsibilities.

The farmers who rely on cereal production and traditional, subsistence agriculture still face the same problems as before. They share many of these problems with commercial farmers however, including crop damage by wild animals, crop losses due to pests and disease and shortages of water and labour. The lack of suitable technology to resolve these problems is thus a common issue, even though the technology they need may differ from that required by commercial farmers. Weak output markets are less likely to be a major constraint, particularly where access to roads is still poor.

Ostensibly, the divergent growth pathways in the crop sector and the differing needs of the two commodity groups (non-cereals vs. cereals) indicate the need to tailor project support and investment differently. But while the immediate problems to be addressed may differ, the underlying causes of these problems are often the same, particularly where they result from inadequacies in public and private institutions. Project support that includes measures to resolving these underlying institutional constraints is also likely to be more effective and have a wider impact. The common underlying issues are as follows:

- The need to reform and refocus the public institutions involved in research, extension and input supply;
- The need to develop appropriate technology packages for different types of farmers, with particular attention to the needs of resource poor farmers; and
- The need to strengthen private sector engagement in input and output markets, through both direct support and a phased withdrawal of the public sector from these markets.

For purposes of project design this broader set of issues can be addressed within a regional framework or by focusing on a commodity or commodity group with potential for pro-poor growth and employment generation.

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