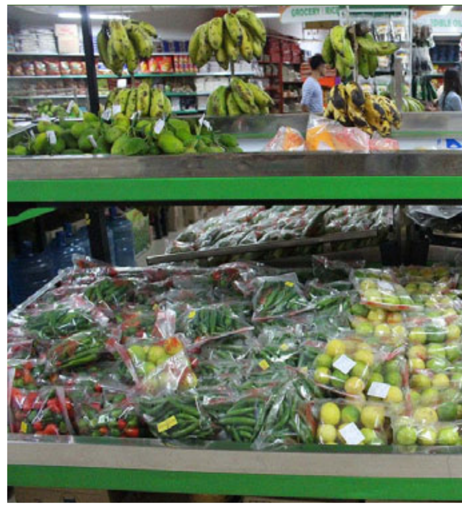
Report No: ACS18679

# NEPAL

## Sources of Growth in Agriculture for Poverty Reduction and Shared Prosperity



WORLD BANK GROUP

December 2016

Global Food and Agriculture Practice
SOUTH ASIA

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## *Sources of Growth in Agriculture for Poverty Reduction and Shared Prosperity*

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Photos courtesy of Karishma Wasti and Purna Chhetri.

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# Abbreviations and Acronyms

| | |
|---|---|
| ADS | Agriculture Development Strategy |
| APP | Agriculture Perspective Plan |
| ASTA | American Spice Trade Association |
| AMS | Agricultural Marketing Service |
| AICL | Agriculture Input Company Limited |
| BIMSTEC | Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation |
| CAC | Codex Alimentarius Commission |
| CAC | Compliances to Codex |
| CDO | Chief District Officer |
| CN | Combined Nomenclature |
| DADO | District Agriculture Development Officer |
| DAP | Diammonium Phosphate |
| DEA | Data Envelopment Analysis |
| DFTQC | Department of Food Technology and Quality Control |
| DISSPRO | District Self Sufficiency Seed Programme |
| DLS | Department of Livestock Services |
| DOA | Department of Agriculture |
| DPH | Department of Public Health |
| EC | European Commission |
| EPP | Export Parity Price |
| ESA | European Spice Association |
| EU | European Union |
| FAN | Floriculture Association Nepal |
| FAO | Food and Agriculture Organization |
| FDA | Food and Drug Administration |
| FDC | Flower Development Center |
| GAP | Good Agricultural Practices |
| GDP | Gross Domestic Product |
| GHP | Global Health Partnerships |
| GMO | genetically modified organisms |
| GMP | Good Manufacturing Practices |
| GON | Government of Nepal |
| HHI | Herfindahl index |
| HIMBOAC-NEPAL | Himalayan Bio-organic Agriculture Center Nepal |
| HS | Harmonized System |
| IAF | International Accreditation Forum |

| | |
|---|---|
| ILAC | International Laboratory Accreditation Cooperation |
| IFOAM | International Federation of Organic Agriculture Movement |
| IPPC | International Plant Protection Convention |
| ISPM | International Standards for Phytosanitary Measures |
| ISO | International Organization for Standardization |
| IVR | Interactive Voice Response |
| JAS | Japan Agricultural Standards |
| MOAD | Ministry of Agricultural Development |
| MOF | Ministry of Finance |
| MOLD | Ministry of Livestock Development |
| MoP | Muriate of Potash |
| MPI | Malmquist Productivity Index |
| MRA | Mutual Recognition Agreements |
| MRL | maximum residue levels |
| NABL | National Accreditation Board for Testing and Calibration Laboratories |
| NARC | Nepal Agricultural Research Council |
| NBSM | Nepal Bureau of Standards and Metrology |
| NCS | The Nepal Council for Standards |
| NGO | Non-Governmental Organization |
| NLSS | Nepal Living Standards Surveys |
| NRs | Nepali Rupees |
| NSB | National Seed Board |
| NSCL | National Seed Company Limited |
| NTIS | National Integrated Trade Survey |
| OCN | Organic Certification Nepal |
| OFPA | Organic Food Production Act |
| OIE | World Organization for Animal Health |
| PACT | Project for Commercialization of Agriculture and Trade |
| PETS | Public Expenditure Tracking Survey |
| PRA | Pest Risk Analysis |
| QSDS | Quantitative Service Delivery Survey |
| RASFF | Rapid Alert System for Food and Feed |
| SAARC | South Asian Association for Regional Cooperation |
| SARSO | The South Asian Regional Standards Organization |
| SMS | Short Message Service |
| SOPs | Standard Operation Procedures |
| SPS | sanitary and phyto-sanitary |
| STC | Salt Trading Company |
| TBT | Technical Barriers to Trade Committee |
| TFP | Total Factor Productivity |
| USA | United States of America |
| USD | United States Dollars |
| VAT | Value Added Tax |
| VDC | Village Development Council |
| WAAPP | West Africa Agricultural Productivity Program |
| WTO | World Trade Organization |

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# Executive Summary

Not many countries have experienced mass poverty reduction without first increasing agriculture productivity (Johnston and Mellor, 1961; Timmer 1988, 2002). Agriculture contributes about 35 percent to the GDP of Nepal. But growth in the sector has been quite volatile in the last decade, to the extent that the lowest and highest growth rates were recorded in consecutive years. Agriculture in Nepal is characterized by relatively low yields compared to neighboring countries. Moreover, land is disproportionately allocated to grain staples (rice, maize, wheat, millet, barley, and buckwheat), despite fruits and vegetables showing relatively higher yields and higher growth in consumption. While the contribution of grain staples to agricultural GDP is only about 3 times higher than fruits and vegetables, land allocation to grain staples is disproportionately 10 times higher. There are signs that farmers are diversifying away from grain staples to fruits and vegetables, but the trend is unlikely to occur at a larger scale unless: (i) there is broad-based productivity gains in main food grains to release land to other crops and (ii) farmers with comparative advantage in fruits and vegetables develop stable expectations that the market could be relied upon to consistently deliver staples food at low cost.

Agriculture is an important sector for poverty reduction and shared prosperity. Most of the poverty reduction between 2003–04 and 2010–11 occurred in rural areas and was driven by rising agriculture incomes (World Bank, 2013). A decomposition of the total income change shows that farm income and agriculture wage changed by 24.4 percent, followed by remittances (23 percent), non-agriculture wages (22.8 percent) and enterprises income (18.3 percent). The impact of agriculture on poverty reduction was highest among the bottom 40 percent where agriculture incomes contributed about 39 percent of their income gains, which is much higher than the 20 percent contribution of remittances. However, investments in agriculture have remained low despite increased agriculture incomes and substantial inflows of remittances. Remittances have grown tremendously in recent years, reaching about 32 percent of GDP in 2015–16 (GoN, 2016). Rural areas receive more remittances than urban areas, although the average size is higher in urban areas. However, most of the remittances are primarily used to finance consumption as opposed to investment in productive activities in agriculture and rural non-farm. It is estimated that only about 1.2 percent of remittances is invested in rural areas. This suggests there are some structural constraints to investments in agriculture and rural non-farm activities.

A good understanding of the sources of agriculture growth would help identify what kind of agriculture offers most potential to further reduce poverty and boost shared prosperity. Growth in agricultural income can be generated by a number of factors, including higher yields, expansion in cropped area, change in real prices, or diversifying production from staples to high value fruits and vegetables. On the demand side, the per-capita consumption of food is increasing fast in Nepal and at a rate that is much faster than India. Moreover, the proportion of consumption of home produced foods to total consumption reduced faster in Nepal than in India—by about 4 percentage points in Nepal compared to 2 percentage points in India. Food consumption has increased across all food categories and across the rural-urban divide. In addition, households are increasingly relying on food markets to meet their consumption needs. Yet much of the supply of this marketed food consists of imports as domestic value chains become less competitive and lose market share in Nepal's domestic food market. Moreover, exports are declining. Nepal is increasingly becoming a net importer of food, both in high value foods such as fruits and vegetables as well as staples such as rice, potatoes, and maize. These trends lead to an important policy question of whether to consider an import substitution strategy to meet growing demand for food commodities and products. The answer largely depends on whether domestic value chains are able to compete with imports. A related policy issue is whether to embark on expanding exports of agricultural commodities, especially where there are comparative advantages. Expanding exports would require investments in infrastructure and a conducive regulatory environment to certify that products from Nepal achieve the various Sanitary and Phyto-sanitary standards of foreign markets.

The main objective of this report is to identify policy and investment priorities to stimulate agricultural growth for poverty reduction and shared prosperity. It ultimately seeks to inform strategic dialogue between Government of Nepal and the World Bank Group towards investments in agriculture and supporting sectors, consistent with the Agriculture Development Strategy (2015). The report is organized to provide building blocks to identify policy and investments priorities. Following a brief Introduction, Chapter 2 examines the main drivers of agriculture for poverty reduction and shared prosperity. The key issues addressed are drivers of agricultural income, drivers of total factor productivity growth, emerging patterns of diversification, degree of mechanization, and constraints to investments in the sector. Chapter 3 examines the effects of public expenditures in fertilizer and seed distribution programs, paying specific attention to effects on: supply of fertilizers, fertilizer application rates, retail prices, private sector participation, performance of the distribution chain, relative access between various categories of farmers, and consistency of the program with inequalities in the distribution of poverty and food and nutritional security. Chapter 4 generates lessons on policy and investments to expand exports. Chapter 5 generates lessons on policy and investments to substitute imports. Chapter 6 provides overall recommendations for policy and investments priorities, while distinguishing between actions needed to stimulate broad-based productivity growth with actions needed for export promotion and import substitution.

## Key Messages on Stimulating Broad-Based Productivity Growth

**Going forward, any strategy for poverty reduction and shared prosperity should include a national program for increasing broad-based agricultural productivity through: developing new technologies and varieties that are more productive, climate resilient, and more nutritious; dissemination of technologies and varieties; and high-impact innovative extension approaches to ensure farmers are able to utilize technology appropriately.**[1] While agriculture has proved to be important for poverty reduction and shared prosperity, most of increase in agricultural income has been due to higher producer prices. A decomposition of the change in crop income indicates that on average about 78 percent was due to increased food prices, while yields contributed about 22 percent, and land contraction decreased crop income by about 9 percent. Productivity could be increased through technical change, which occurs when farmers use newly released technologies that allows them to shift to a new production frontier, or technical efficiency change which occurs when farmers move closer to an existing production frontier. Already the government is implementing the Agriculture and Food Security Project (AFSP) in mid and far western hills and mountain districts with support from the World Bank. The proposed program could involve expanding the AFSP nationally while strengthening its technical components.

**Efforts to stimulate broad-based agricultural growth should address the main constraints to private investment in agriculture: which are lack of technical knowledge on precision farming methods, weak irrigation infrastructure, and weaknesses in the financial sector.** The principal factors inhibiting growth in agricultural productivity in Nepal relate to the low levels at which new practices and technologies are adopted by producers, and issues in the financial sector that limit private investment in agricultural enterprises. The two are closely related. If farmers have access to technical knowledge about precision farming and the use of modern inputs and varieties, that would make agriculture more attractive for investments. The lack of technical knowledge discourages investments. Yet this is not the only constraint in Nepal. Another major constrain is that bank lending policies require applicants for credit to own land and to use it as collateral, which crowds-out a large section of farmers from credit markets and undermines the flow of investible funds to farmers. The banking lending policies impose a serious constraint on some of Nepal's most innovative and technically-skilled farmers—those who had gone abroad to work on farms in

Israel, Japan, South Korea, and Gulf countries and returned with direct knowledge and experience of highly advanced, capital intensive production systems. Most of these farmers do not have their own lands, which partly explains why they had gone abroad, and so are unable to meet the collateral requirements of banks. Their investments in agriculture are therefore largely limited to the savings they have accumulated abroad. Yet these returnees are potentially decisive agents of change, many of whom already disseminate the knowledge they have to neighboring farmers and even offer internships to college students. Many of them are also organized. About 80 percent of the 400 member Nepal Commercial Farmers Association are returnees. Therefore, enabling them and their neighbors to expand their operations through access to formal sources of credit has considerable potential to resolve one of the most basic constraints affecting agriculture in Nepal, and in so doing to transform agricultural production in the country. Such a transformation can take place through both improved technical efficiency that allows producers to move closer to an existing production frontier, and through technical change that enables them to shift to a new production frontier by using more modern practices and technologies.

**A national soil fertility management program should be considered to: address imbalanced use of fertilizers due to current fertilizer distribution policies; introduce efficient and profitable use of fertilizers; and re-orient input distribution policies towards smart subsidies. Such a program would include Technical Assistance to redesign the input distribution programs in a way that includes the private sector in the distribution channels and to deliver smart subsidies efficiently through successful models such as vouchers.** Currently, the government subsidy program is supplying about 50 percent of the estimated demand for fertilizers. It's unlikely the program could be expanded to cover all the demand without imposing major pressures on the national treasury, which is exactly what led to the disbanding of the previous subsidy program in 1996/97. Furthermore, the current program is supplying only Urea, DAP, and potash fertilizers—with Urea occupying more than 60 percent of the subsidized quantities. Urea (46:0:0) constitutes of only Nitrogen (N) and no Phosphorous (P) or Potassium (K). It means there has been imbalanced use of fertilizers for the past several years which needs to be corrected through a national soil fertility management program. Addressing these imbalances would increase efficiency in the use of fertilizer and improve long-term farm profitability. This is important because sustaining long-term soil fertility and crop yields requires balanced use of all fertilizer nutrients (N, P, and K)—rather than predominantly N as has been the case in Nepal. Farmers that could use fertilizers profitably without subsidy should not be subsidized. The proposed soil fertility management program would help identify such farmers. The program would be integrated with smart subsidies that operate under the following principles: (a) target farmers that need to learn about proper use of fertilizers; (b) target farmers that could use fertilizers profitably but are not able to do so due to working capital constraints; and (c) deliver the subsidy through the private sector by using modern voucher systems that have worked in other countries—which is not necessarily what is being piloted in Nepal. A good example of successful voucher programs is in Senegal where the World Bank funded West Africa Agricultural Productivity Program is delivering smart subsidies through e-vouchers. Other examples of voucher schemes are in Nigeria, Burkina Faso, Cote d'Ivoire, and Liberia.

**Smart subsidies can also be used for social welfare purposes, with inputs targeted to address food insecurity and nutrition status as well.** Often time's governments have implemented welfare programs aimed at addressing poverty and contributing to national development—for example employment guarantee programs, conditional cash transfers, and pension schemes. Input subsidies could also be designed as welfare schemes to address inequality in poverty, food insecurity, and nutrition status. In the context of Nepal, this is important because under the current program most of the subsidies are going to the Central region. This region has consistently received most of the chemical fertilizer every year since the program was introduced in 2008 and it's share has ranged from 45 percent in 2009/10 to 53 percent in 2010/11 and 2012/13. However, both the proportion of poor people and the absolute number of poor people are lower in Central region and highest in Western region. Furthermore, data from the National Demographic and Health Survey 2011 show that Food and Nutrition Security (FNS) indicators are worse in the Western region of Nepal. For example, the rate of stunting among children under five years old is about 55 percent in Western region compared to the national average of 41 percent. The main implication of the current regional distribution of fertilizer subsidies is that the program is not consistent with addressing regional disparities in poverty and food security, does not promote shared prosperity, and is likely to exacerbate regional disparities in income distribution. However, targeted programs can be very sensitive in the social context of Nepal. Therefore, efforts to design a program that targets poverty or FNS should be informed by a proper understanding of the political economy and the social structures in the country. Furthermore, poor people or food insecure households may not necessarily be efficient users of fertilizers. It means that targeting based on poverty or FNS indicators alone may not necessarily be aligned to the principles of smart subsidies outlined above. Therefore, targeting based on poverty or FNS indicators should be considered within the context of a smart subsidy program.

## Key Messages on Export Promotion and Import Substitution

The Government of Nepal is keen to expand exports and substitute imports. Recently the government conducted a National Integrated Trade Survey (NTIS) in 2010 and again in 2015 which recommended several value chains for export development. The recommended value chains includes ginger, cardamom, honey lentils, tea, noodles, and medicinal herbs or essential oils. But Nepal is unlikely to expand agriculture exports, especially high value fruits and vegetables, without investments in infrastructure to certify that its goods achieve the various sanitary and phyto-sanitary (SPS) standards of foreign markets. There are gaps between the infrastructure available in Nepal and capacity required for accreditation. For example, there are no accredited laboratory facilities to conduct Pesticide Residue Analysis—a major issue in export markets. Without such capacity any consignment of goods from Nepal would need to be tested for pesticide residues in destination countries. The risks are substantial for exporters as the produce could be rejected without recourse. A study of ginger and cut-flower value chains were used to draw lessons that apply more generally for export promotion and import substitution of agricultural commodities.

**The key recommendation is to develop a national horticulture development program to promote exports and substitute imports.** The suggested program would have the following features:

*Seed development*. One of the first priorities will be to transition growers out of the current practice of using locally available seed materials retained from previous growing seasons. As a result, only two major types of ginger are grown in Nepal. Addressing this challenge will entail developing a national seed development program that replenishes farmers' supply with improved varieties.

*Good Agricultural Practices (GAP)*. This would be instrumental in enabling farmers to comply with trade standards and government regulations to ensure food safety and quality. This moves farmers closer to meeting the specific requirements of high value niche markets in other countries at the same time that it improves food safety for domestic consumers.

*Operational plan for monitoring contamination in value chains of major commodities.* This may involve both broadly defined as well as commodity specific operational plans for avoiding, detecting and monitoring the contamination levels of pests and pesticides in major commodities. To implement such a plan there would be need to: (i) develop specific training modules and build capacity of government staff, and (ii) partnership program with the private sectors (growers and traders) to share information and jointly develop programs to improve traceability.

*Building the capacity of laboratories to test presence of important contaminants.* There is no laboratory capacity for testing and monitoring pesticide residues, mycotoxins, and microbial contamination as per Codex standards/EU requirements. The existing laboratories lack both high precision and basic instruments and equipment's to test for diseases, pesticide levels, microbial contaminations, heavy metals, etc. For example, the Central Food Research Laboratory is limited to 27 parameters and does not include microbial contaminants and heavy metals. The ability to test for these contaminants is crucial to complying with various standards in export markets and is therefore necessary for promoting Nepal's products and ultimately accessing export markets.

*Building human capacity for conducting testing, coordinating SPS issues, and enforcing inspections.* There is a lack of advance level trainings to personnel involved in laboratory testing and inspections, especially as it relates to Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Global Health Partnerships (GHP), and production and processing systems.

*Establishing a local laboratory accreditation board to facilitate Mutual Recognition Agreements (MRA)*. There is no local accreditation board to engage with international accreditation institutions such as the International Laboratory Accreditation Cooperation (ILAC) and other relevant bodies such as International Accreditation Forum (IAF). Nepal relies on India's National Accreditation Board for Testing and Calibration Laboratories (NABL) for accreditation of its facilities. A local accreditation body would be able to promote Mutual Recognition Agreements (MRA) with potential export markets. An MRA is important to facilitate trade as it provides a forum to define what is acceptable among trading partners.

*Compliance with international standards for pest management—International Plant Protection Convention (IPPC)/International Standards for Phytosanitary Measures (ISPM)*.[2] The key actions for compliance include conducting pest risk analysis and identifying pest free areas or areas with low pesticides. There is no proper national survey and surveillance of diseases and pests in Nepal nor is there a regular practice of pest reporting, although certain piecemeal efforts have been carried out in certain projects several years ago. An investment is needed to conduct systematic study to investigate and document various diseases and pests and their incidences in different value chains, including ginger growing areas. The International Standards for Phytosanitary Measures (ISPMs 06, 08, 17 and 22) of IPPC needs to be adopted with local adaptation as national standards to undertake this activity.

*Strengthened SPS enquiry point at DFTQC*. The SPS Enquiry Point needs to be strengthened to take up all matters related to SPS with importing countries and to facilitate negotiating trade based on scientific principles. At present there are very few dedicated staff in the SPS Enquiry point, which is insufficient not only for responding to queries from importing countries and domestic industry, but also far from the capacity required to create and update an effective knowledge base of all the SPS related information.

*SPS diplomacy for export promotion*. The main element of SPS diplomacy is engaging with regional and international organizations, particularly those setting international standards and the WTO SPS Committee. Developing countries are often weak in this area and act as receivers of standards set by others. SPS diplomacy is also essential in bilateral market negotiations between trade partners, and in resolving problems or disagreements which arise during trade. SPS diplomacy relies on scientific capacity. There is need to develop capacity for SPS diplomacy by training a batch of key experts on: (i) policy and regulatory affairs with special reference to compliances to SPS/WTO, (ii) technical skills on pest reporting and risk analysis, (iii) mitigation measures identified by IPPC and other reference standards, (iv) risk communications as per IPPC and Codex, (v) marketing and trade promotion, and (vi) communication and negotiation skills.

*A national strategy for SPS information management, SPS risks communication, and traceability system*. The information management system would bring together, in one platform, all information (legal, technical, institutional, export promotion, global markets) related to SPS matters of different Ministries and Departments—along with national standards and extent of compliances to various IPPC/Codex Standards. Such a platform would also cover risk assessment protocols and updates on SPS issues at different parts of the chains. There are very good lessons on establishing traceability systems from countries such as Kenya.

*A national strategy to access high value niche organic markets, including branding of organic products from Nepal*. With the growing demand in organic products in the international markets, organic ginger from Nepal could be branded and marketed to serve the growing demand. Farmers are already practicing some important principles of organic farming, including low chemical pesticides and farm yard manure, which indicates potential to further adopt organic principles.

*Eradication of poor quality imports of planting materials and agrochemicals from the market*. For example, in cut-flowers the planting materials sourced from plant propagation sites from India are not of the same quality as those imported directly through Europe based companies. Often times, products delivered do not match the quality of products ordered. Producers also complain of fake chemicals in the market and that they do not have the knowledge or means to differentiate the fake chemicals from real ones. Therefore, they end up using whatever is available. Fake chemicals damage the soil and reduce both productivity and quality of cut-flowers.

*Enforcement of land rental contracts to encourage large scale investments in floriculture*. Currently, most producers involved in cut-flowers are smallholders and they lease land for production—with the exception of 2 or 3 integrated firms. Although legal contracts are signed for land lease, there is almost always a provision to end the contract prematurely by either party with prior notice. This clause is required to safeguard the producer in case of a loss, but it also allows the landlord to switch renters whenever a better rental offer emerges. Furthermore, this clause has been used by landlords to sell land during land tenure without compensating the renter for their investment. The land rental market has many inherent risks that has kept investors away, especially in enterprises that are already risky such as floriculture.

*Improved mechanisms for delivery of incentives for procurement of inputs to ensure they actually reach farmers*. The government provides support to producers by exempting tax and VAT on the import of planting materials and insecticides. For example, VAT is exempted and only 1 percent duty is applied on the import of greenhouses. Most producers are small and require these materials in small quantities. The administrative procedures for imports are time consuming and costly, and the transaction costs for each small producer are high. Therefore, the producers buy these inputs from traders or input supply companies. But the government does not provide the same tax and VAT exemptions to traders who supply the producers. It means producers cannot take advantage of these incentives. For small producers, the cost of greenhouses is beyond their investment capacity. Instead of importing greenhouses, they would prefer importing some of the raw materials used in greenhouses and then fabricating locally. But raw materials for greenhouses are subject to 13 percent VAT and a total of 25 percent import duty.

*Introduce agribusiness incubation programs to incentivize investments in cold storage for both planting materials and produce as well as climate controlled transportation services.* For example, planting materials for Gladiolus or its bulbs need to be preserved in controlled temperature and properly ventilated space during off season. But due to absence of chilled rooms these planting materials are preserved under normal conditions. Consequently, many bulbs are destroyed or do not produce expected yields. And when flowers are harvested they do not undergo any post-harvest treatment. It is important to store freshly harvested flowers in chilled room and treat the produce with chemicals in order to kill undesired micro-organisms, reduce damage and prolong vase life.

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## Notes

1. The Agriculture and Food Security Project consists of these features but is implemented only in the mid and far western hills and mountain areas.
2. The intention of ISPMs is to harmonize phytosanitary measures for the purpose of facilitating international trade. ISPMs can cover a wide range of issues including; surveillance, pest risk analysis, establishment of pest free areas, export certification, phytosanitary certificates and pest reporting. The IPPC encourages adoption of these standards, but they only come into force once contracting (members) and non-contracting parties to establish requirements in national legislative instruments. IPPC standards generally fall into three categories: 1) Reference standards, such as the Glossary of phytosanitary terms; 2) Conceptual standards, such as the Guidelines of pest risk analysis; 3) Specific standards, which typically directed at a specific pest or pathogen (e.g. surveillance for citrus canker).

CHAPTER 1

# Introduction

**Agriculture is the key sector for poverty reduction and shared prosperity in Nepal.** The poverty rate decreased to 25.2 percent between 2003–04 and 2010–11. Most of that poverty reduction occurred in rural areas and was driven by rising agriculture incomes (World Bank, 2013). A decomposition of the total income growth shows that farm income and agriculture wage contributed the highest share of 24.4 percent, followed by remittances (23 percent), non-agriculture wages (22.8 percent) and enterprises income (18.3 percent)—see Table 1.1 below. The impact of agriculture was highest among the bottom 40 percent (the lowest and second lowest income quintile) where agriculture contributed about 39 percent of the income gains, much higher than the 20 percent contribution of remittances. Clearly agriculture has proved to be a pro-poor sector and continues to offer enormous potential to drive further poverty reduction in years to come. This is consistent with the conclusions of the *2008 World Development Report* that GDP growth which originates from agriculture is markedly more effective in reducing poverty than growth which originates in other sectors (World Bank 2008). It is also consistent with a broad body of development literature that suggests that very few countries have achieved massive poverty reduction without increase in agricultural productivity (Johnston and

**Table 1.1 Decomposition of Income Changes: 2003–04 and 2010–11**

| | Percentage Contribution to Income Growth between 2003–04 and 2010–11 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Quintile* | *Agri-wage* | *Non-agri-wage* | *Farm income* | *Enter-prises income* | *Property income* | *Remitt-ances* | *Housing income* | *Other income* | *Total* |
| 1 | 6.7 | 24.1 | 35.5 | 8.3 | 0.0 | 20.3 | 5.3 | –0.2 | 100.0 |
| 2 | 3.7 | 27.3 | 31.7 | 10.5 | 0.1 | 21.0 | 5.3 | 0.4 | 100.0 |
| 3 | 1.5 | 22.0 | 34.3 | 10.6 | 0.4 | 22.3 | 5.6 | 3.4 | 100.0 |
| 4 | 1.2 | 21.7 | 25.0 | 15.4 | 0.5 | 25.2 | 8.9 | 2.2 | 100.0 |
| 5 | 0.1 | 22.0 | 13.0 | 26.5 | 1.0 | 23.3 | 7.8 | 6.3 | 100.0 |
| Total | 1.5 | 22.8 | 22.9 | 18.3 | 0.6 | 23.0 | 7.2 | 3.7 | 100.0 |

*Source:* World Bank (2013) based on NLSS II and III, 2003–04 and 2010–11.

Mellor, 1961; Timmer 1988, 2002). While Nepal has reduced poverty through increased agriculture incomes, the sources of that income growth remain unclear—whether it is increased yields, or change in real prices, or diversification from staples to high value fruits and vegetables, or expansion of cropped area. The analysis in this report will identify what kind of agriculture offers most potential to further reduce poverty and boost shared prosperity.

**Agriculture contributes about 35 percent to the GDP, but growth in the sector has been volatile in recent years.** The three most important sub-sectors are food grains, livestock, and fruits and vegetables—in that order. The share of food grains in GDP is about 12.8 percent, livestock (9 percent), fruits and vegetables (4.6 percent), forestry (2.8 percent), cash crops 2.2 percent), pulses (1.6 percent) and fisheries (0.3 percent). Annual growth rate fluctuated rapidly in the last 10 years such that the lowest and highest growth rates were recorded in consecutive years—about 1 percent in 2006/7 followed by 6 percent in 2007/8 (see Figure 1.2). The drastic growth in 2007/08 is likely driven by the response of domestic food prices to the global food crisis. Growth in the industry sector

**Figure 1.1 Share of Agriculture in GDP and Relative Sectoral Growth Rates**

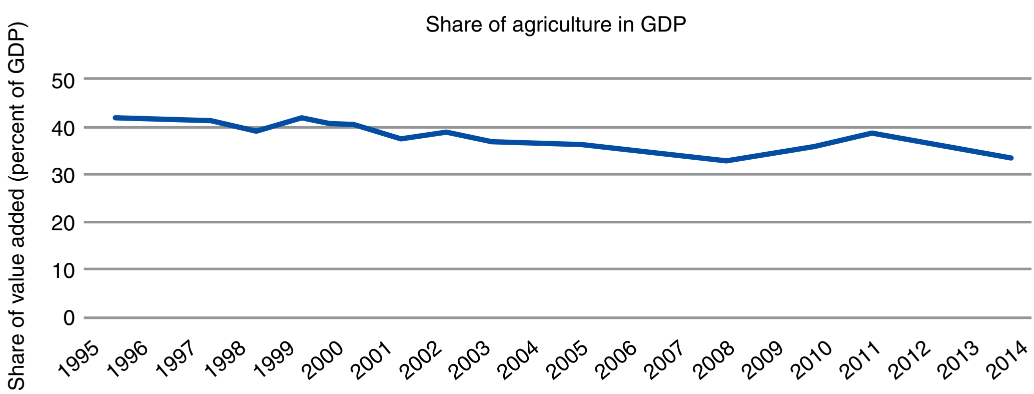
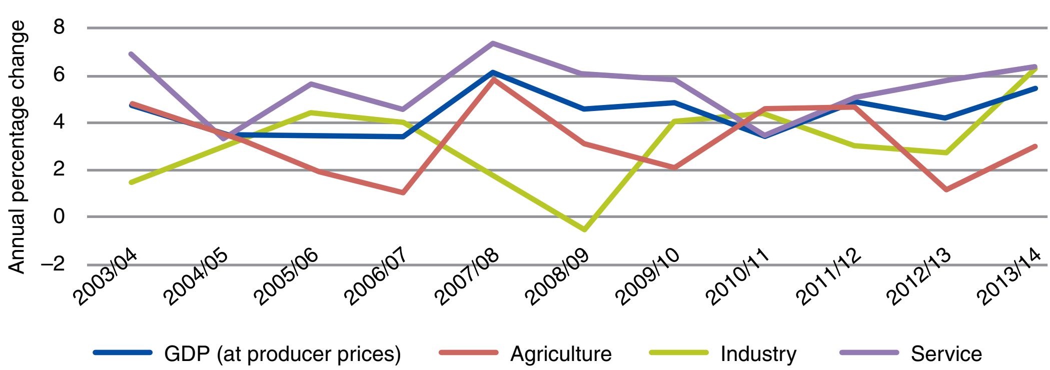



**Figure 1.2 Annual Growth Rate between Agriculture and Non-Agriculture Sectors**



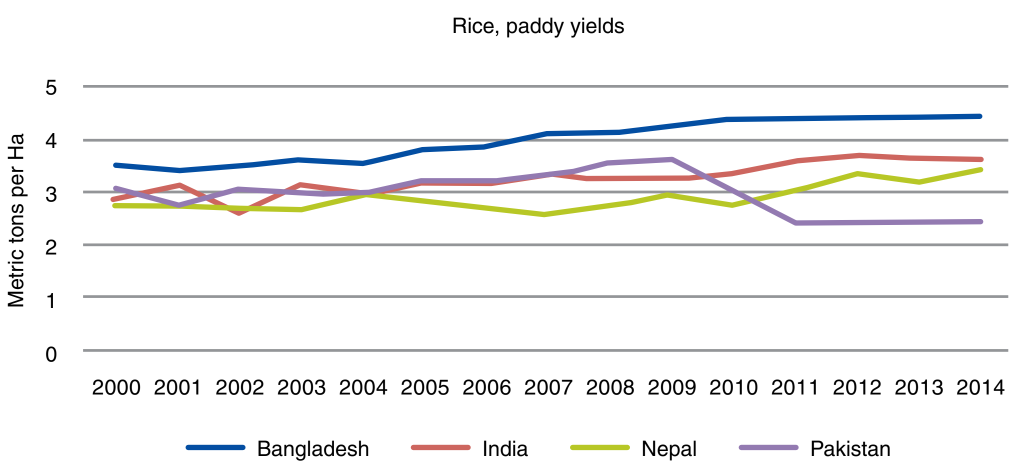

*Source:* Economic Survey (2014/15).

has also been relatively volatile, but it does not always follow the same pattern as agriculture growth. On the other hand, the services sector has been quite stable. GDP growth seems to track growth in services more than in any other sector. This is mainly because services are the largest sector contributing about 50 percent to GDP while industry contributes about 15 percent. The observed volatility in agricultural growth is often attributed to weather fluctuations and civil instability.

**Agricultural production occurs in disparate agro-ecological zones in the country—Terai (low elevation), hills (mid-elevation), and mountains (high elevation)—all running from East to West.** The Terai has the most fertile land and accounts for most of agricultural production. The region is endowed with favorable climate for many crops, better road connection, and a long border with India. The hills and mountains are suitable for maize, millet, barley and buckwheat. Fruits are mostly grown in the hill and mountain region, while vegetables can be grown across all three agro-ecological zones. There are stark differences between the three zones in terms of agro-climatic potential, soil type, rainfall levels, irrigation potential, access to roads and infrastructure, access to improved seed varieties, access to markets for inputs and outputs, and access to energy. Generally speaking, the Terai region has better access to markets and infrastructure compared to hills and mountains zones, which are characterized by rough terrain, poor road networks, and distant markets for inputs and outputs.

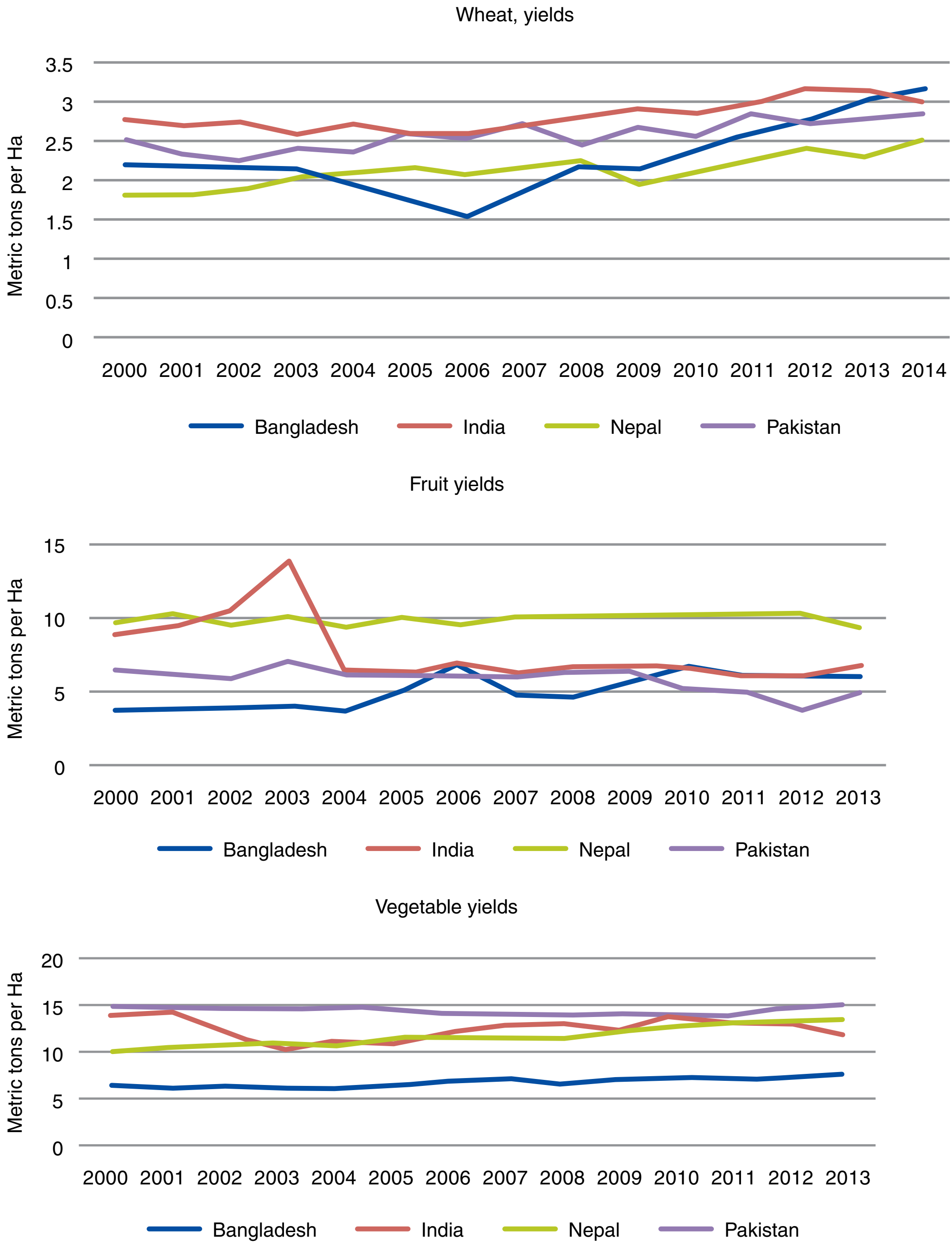
**Nepal's crop agriculture is characterized by relatively low land productivity, especially in food grains such as rice and wheat, which occupy most cultivable land.** Compared to its neighbors in South Asia, Nepal yields in rice are lower than India and Bangladesh, while wheat yields have been consistently lower than India, Bangladesh, and Pakistan over the past decade. However, Nepal can boast highest yields in fruits relative to its neighbors and second highest yields in vegetables (see Figure 1.3). According to the Agriculture

**Figure 1.3 Comparative Yields for Rice, Wheat, Fruits, and Vegetables**




*(continues)*

**Figure 1.3 Comparative Yields for Rice, Wheat, Fruits, and Vegetables** *(continued)*




*Source:* Authors compilation from FAOSTAT.

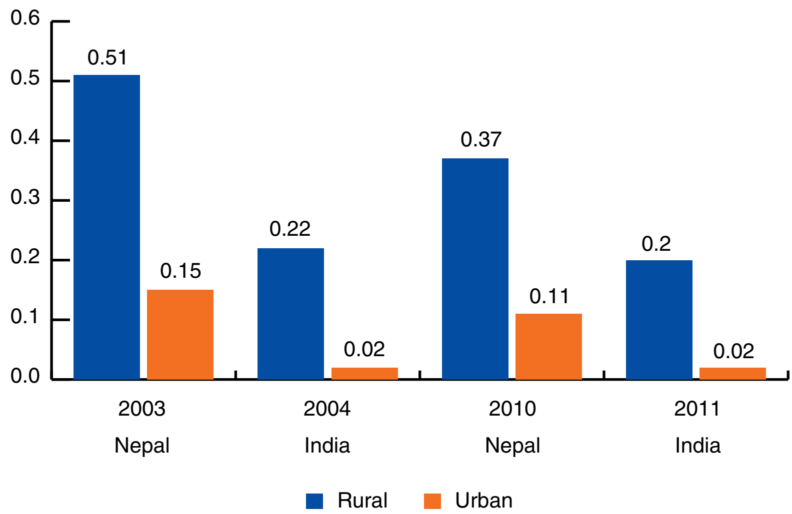
Development Strategy (ADS) 2015, the underlying causes of low yields in cereal crops are low rates of adoption of improved technology due to subsistence farming, poor access to suitable technology (both on-farm and post-harvest), limited availability of inputs (planting materials, livestock germplasm, fertilizer, animal feed, plant and animal health protection, irrigation, electricity, finance), and limited investment in the sector.

**Labor is moving out of agriculture and the outmigration is putting pressure on agricultural wages such that the wage differential between agriculture and non-agriculture sectors has narrowed considerably.** However, employment in the non-agricultural sectors is still more rewarding across all education levels, which suggests that occupational shifts to agriculture are not likely under the current environment (World Bank, 2013). Furthermore, recent trends indicate that the share of agriculture sector in wage employment has been declining for the past fifteen years, from 53 percent in 1995/96 to 35 percent in 2010/11 (GoN 2011a). More and more workers are employed outside of agriculture in patterns that mimic structural transformation. However, labor is moving out of agriculture due to the massive wave of migration from rural areas to overseas. Because most of those migrating are males, it has caused feminization of agricultural labor. Employment in agriculture is now predominantly female with about 55 percent of women providing agricultural labor compared to 24 percent of males. The wage rate for males was higher than females by about 50 percent in 2010—daily wages are about Rs 145 for males and Rs 97 for females (GoN 2011a). The premium for male labor is most likely due to differences in labor productivity. It suggests that continued migration of males may constrain agricultural productivity unless the productivity of female labor improves to offset the loss. Without such gains it would become important for Nepal to consider measures such as farm mechanization with equipment suitable for the production environment.

**Nepal is located between India and China, where demand for food markets is rapidly growing due to rising incomes and urbanization, but there is no evidence Nepal has been able to tap into these markets.** Furthermore, household incomes have also increased in Nepal and this has fueled demand for food products. Per-capita consumption of food products increased faster in Nepal than in India across all food categories, and across the rural-urban divide between 2003/04 and 2010/11. Furthermore, the proportion of consumption of home produced foods to total consumption declined faster in Nepal (by 4 percentage points) compared to India (by 2 percentage points)—see Figure 1.4. This means households are increasingly relying on the market for their food needs.

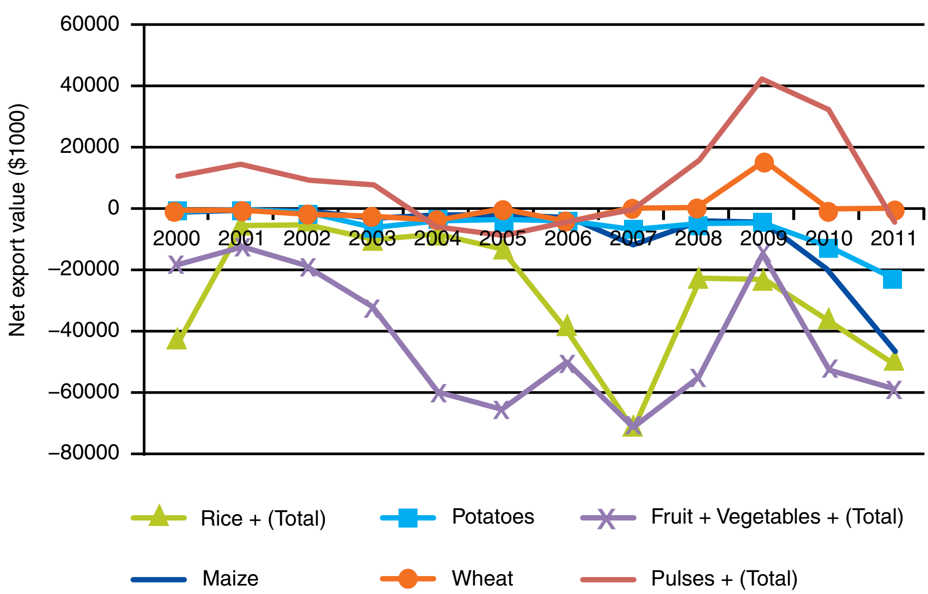
**Nepal agriculture is becoming less competitive in both domestic and export markets.** Nepal's net importer position has consistently grown since 2009, both in high value foods such as fruits and vegetables as well as staples such as rice, potatoes, and maize (see Figure 1.5). Nepal continues to be in autarky in wheat with an occasional fleeting gain in exports. The trade position

**Figure 1.4 Share of Consumption of Home Produced Foods to Total Consumption (per capita)**



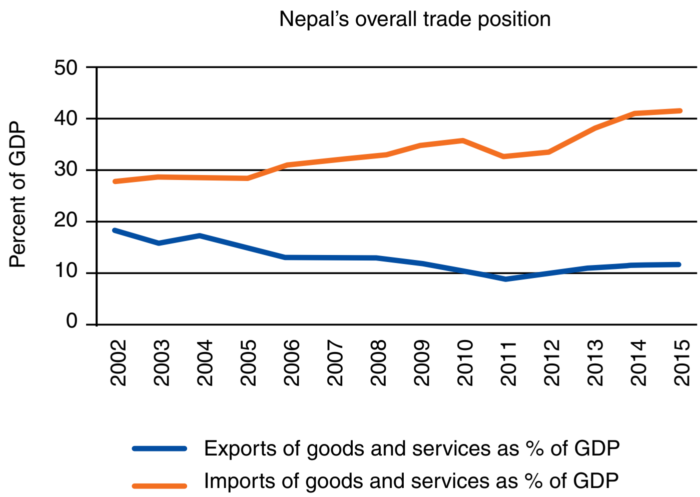

*Source:* Authors calculation from NLSS II, III and CSO 2004, 2011.

**Figure 1.5 Net Exports of Agriculture Commodities: 2000–2011**




*Source:* Authors compilation from FAOSTAT.

**Figure 1.6 Exports and Imports as Percent of GDP**




*Source:* Authors compilation from http://data.worldbank.org/indicator.

in pulses has been shifting between net exporter to autarky in the period covering 2000 and 2011. The deteriorating trade position goes far beyond agriculture. On aggregate exports have been declining relative to GDP, while on the other hand imports have been growing (see Figure 1.6). This implies the country is losing competitiveness not just in agriculture but also in other sectors of the economy.

**The overall policy framework for agriculture is articulated in the Agriculture Development Strategy (ADS) 2015.** In addition to the ADS 2015, the major agriculture sector policy documents include: National Fertilizer Policy (2001), Chemical Fertilizer Guidelines (2000), Guidelines for Chemical Fertilizer and Seed Transportation Grant Subsidy (2004), Seed Act (1988), Organic Fertilizer Subsidy Guidelines (2011), Organic Fertilizer Subsidy Directives (2011), Organic and Bio-Fertilizer Regulating Working Procedure (2011). Annex 3.1 provides a summary of the functions, objectives, and strategies adopted in these policies.

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CHAPTER 2

# What Are the Main Drivers of Agricultural Growth for Poverty Reduction and Shared Prosperity?

## 2.1 What Is Driving Change in Agricultural Income?

**On average about 78 percent of the increase in crop income was due to increased food prices, while yields contributed about 22 percent, and land contraction decreased crop income by about 9 percent.** The data used to calculate these changes is from National Living Standards Surveys in 2003/04 and 2010/11. Food prices were still recovering from the effects of the global food price inflation in 2010/11, therefore it is not surprising that changes in food prices contributed the most to crop incomes. The contribution of yields is about 22 percent and this captures the change in crop output per unit land. The contribution of land is negative, which indicates that there was contraction of area under cultivation despite the increased food prices. Increased food prices would normally give farmers incentives to employ more factors of production, including putting more land under cultivation. However, food prices were not only high but also volatile and the volatility became a major source of risk to the food sector. For farmers engaged in primary food production, unstable commodity prices in output markets is a primary concern, and the uncertainty this generates affects investment decisions regarding use of productive factors (Sandmo, 1971; Moschini and Hennessy, 2001). The finding that area under cultivation contracted in 2010/11 relative to 2003/04 mirrors global evidence that farmers reduced land allocation to major cereal crops during the recent[1] global food crisis when prices were high and volatile (Haile, Kalkuhl, and von Braun, 2014). The reduction in acreage ultimately led to reduced global production of major cereal crops, and this explains why the supply response to higher prices was not large (Subervie, 2008; Haile, Kalkuhl, and von Braun, 2015). The results are summarized in Table 2.1. The methodology of decomposing change in crop income is given in Box 2.1.

**Table 2.1 Decomposition of Changes in Crop Income between 2003/04 and 2010/11**

| | *Nepal* | *Terai* | *Hills* | *Mountain* |
|---|---|---|---|---|
| Change in crop income | 0.21 | 0.35 | 0.07 | 0.32 |
| Contribution of land | −0.02 | 0.00 | −0.01 | −0.11 |
| Contribution of yield | 0.05 | 0.14 | −0.07 | 0.23 |
| Contribution of price | 0.18 | 0.21 | 0.15 | 0.19 |

*Source:* Authors calculations,

### Box 2.1 Decomposition of Crop Income into Contribution of Food Prices, Yields, and Land

The total value of agricultural production for each household is calculated, including both the output marketed for sale and the output consumed at home. The value for 2003 is converted into real terms by 63.0 percent inflation rate between 2003 and 2010. To decompose changes in crop income, consider the following components of the crop income *R*;

$$R = A \cdot y \cdot p$$

where *A* is the area in Ropani used for agricultural production, *y* is the yield of the aggregate crop production per Ropani, and *p* is the price index (i.e., revenue share-weighted average of individual crop prices, calculated at the household level). The crop income *R* can be decomposed into the aggregate crop production $A \cdot y$ and the price *p*. The total differentiation of *R* gives

$$dR = dA \cdot y \cdot p + A \cdot dy \cdot p + A \cdot y \cdot dp.$$

Replacing the derivatives with the difference operators between the two survey years yields

$$\Delta R = \Delta A \cdot y \cdot p + A \cdot \Delta y \cdot p + A \cdot y \cdot \Delta p$$

where the difference operators are multiplied by the 2003 values of area, yield, and price variables. The decomposition shows the relative contributions of the changes in land, yield, and prices to the change in crop income. For the ease of interpretation, the decomposition is also presented in logarithmic terms;

$$\Delta \ln R = \Delta \ln A + \Delta \ln y + \Delta \ln p$$

where each component represents a percentage change of the variable.

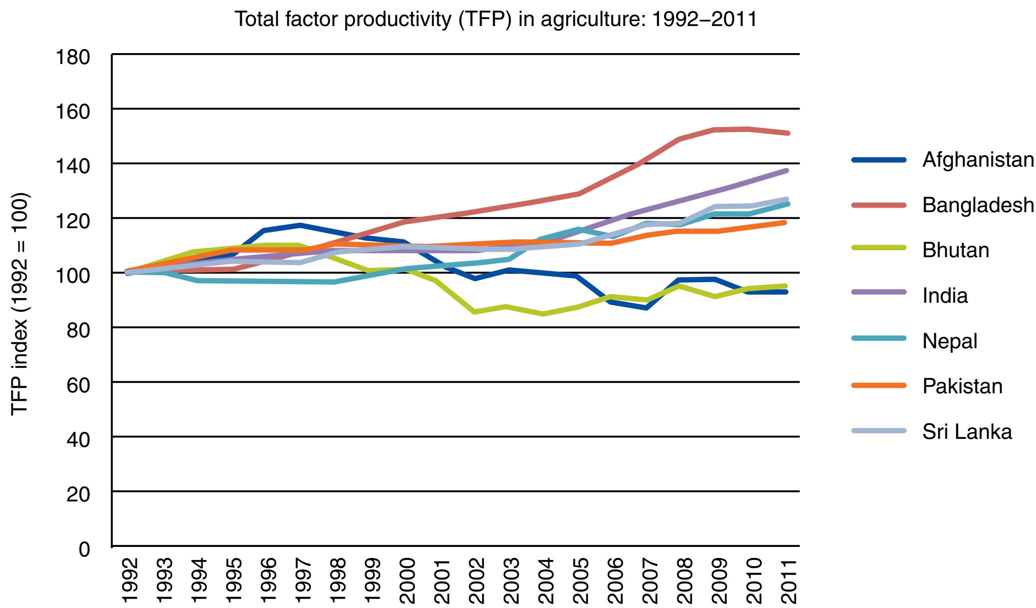
**Both food prices and yields contributed to increased crop income in Mountains and Terai, but in the Hills crop incomes were driven only by increased prices—the yields actually declined and their effect was to take away about 47 percent of the increased crop income due to prices.** The only region where the contribution of yields to crop income was higher than that of prices is in the Mountains. Land contraction decreased crop incomes in all regions except the Terai. It is important to note that the Terai region shares a long and open border with India through which food trade occurs between the two countries. India was virtually unscathed by the global food price inflation because of policies that prevented international prices from being transmitted to the domestic market. The stabilizing effects of India's policies on food prices were likely transmitted across the border into the Terai region, such that any residual price volatility did not cause adjustments in land allocation. On the other hand, the part of the country that would have least benefitted from India stabilizing policies would be the Mountains region. The results shows that the negative contribution of land reduction to crop income was highest in the Mountain region. In addition, it's likely that a number of local factors might also have contributed to the decrease in area under cultivation. Among the most important factors would be: (a) migration of male labor from rural areas to overseas, which has not only led to fewer people working on the farms but also to an increasingly female agricultural labor force; and (b) land tenure laws that discourage renting land. In contrast to the Terai region, land contraction decreased crop income by about 7 percent in the Hills and about 26 percent in the mountains region.

## 2.2 What Is Driving Change in Productivity?

**Overall, agricultural productivity is increasing.** A useful measure of the productivity of any sector is Total Factor Productivity (TFP), which measures differences in productivity that are not due to differences in use of inputs, but rather attributable to factors such as technological progress and efficiency in conversion of inputs to outputs. Most discussions of TFP have relied on Fugile (2012) who use data from FAO[2] and apply growth accounting methods to estimate TFP in various countries, including Nepal (see Figure 2.1). The data suggests that TFP in Nepal agriculture has grown steadily since 1998. From 1992 to 2011 TFP in Nepal grew faster than in Pakistan, Bhutan, and Afghanistan and was at par with Sri Lanka—a middle income country in the region. However, its growth was substantially lower than in India and Bangladesh. The growth accounting methodology used in Fugile (2012) does not allow decomposing TFP to examine its sources, in particular whether productivity is coming from progress towards reaching an existing production frontier (efficiency) or shift towards another production frontier (technical change).

**Technical change is the main driver of productivity increase in all agro-ecological zones, more so in the Mountains and Hills compared to the Terai.** The decomposition of productivity change is presented in Table 2.2. Productivity is measured through the Malmquist Productivity Index (MPI) and the change in the index is decomposed into technical change and technical efficiency change using Data Envelopment Analysis (DEA) methods (see Annex 2.1). Technical change is associated with release and application of new technology, while technical efficiency change is about how well existing technologies are utilized by farmers. The results indicate that technical change is the main driver of productivity increase in all regions of the country—and it increased by 26 percent

**Figure 2.1 Comparison of Total Factor Productivity in Agriculture across South Asia**




*Source:* Data from Fugile (2012).

**Table 2.2 Relative Contribution of Technical Change and Technical Efficiency to Productivity**

| | *Mountain* | *Hills* | *Terai* |
|---|---|---|---|
| Malmquist productivity index (MPI) | 1.22 | 1.26 | 0.94 |
| Technical change | 1.26 | 1.18 | 1.10 |
| Technical efficiency change | 0.95 | 1.06 | 0.85 |

*Source:* Authors calculations.

in the Mountains, 18 percent in the Hills, and 8 percent in the Terai. It means that farmers are adopting new technologies and these new technologies are having a relatively large impact in the Mountains, followed by Hills, and then the Terai. The larger effects in Mountains and Hills relative to the Terai are perhaps because traditionally there has been more technologies developed for the Terai such that other regions are starting from a low base and any new technologies are likely to increase productivity relatively faster. Furthermore, the increase in technical change in the Terai was offset by decline in technical efficiency change such that the region suffered productivity loss between 2003/04 and 2010/11.

**The poor performance in technical efficiency change suggests that farmers are not efficiently using existing technologies.** This points to the need to strengthen extension, but not at the expense of research and technology development. Technical efficiency change declined by about 15 percent in the Terai and 5 percent in the Mountains. The only zone with gains in technical efficiency change is in the Hills where it increased by about 6 percent. These findings underscore the need to strengthen extension efforts and optimize use of existing technologies across the country, but this should not come at the expense of research and technology development, especially in terms of developing new technologies for the Mountains and Hills where they are having the largest impacts. Overall productivity increased by about 22 percent in the Mountains and 26 percent in the Hills, but declined by 6 percent in the Terai. In the Mountains all of the productivity gains were driven by technical change, indicating that more productive farmers are adopting new technologies or innovative practices. But while leading farmers have adopted new technologies and increased productivity through technical change, there are many inefficient farmers who have not caught up with the leading farmers hence the decline in the mean efficiency level. In the Hills the productivity gain is driven by both technical progress and efficiency gains. The combination of leading farmers adopting new technologies and shifting to a higher production frontier—and other farmers closing the efficiency gap with leading farmers—results in the largest productivity growth among the three agro-ecological zones.

**There are important differences across districts in terms of productivity, technical change, and technical efficiency change.** The district level averages suggest important differences in agricultural productivity, as well as the relative contribution of new technologies (technical change) and efficiency of using existing technologies (technical efficiency change). For example, among the sampled districts in the Mountains, the most productivity gains occurred in Manang district where productivity more than doubled with technical change increasing by 87 percent and technical efficiency change increasing by 23 percent (see Annex Table A2.2.1). The least performing districts in the Mountains were Bajura and Bajhang where productivity decreased by 18 percent and 10 percent respectively. The decline in Bajura was driven by declining efficiency (by 25 percent) which offset the 10 percent gains in technical change. But in Bajhang district both technical change and technical efficiency change decreased by 4 percent and 6 percent respectively. The best performing districts in the Hills are Tanahun and Baglung where productivity more than doubled—and the least performing districts are Pyuthan, Salyan, Gulmi, and Jarjakot where productivity decreased by at least 16 percent (see Annex Table A2.2.2). The best performing districts in the Terai are Sarlahi and Bara where productivity increased by 34 percent and 25 percent respectively, driven by technical change of 25 percent and 15 percent respectively (see Annex Table A2.2.3). The least performing districts in Terai were Kapilbastu, Morang, and Rupandehi where productivity declined by at least 16 percent with both technical change and technical efficiency change declining.

**Small farms are the only category with consistent productivity growth across the agro-ecological zones and also the only category where growth is consistently driven by both technical change and technical efficiency change.** Land is an important factor of production. Access to land

**Table 2.3 Relationship between Land Size and Productivity**

| | *Land size (Ropani)* | | | | | |
|---|---|---|---|---|---|---|
| | *[0, 5)* | *[5, 10)* | *[10, 15)* | *[15, 20)* | *[20, 50)* | *[50, Inf)* |
| | | | *Productivity change* | | | |
| Mountains | 1.77 | 1.20 | 1.11 | 1.84 | 1.11 | 0.79 |
| Hills | 1.50 | 1.14 | 1.23 | 1.29 | 1.31 | 1.34 |
| Terai | 1.14 | 0.97 | 0.84 | 0.86 | 1.04 | 0.72 |
| | | | *Technical change* | | | |
| Mountains | 1.38 | 1.27 | 0.67 | 1.65 | 1.31 | 1.20 |
| Hills | 1.20 | 1.14 | 1.24 | 1.16 | 1.20 | 1.15 |
| Terai | 1.14 | 1.09 | 1.07 | 1.18 | 1.10 | 1.06 |
| | | | *Technical efficiency change* | | | |
| Mountains | 1.31 | 1.00 | 0.57 | 1.13 | 0.95 | 0.77 |
| Hills | 1.16 | 1.02 | 0.96 | 1.11 | 1.14 | 1.16 |
| Terai | 1.11 | 0.89 | 0.77 | 0.70 | 0.85 | 0.79 |

*Source:* Authors calculations.

is affected by many factors, chief among them is the functioning of land rental markets. The land rental markets in Nepal are thin mainly because there are tenure laws which impose a risk that rented land may be lost by the landowner if the renter stays there long enough. One implication of weak land markets is that rural households that are land-constrained may not be able to rent additional land and would therefore be trapped in small-scale agriculture. If the relationship between land sizes and productivity is positive, small-scale agriculture could become a low income trap. However, the results suggest that small pieces of land are the only category with consistent productivity growth across agro-ecological zones and also the only category where growth is consistently driven by both technical change and technical efficiency change (see Table 2.3). In the smallest land size category: (a) productivity increased by 77 percent in the mountains, 50 percent in the hills, and 14 percent in the Terai; (b) technical change increased by 38 percent in the mountains, 20 percent in the hills, and 14 percent in the Terai; and (c) technical efficiency change increased by 31 percent in the mountains, 16 percent in the hills, and 11 percent in the Terai. There is no other land category where there are gains in all agricultural zones in productivity, technical, change, and technical efficiency change.

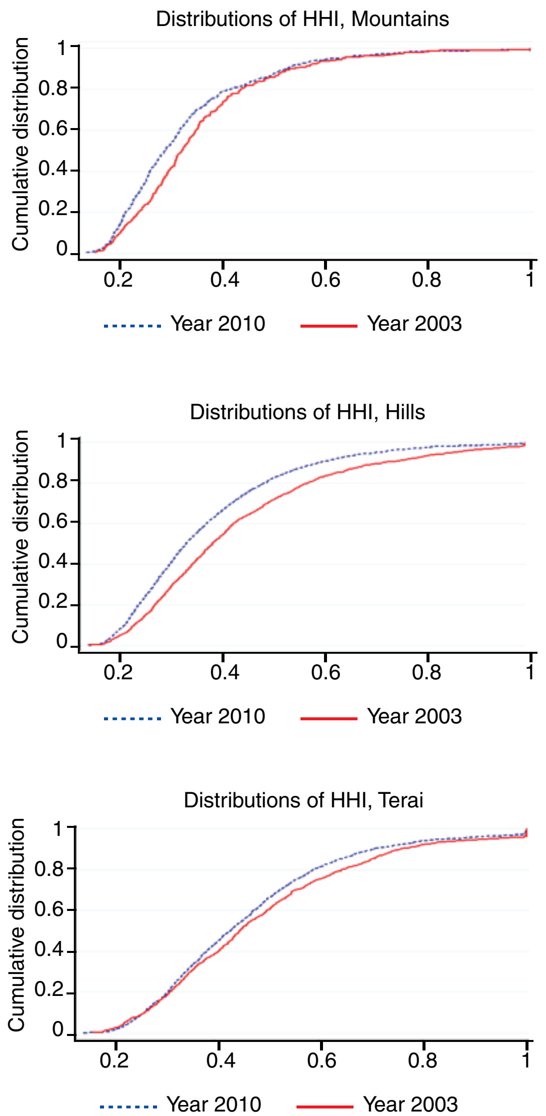
## 2.3 Are Farmers Diversifying Crops?

**Overall, farmers are diversifying production, but the progress has been slow, such that although the contribution of grain staples to agricultural GDP is about 3 times higher than fruits and vegetables, land allocation to grain staples is 10 times higher.** The yields of main staples in Nepal are persistently lower than in neighboring countries (China, India, Bangladesh, Pakistan, and Sri Lanka). The yields of fruits and vegetables fare relatively better and

Nepal lags behind only China and India. Despite fruits and vegetables showing relatively higher yields and higher growth in consumption, land is disproportionately allocated to grain staples (rice, maize, wheat, millet, barley, and buckwheat). The contribution of grain staples to agricultural GDP is about 3 times higher than fruits and vegetables, but land allocation to grain staples is 10 times higher. However, land holdings cultivating paddy decreased from about 76 percent in 2003/04 to 72 percent in 2010/11 while cultivation of summer vegetables increased from 61 percent to 69 percent (GoN 2011b). This suggests that farmers may be transitioning from main staple food crops such as paddy to vegetables, but diversification is unlikely to be sustained unless; (i) there is broad-based productivity gains in main food grains to release land to other crops, and (ii) farmers develop stable expectations that the market can be relied upon to consistently deliver low-cost food they would no longer produce. This would require efficient rural infrastructure services—road networks, capacity for competitive storage, and energy.

**Farmers in the Mountains and Hills have diversified production relatively more than in Terai, and although diversification is increasing across all agro-ecological zones, it is happening faster in the Hills and Mountains.** The degree of crop diversification is measured using the Herfindahl index (HHI) which is calculated as the sum of squared output-value shares of different crops. The analysis of the zone-specific cumulative distributions of the HHI show that: (i) there was more diversification in the Mountains and Hills compared to the Terai and (ii) that change in diversification happened faster in the Hills—although this region is still behind the Mountains. The distributions are presented in Figure 2.2. In all regions, the distribution of HHI in 2010/11 stochastically dominates the distribution of HHI in 2003/04 in the first degree. This means that for any given HHI value (x) there is a larger proportion of farmers in 2010/11 who have values of HHI smaller than (x) than there were in 2003/04. Since smaller values of HHI indicate more diversification, the distributions indicate that there was more diversification in 2010/11. A comparison of the zone-specific cumulative distribution functions indicates that for any given HHI value (x) there was a larger proportion of farmers with smaller values of HHI than (x) in Mountains than there were in Hills and Terai. Additionally, there is a larger proportion of farmers with HHI values smaller than (x) in Hills than Terai. This means that most diversification was in the Mountains followed by Hills and then Terai. Furthermore, the region-specific distributions indicate that diversification was happening faster in the Hills. Crop diversification allows farmers to spread both production risks (e.g. weather and pests) as well as market risks related to prices. The finding that farmers in Mountains and Hills have diversified production relatively more than in Terai suggests they are better equipped to deal with production and market risks. This is important in a developing country like Nepal where market-based mechanisms for risk sharing such as insurance are not well developed, especially in hard to reach areas in the Mountains and Hills.

**Figure 2.2 Cumulative Distribution Functions of the Diversification Index across Zones**




*Source:* Authors calculations.

## 2.4 Are Farmers Adopting Mechanization?

**Mechanization of agriculture occurs only in the Terai region and there is no evidence it is increasing.** The stark difference in the pattern of mechanization across agro-ecological zones is presented in Table 2.4. Adoption of mechanized tools is almost non-existent in the mountain area. In contrast, the vast majority of the tools (both high and low productivity) are used in the Terai

**Table 2.4 Distribution of Households Using Agricultural Tools, by Region (Percent)**

| | *High productivity tools* | | | *Low productivity tools* | |
|---|---|---|---|---|---|
| *Distribution of households using agricultural tools* | *Tractor* | *Thresher* | *Combined harvester* | *Animal cart* | *Iron plough* |
| | *−1* | *−2* | *−3* | *−4* | *−5* |
| *By Ecological Belt* | | | | | |
| Mountain Region | 0.00 | 0.07 | 0.00 | 0.00 | 0.02 |
| Hill Region | 3.54 | 4.62 | 0.60 | 0.61 | 9.83 |
| Terai Region | 96.46 | 95.31 | 99.40 | 99.39 | 90.15 |
| *By Development Region* | | | | | |
| Eastern Region | 18.52 | 20.54 | 12.32 | 22.01 | 31.86 |
| Central Region | 40.11 | 40.82 | 26.50 | 30.70 | 26.24 |
| Western Region | 22.26 | 16.96 | 41.49 | 13.91 | 16.13 |
| Mid-Western Region | 7.04 | 7.37 | 5.61 | 10.50 | 12.29 |
| Far-Western Region | 12.08 | 14.31 | 14.09 | 22.87 | 13.48 |

*Source:* Using the 2011/12 National Sample Census of Agriculture Nepal. All estimates adjusted for sampling weights.

region. This is mainly because the flat terrain in the Terai makes it more amenable to the use of machinery, while the terrain becomes increasingly more difficult and less cost-effective in the hilly and mountainous regions. The regional distribution suggests most mechanization is in the Central region and the least incidence of mechanization is observed in the Mid-Western development region, especially with regard to the adoption of high productivity tools such as tractor, thresher, and combined harvester.

**Land fragmentation and small and declining farm sizes constrain mechanization.** Table 2.5 shows that households with larger parcel sizes, on average, were more likely to use both higher technology tools such as tractor, thresher and combined harvester, as well as low technology tools like animal cart and iron plough. And using the Simpson's Index of Fragmentation (Table 2.6), it becomes evident that the least fragmented quartile had a higher incidence of using tractor, thresher, and iron plough compared to the most fragmented quartile. The use of animal cart use was higher among households living in the most fragmented quartile.

**Substituting labor with capital-intensive means of production and access to irrigation is relatively more important in the Terai, while access to skilled agricultural labor is more important in the Mountains and Hills regions.** These findings suggests that the technology of production is quite different across agro-ecological zones. The output elasticity of irrigation is relatively higher in Terai (0.31) compared to 0.08 in both the Mountains and Hills (see Annex Table 2.3.2). The output elasticity of capital is twice in Terai (0.14) compared to Hills (0.07) and much lower in the Mountains (0.04). However, agricultural output responds better to increased use of labor in the Hills and Mountains relative to the Terai—the elasticities are 0.33 in Mountain, 0.20 in Hills and 0.06 in Terai. Furthermore, quantile regressions suggest important

**Table 2.5 Distribution of Households Using Agricultural Tools, by Land Fragmentation Indexes (Percent)**

| *Distribution of households using agricultural tools* | *High productivity tools* | | | *Low productivity tools* | |
|---|---|---|---|---|---|
| | *Tractor* | *Thresher* | *Combined harvester* | *Animal cart* | *Iron plough* |
| | *–1* | *–2* | *–3* | *–4* | *–5* |
| *Average Parcel Size* | | | | | |
| Smallest Quintile | 7.51 | 8.08 | 7.88 | 4.87 | 8.58 |
| 2nd Quintile | 15.72 | 15.73 | 15.45 | 11.64 | 14.75 |
| 3rd Quintile | 19.84 | 19.92 | 20.10 | 18.50 | 18.70 |
| 4th Quintile | 24.43 | 24.34 | 27.31 | 26.33 | 24.87 |
| Largest Quintile | 32.50 | 31.93 | 29.26 | 38.66 | 33.11 |
| *Number of Parcels per holding* | | | | | |
| One parcel per holding | 18.04 | 15.63 | 11.91 | 10.64 | 22.29 |
| Two parcels per holding | 30.41 | 29.78 | 21.65 | 25.34 | 29.27 |
| Three parcels per holding | 18.96 | 19.92 | 18.60 | 19.91 | 17.64 |
| Four parcels per holding | 11.83 | 12.64 | 14.65 | 14.27 | 11.36 |
| More than four parcels per holding | 20.76 | 22.03 | 33.18 | 29.84 | 19.44 |

*Source:* Authors calculations using the 2011/12 National Sample Census of Agriculture Nepal. All estimates adjusted for sampling weights.

**Table 2.6 Share of Household Using Agricultural Tools, Using Simpson's Index of Fragmentation (Percent)**

| *Distribution of households using agricultural tools* | *High productivity tools* | | | *Low productivity tools* | |
|---|---|---|---|---|---|
| | *Tractor* | *Thresher* | *Combined harvester* | *Animal cart* | *Iron plough* |
| | *–1* | *–2* | *–3* | *–4* | *–5* |
| *Simpson's Index of Fragmentation* | | | | | |
| Least Fragmented Quartile | 28.79 | 26.50 | 21.81 | 18.46 | 30.12 |
| 2nd Quartile | 28.59 | 28.30 | 23.47 | 26.94 | 28.53 |
| 3rd Quartile | 25.00 | 26.39 | 27.49 | 29.07 | 23.60 |
| Most Fragmented Quartile | 17.61 | 18.82 | 27.23 | 25.53 | 17.74 |

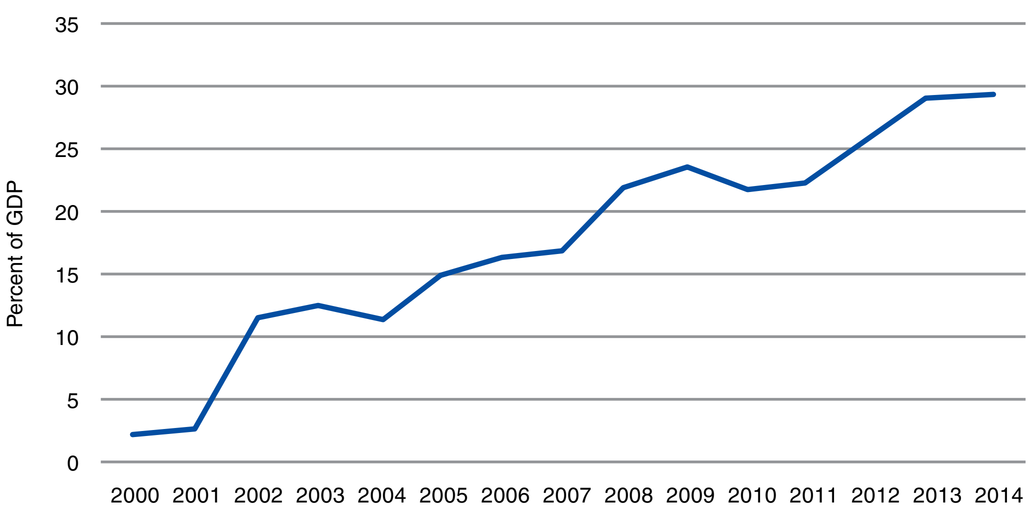
*Source:* Calculations using the 2011/12 National Sample Census of Agriculture Nepal. All estimates adjusted for sampling weights.

differences in drivers of productivity within the same agro-ecological zones. In the Mountains, highly productive farmers exhibit more intensive use of labor and less intensive use of irrigated land and capital, compared to their less-efficient peers in the same zone. And in the Hills, the most productive farmers use relatively more pesticides and labor, while less intensively using land and capital asset. In the Terai, the most productive farmers operate with higher intensifies of capital asset and lower intensities of household labor. The main implication of this findings is that substituting labor with capital-intensive means of production and access to irrigation is relatively more important in the Terai.

## 2.5 What Is Constraining Investments in Agriculture?

**Investments in agriculture continue to be low despite significant inflow of remittances and increased agricultural income.** Of all sources of income, remittances appear to be relatively more evenly distributed across income groups. Furthermore, remittance income is liquid and perhaps highly investible. Remittances accounted for between 20 percent and 23 percent of income gains across all income quintiles between 2003 and 2010. The average size of remittances is higher in urban areas, but rural areas receive more on aggregate because the bulk of the population lives there. Remittances have grown tremendously as a share of GDP to more than 29 percent by 2014 (see Figure 2.3). This suggests there is money in rural areas from not only remittances but also crop income which could be invested in rural sectors such as agriculture and rural non-farm. However, about 87 percent of remittances in rural areas goes to finance consumption and only about 1.2 percent is invested in capital formation (see Table 2.7).

**Figure 2.3** **Remittances Income as Proportion of GDP**




*Source:* World Bank Development Indicators http://data.worldbank.org/indicator.

**Table 2.7 Distribution of Remittance by Primary Uses (Percent)**

| | *Daily consumption* | *Education* | *Capital formation* | *Business* | *Property* | *Saving* | *Repaying Loans* | *Others* | *Total* |
|---|---|---|---|---|---|---|---|---|---|
| Urban | 84.5 | 3.5 | 2.1 | 0.4 | 3.8 | 0.5 | 1.4 | 3.9 | 100 |
| Rural | 86.6 | 3.6 | 1.2 | 0.3 | 5.6 | 0.4 | 0.5 | 1.9 | 100 |
| Total | 78.9 | 3.5 | 2.4 | 0.5 | 4.5 | 0.6 | 7.1 | 2.5 | 100 |

*Source:* NLSS III.

**Several factors contribute to low investments in the agriculture sector.** These include relatively low productive technologies that translate to low returns on investments; land fragmentation and declining farm size discouraging investments in mechanization; weak technical capacity of farmers, etc. In addition, the analysis of household surveys indicates that access to infrastructure, markets, and agricultural services may have improved over the years (Table 2.8), but access to agricultural credit from formal sources may have declined substantially (Table 2.9). It indicates that investments in the sector are also constrained by factors such as lack of financial sector deepening. Although access to various infrastructure has improved, there is still need for further development of critical infrastructure—including energy, irrigation, roads, etc. Land tenure systems tend to discourage strong forms of sharecropping arrangements, which deprives entrepreneurs who do not own land from investing in agriculture.

**Returning immigrants are investing in commercialized agriculture and their investments are driven by technical knowledge, which they acquired abroad, and investible funds from their own savings.** A case study of returnee farmers was conducted to identify what constraining factors they have been able to overcome—whether it is capital accumulation, technical skills acquired abroad, market knowledge acquired abroad, etc. The returnee

**Table 2.8 Distance to Infrastructure, Markets, and Agriculture Services (Kilometers)**

| | *Dirt road vehicle passable* | | *Market center* | | *Agriculture center* | | *Cooperatives* | | *Bank* | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Region* | *2010* | *2003* | *2010* | *2003* | *2010* | *2003* | *2010* | *2003* | *2010* | *2003* |
| Eastern | 5.31 | 13.67 | 2.51 | 4.81 | 1.80 | 4.30 | 1.59 | 5.18 | 4.20 | 6.76 |
| | (10.60) | (19.49) | (5.26) | (10.05) | (2.07) | (8.73) | (2.35) | (9.44) | (9.29) | (11.26) |
| Central | 1.63 | 1.13 | 2.23 | 1.71 | 2.06 | 1.76 | 1.91 | 1.91 | 3.14 | 2.31 |
| | (3.41) | (2.22) | (4.30) | (1.65) | (3.73) | (1.91) | (4.37) | (2.13) | (5.93) | (3.14) |
| Western | 1.70 | 13.72 | 1.74 | 7.83 | 1.29 | 6.16 | 0.92 | 7.17 | 2.02 | 10.86 |
| | (2.52) | (28.71) | (2.55) | (21.19) | (2.02) | (15.81) | (0.93) | (17.49) | (3.08) | (25.37) |
| Mid-Western | 7.56 | 29.75 | 4.75 | 11.41 | 1.87 | 7.96 | 4.26 | 11.62 | 8.32 | 12.99 |
| | (14.96) | (51.92) | (8.91) | (20.98) | (2.15) | (21.66) | (10.45) | (22.82) | (14.33) | (23.81) |
| Far Western | 5.27 | 10.97 | 2.99 | 2.43 | 2.48 | 3.66 | 5.03 | 5.08 | 8.19 | 5.10 |
| | (8.06) | (16.25) | (6.42) | (2.32) | (9.21) | (5.44) | (12.73) | (5.79) | (15.04) | (5.29) |

*Source:* NLSS II and III.

**Table 2.9 Sources of Agriculture Credit**

| | 2010 | | | 2003 | |
|---|---|---|---|---|---|
| *Source* | *Amount (NRs)* | *Proportion* | *Source* | *Amount (NRs)* | *Proportion* |
| Relatives/friends | 59,359,890 | 0.19 | Relatives/friends | 16,883,500 | 0.19 |
| Agri. dev. bank | 30,933,874 | 0.10 | Agri. dev. bank | 24,621,870 | 0.28 |
| Commercial bank | 50,029,000 | 0.16 | Commercial bank | 26,009,250 | 0.29 |
| Rural dev. bank | 9,868,000 | 0.03 | Grameen devt bank | 4,227,050 | 0.05 |
| Other fin. Institution | 100,932,600 | 0.33 | Other fin. Institution | 10,028,500 | 0.11 |
| NGO or relief agency | 14,479,401 | 0.05 | Ngo or relief agency | 1,045,600 | 0.01 |
| Landlord/employer. | 886,000 | 0.00 | Landlord/employer | 413,025 | 0.00 |
| Shopkeeper | 2,407,800 | 0.01 | Shopkeeper & Money lender | 5,592,650 | 0.06 |
| Money lender | 12,952,000 | 0.04 | | | |
| Co-operative | 23,694,500 | 0.08 | | | |
| Other | 3,076,000 | 0.01 | Others | 217,000 | 0.00 |
| **Total** | **308,619,065** | **1.00** | | **89,038,445** | **1.00** |

*Source:* NLSS and III.

farmers are organized and have recently formed the Nepal Commercial Farmers Association. The membership is currently about 400 farmers, out of which 80–90 percent are returnees. The majority of farmers returning were from Israel, South Korea, Korea, Japan, and Gulf countries—including Qatar and Saudi Arabia. About 15 returnees were interviewed and a common thread among them is that (a) they were employed in farms abroad where they learned modern farming methods that are capital intensive but highly productive, (b) their initial investments in farming was self-financed through savings accumulated abroad, (c) most of them do not have their own land and are farming on rented farms that have access to irrigation, (d) most of them have become active disseminators of technology and modern farming methods to neighbors and college students, and (e) they would like to expand operations but cannot access credit from formal sources in Nepal. The reason they are facing constraints in access to additional capital is that Banks don't provide loans unless it is collateralized with land. The largest investments among interviewed returnees is Nepali Rupees 8,500,000 on 21 hectares of land out of which 19 was rented and 2 was own land. The crops cultivated in these farms include tomatoes, grapes, ginger, bananas, okra, cucumber, mustard, cauliflower, cabbage, radish, coriander, sponge gourd, pumpkins, dairy, poultry, etc.

## 2.6 Conclusions and Recommendations

**While agriculture has proved to be important for poverty reduction and shared prosperity, most of the agricultural income has been from increased prices.** Most of the poverty reduction between 2003/04 and 2010/11 occurred in the rural areas and was driven by rising agriculture incomes, which registered about 24.4 percent increase on average. The impact of agriculture was highest among the bottom 40 percent (the lowest and second lowest income quintile) where agriculture contributed more than 40 percent of their income gains. Overall, crop income alone increased by about 23 percent. A decomposition of this change in crop income indicates that on average about 78 percent was due to increased food prices, while yields contributed about 22 percent, and land contraction decreased crop income by about 9 percent. The data used to calculate these changes is from National Living Standards Surveys in 2003/04 and 2010/11—therefore it is not surprising that changes in food prices contributed the most to crop incomes because the food prices in 2010/11 were still recovering from the effects of the global food price inflation.

**Therefore, going forward any strategy for poverty reduction and shared prosperity for Nepal should be anchored by a national program[4] for increasing broad-based agricultural productivity through developing new technologies, dissemination of technologies, and effective extension to ensure farmers are able to utilize technology appropriately.** Productivity could be increased through technical change, which is associated with release and application of new technology, or technical efficiency change which is about how well existing technologies are utilized by farmers. The findings indicate that technical change has been the main driver of productivity increase in all agro-ecological zones. The contribution of technical change is relatively higher in the Mountains and Hills compared to the Terai. It means that farmers are adopting new technologies and these new technologies are having a relatively large impact in the Mountains, followed by Hills, and then the Terai. These patterns are likely because traditionally there has been relatively more technologies developed for the Terai such that other regions are starting from a low base and any new technologies are likely to increase productivity relatively faster. These findings call for a national program for increasing broad-based agricultural productivity through developing new technologies, dissemination of technologies, and extension efforts to ensure farmers are able to utilize technology appropriately. Already the government is implementing the Agriculture and Food Security Project, but the project only covers mid and far western hills and mountain districts, and therefore should be expanded nationally. And since there are important differences across districts in terms of productivity, technical change, and technical efficiency change—even within similar agro-ecological zones—the proposed national program should be informed by a better understanding of the causes of these differences.

**Efforts should also focus on expanding irrigation programs and developing skills for producing high value crops, especially in the Hills and Mountains.** The output elasticity of irrigation is relatively higher in Terai (0.31) compared to 0.08 in both the Mountains and Hills agro-ecological zones. On the other hand, agricultural output responds better to labor in the Hills and mountains relative to the Terai—with elasticity of 0.33 in Mountain, 0.20 in Hills and

0.06 in Terai. In the mountains, highly productive farmers exhibit more intensive use of labor compared to their less-efficient peers. And in the Hills, the most productive farmers use relatively more pesticides and labor relative to their less-efficient peers. In the Terai, the most productive farmers operate with higher intensities of capital asset compared to their peers. The main implication of the findings is that while all factors of production are important across the board, a national program for broad-based productivity growth should be informed by these differences on factor productivities.

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## Notes

1. Refers to the 2006 to 2009 global food crisis when food prices were high and volatile.
2. Food and Agriculture Organization of the United Nations.
3. Self-reported values of draft animals (including bullocks/cows and buffaloes) and equipment (including tractors, ploughs, water pumps, and generators).
4. The Agriculture and Food Security Project consists of these features but is implemented only in the mid and far western hills and mountain areas.

CHAPTER 3

# What Is the Impact of Public Expenditures in Fertilizer and Seed Distribution Programs?

## 3.1 Policy Milestones in Inputs Delivery

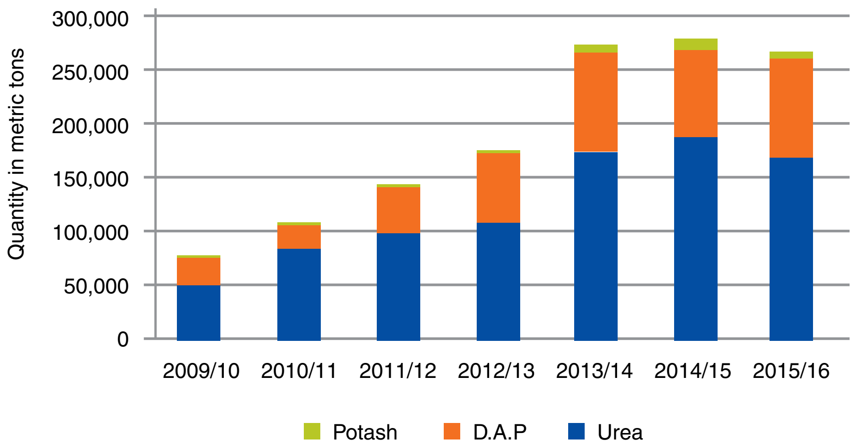
### *3.1.1 Historical Fertilizer Policies before the Current Distribution Program*

**In 1966 the government formed the Agriculture Inputs Company (AIC) to import and distribute fertilizers at commercial terms and without subsidy.** Chemical fertilizers were introduced in Nepal in the early 1950s when a group of traders from India started exporting fertilizers to Nepal (Shrestha, 2010). From 1952 to 1965, the National Trading Limited (a government owned company) imported fertilizers from Russia and China. A major policy shift happened in 1966 when the government formed the Agriculture Inputs Company (AIC) to import and distribute fertilizers at commercial terms and without subsidy. The main source of fertilizer imports by the AIC was India and the international market (Shrestha, 2010; Thapa, 2006). One of the lessons from this era is that fertilizer use was quite low, especially in the Hills and Mountain areas due to high costs.

**The government introduced fertilizer subsidy in 1973/74 through 1996/97.** The aim of the subsidy was to increase food production and to encourage farmers to use chemical fertilizers. The policy included not only a price subsidy on the fertilizer but also a transport subsidy (APP, 1995). While the price subsidy was for all farmers throughout the country, the transport subsidy only applied to farmers residing in hill and mid-hill areas. However, there were concerns that the farmers who benefited from the subsidy were those with personal networks such that more than 80 percent of the subsidized fertilizer was sold only in the Kathmandu valley (Ghimire, 2009). Furthermore, the subsidy burden skyrocketed and it is estimated that AIC deficits rose to 850 million rupees (Shrestha, 2010). Yet supplies were considered insufficient to meet demand (Pandey, 2014).

**In 1995 the government articulated a policy on fertilizers in the Agriculture Perspectives Plan (1995), in which fertilizers were recognized**

**Figure 3.1 Quantity Distributed by Fertilizer Type**




*Source:* Authors compilation based on data from MoAD.

**as a prime input to enhance agriculture productivity.** A target was set to increase fertilizer use to 131 kg nutrients/hectare by 2015. The Agriculture Perspectives Plan (APP) has been the foundation of successive policies on fertilizers and seeds. A summary of the major policies regulating the inputs sector is provided in Annex 3.1. Following the APP (1995), the fertilizer market was liberalized in 1997/98. The AIC was dissolved and in its place two companies were formed; (a) the Agriculture Input Company Limited (AICL) was formed in 2002 and charged with the responsibility to import and distribute fertilizers; and (b) the National Seed Company Limited (NSCL) was created in 2002 and charged with seed distribution. The liberalization led to entry of many private sector companies in the business of importing and distributing fertilizers. However, the liberalization era was marked by: (a) informal imports of fertilizers of unknown and unverified quality; (b) increased private sector participation in fertilizer importation and distribution; (c) marked decline of formal imports of fertilizers compared to the period prior to liberalization; and (d) rising fertilizer prices, which further encouraged trading in cheap fertilizers of unknown quality.

### *3.1.2 The Current Fertilizer Distribution Program*

**The liberalization era was ended in 2008/09 and the government initiated a fertilizer distribution program to increase use of chemical fertilizers.** Under the program fertilizer is supplied by Agriculture Inputs Company Limited (AICL) and Salt Trading Company (STC) and sold to farmers at subsidized prices through cooperatives. Both AICL and STC are government owned. Initially the target group was marginal farmers—defined as farmers with landholding less than 4 hectares in the Terai and less than 0.75 ha (15 Ropani) in the Hills. However, these rules were relaxed around 2011/12 and all types of farmers are now eligible to benefit from the program. The program was initially targeted to paddy, wheat, maize, and millet—but that is also no longer the case and farmers are now free to apply subsidized fertilizers to any crop. In brief, the program is implemented as follows. First the cooperatives reach out to farmers and collect information on fertilizer demand by farmers. The cooperatives compile the information and submit to local offices of AICL. On that basis fertilizer is released by AICL to cooperatives. Farmers would then purchase the fertilizer at subsidized prices from cooperatives. While there is at least one cooperative in each Village Development Council (VDC), it is believed that not all farmers are members of a cooperative or utilize cooperative services. It is not clear whether using cooperatives crowds out farmers who are not members.

**Government policy on fertilizers was updated in 2011 to promote use of organic fertilizers.** The objective is to incrementally substitute for chemical fertilizers. The main policy documents on organic fertilizers are the Organic Fertilizer Subsidy Directives (2011) and the Organic and Bio-Fertilizer Working Procedure (2011). These policies provide a subsidy to purchase domestically produced organic fertilizers that meet certain criteria. The subsidy rate and quantity restrictions are decided by a high-level Subsidy Distribution Management Committee. The responsibility for actual distribution lies with district-level committees. The main organic fertilizer distributed under the program is vermi-compost manure and the subsidy rate was 58 percent in 2011/12, 58 percent in 2012/13, and 65 percent in 2013/14.

### 3.1.3 Historical Seed Policies before the Current Program

**Seed policy in Nepal was first articulated in the Seed Act (1988).** The Act provides guidelines to promote production and processing of high quality seed for various agro-climatic zones. The Seed Act is the foundation for successive policies that have culminated to the seed distribution program. The National Seed System in Nepal involves four agencies: (a) public institutions, (b) the private sector, (c) international collaborators, and (d) farmer communities. The National Seed Board (NSB) under MOAD is the coordinating agency for varietal release and registration. National Agricultural Research Council undertakes breeder and foundation seed production. These source seeds are supplied to the National Seed Company (NSCL) and registered private seed companies for production of certified or improved seeds, which are then sold to farmers. Multiple agents are involved in seed production, including (a) government farms and stations, (b) contract seed production by the National Seed Company Limited (NSCL), (c) NGOs, (d) private seed companies, and (d) the District Self Sufficiency Seed Programme (DISSPRO). Some farmers use seed retained from previous crops and also sell it to other farmers. In addition, farmers obtain seed from India and neighboring countries through informal cross border trade.

### 3.1.4 The Current Improved Seed Distribution Program

**The seed distribution program was started in 2011/12 with the objective to improve seed replacement rate from 11 percent to about 25 percent**

**within 15 years.** The implementation arrangements are similar to the fertilizer distribution program. But while fertilizers are supplied by the Agriculture Inputs Company Limited (AICL), certified seeds are sourced from the National Seed Company Limited (NSCL)—which is also government owned. The NSCL was created in 2002 under MOAD, with the mandate to produce, procure (domestically as well as through imports), process, and sell subsidized seeds. The NSCL contracts seed growers around the country and has a wide range of infrastructure—including storage capacity, processing plants and seed labs to process, grade, and treat the seeds. The following crops are covered: paddy, wheat, maize, millet, lentil, gram, pigeon pea, and green grams. The subsidy rate has varied between 25–40 percent over three years of implementation.

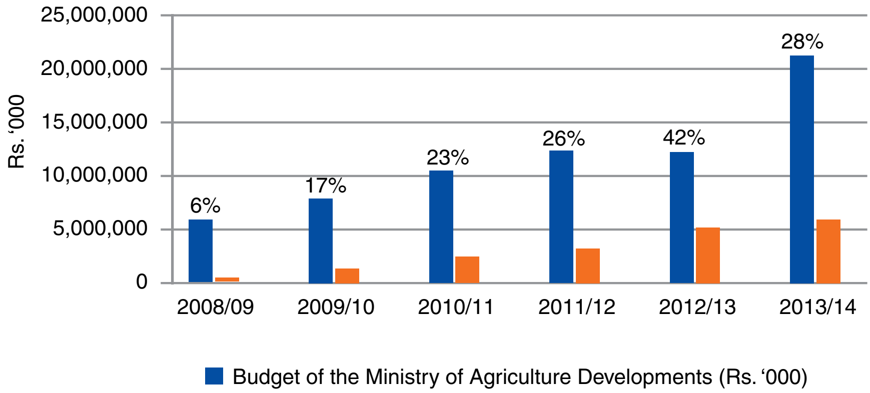
## 3.2 Public Expenditure Tracking for Fertilizers and Seed Subsidy Programs

**The report presents the findings of a public expenditure tracking survey (PETS) to assess various aspects of the inputs distribution programs.** The objectives of the PETS is to address the following issues: (a) access of farmers to subsidized inputs and whether it varies depending on farm size and region, (b) whether prices paid by farmers in purchasing subsidized inputs are lower than before the program was introduced, (c) effectiveness of the existing local governance and oversight arrangements and how they may be strengthened, and (e) how to improve the input delivery system. The public expenditure review is conducted using two complementary tools: Public Expenditure Tracking Survey (PETS) and Quantitative Service Delivery Survey (QSDS). The choice of the tools was influenced by the objectives of the analysis. Annex 3.2 provides a detailed presentation of the methodology for applying the PETS and QSDS to the inputs program in Nepal.

### *3.2.1 Budget Allocation*

**Both programs are funded by the government through the national budget.** The Ministry of Finance (MOF) disburses the funds to the Ministry of Agricultural Development (MoAD) which then disburses the funds to public companies to procure inputs. The Agricultural Inputs Company Limited (AICL) and Salt Trading Company (STC) import and distribute fertilizers to cooperatives; and National Seed Company Limited (NSCL) is involved in procuring seeds. The cooperatives would then sell the inputs to farmers after deducting the costs of transport and handling. AICL and STC receive advance of the subsidy amount from MoF through MoAD in three installments during a fiscal year. The AICL has received about 70 percent of the fertilizer subsidy budget in recent years and most of the remaining 30 percent goes to STC. In addition, some of the subsidy budget is spent on supporting private initiatives in the production and distribution of organic fertilizers. The AICL chain includes about 40 depots located throughout the country. All fertilizer imports are delivered to the depots before distribution to the cooperatives. The business of importing

**Figure 3.2 Share of Budget Allocation to the Seed and Fertilizer Programs**




*Source:* MoAD.

and distributing fertilizers to cooperatives is a commercial activity for these companies, which means they add cost of handling and transport to the subsidized border price to arrive at the total cost charged to cooperatives. The subsidized border price is determined by AICL depending on the cost of importing the fertilizers up to the border, the subsidy released by MoAD, and the effective retail price in India.

**The budget allocation to the inputs subsidy programs continues to grow.** The budget has increased from 6 percent of the MoAD budget in 2008/09 to 42 percent in 2012/13 and 28 percent in 2013/14 (see Figure 3.2 above). The decline in budget share between 2012/13 and 2013/14 is due to rapid expansion of the overall ministry budget relative to the subsidy programs. In absolute terms the budget allocation to these programs actually increased by about 14 percent between the two years. That budget allocation to the fertilizer and seed subsidy programs continues to grow indicates the growing importance of these programs in the priorities of the MoAD and Government of Nepal (GoN).

### 3.2.2 Responding to Subsidy Policies in India

**Nepal faces several challenges in implementing any agricultural policy because the long open border with India allows spillover effects from the vast spectrum of agriculture related policies in India.** In the context of input distribution programs, the main concern is that inputs subsidized by Nepal could be re-sold across the border if the price incentives are right. To mitigate this problem the subsidized price of fertilizers is fixed at between 20 and 25 percent above border prices in India. Although this appears counter to the goal of subsidizing input costs, the prices of fertilizers in India are depressed by their domestic subsidies. If the subsidies in India are significant, the difference between border prices and market prices in Nepal could make it possible to ex-ante structure a subsidy scheme in which subsidized prices in Nepal are 20 to 25 percent higher than India prices and significantly lower than domestic market prices.

## 3.3 Main Findings

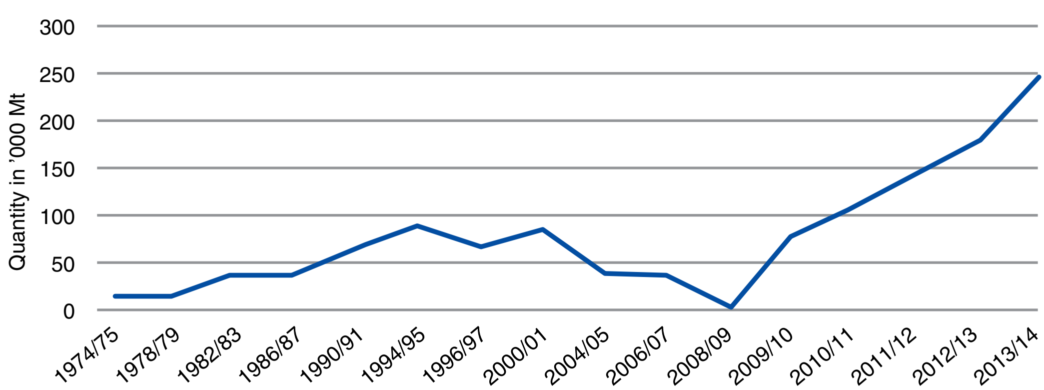
### 3.3.1 Supply of Fertilizers

**The fertilizer subsidy program has tremendously increased fertilizer supply in Nepal. Furthermore, historical data reveals a clear relationship between policy regime and levels of fertilizer supplies: a liberalized market is associated with low and decreasing supply while subsidy policies are associated with increased supply.** The fertilizer program was introduced in 2008/09 when fertilizer supply had been declining for the past decade, reaching an all-time low of less than 5,000 tons in 2007/08. After the program was introduced, fertilizer supply dramatically increased by about 1,054 percent in 2009/10 and has continued to increase since. In 2010/11 fertilizer supplies reached about 110,000 Mt, which was the highest they had ever been, but then continued to increase and doubled in 2013/14 when supply reached around 245,000 Mt (see Figure 3.3). Overall, there is a clear relationship between policy regime and the levels of fertilizer supplies in Nepal (see Figure 3.3). The data available starts around 1973/74 when the government first introduced fertilizer subsidy to increase food production and to encourage farmers to use chemical fertilizers. One of the results of the subsidy policy was that fertilizer supplies increased steadily from about 15,000 tons to nearly 90,000 tons in 1994/95. But the policy was fraught with challenges, including a burgeoning subsidy burden to the Treasury and implementation inefficiencies that made subsidized fertilizers hard to get for ordinary farmers. These issues contributed to the liberalization of the fertilizer market in 1996/1997.

### 3.3.2 Fertilizer and Seed Application Rates

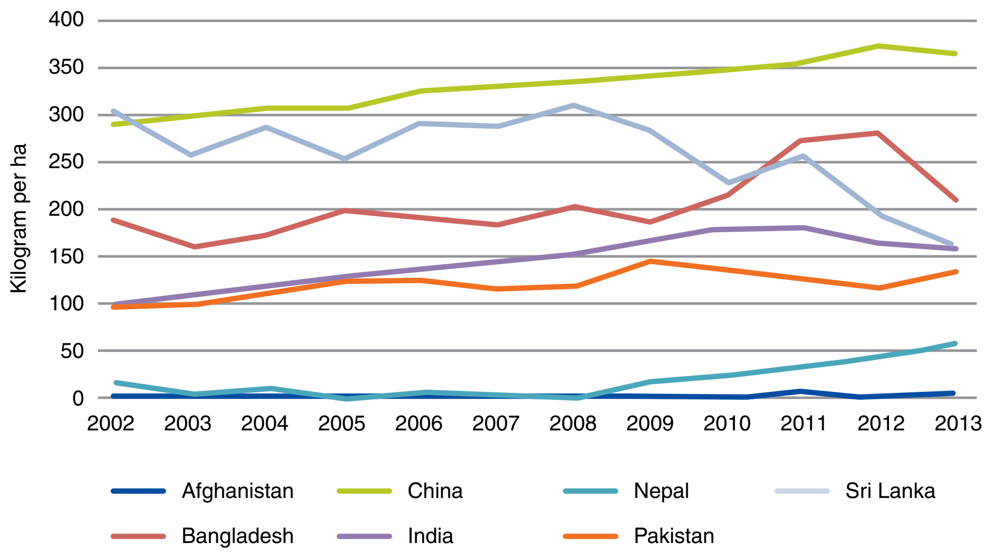
**The fertilizer application rates in Nepal have increased tremendously since the subsidy program was introduced, but they are still remarkably lower than in neighboring countries.** Since the subsidy program was

**Figure 3.3 Imports of Fertilizers into Nepal (1974/75 to 2013/14)**




*Source:* Authors based on data from MoAD.

**Figure 3.4 Fertilizer Application across Countries (Kilogram per hectare of arable land)**




*Source:* Authors compilation from World Development Indicators—http://data.worldbank.org/indicator.

introduced, the fertilizer application rates has increased from 1.4 kilograms per ha of arable land in 2008 to 57.7 kilograms per ha of arable land in 2013. Most of this increase is due to the subsidy program. However, Nepal still lags far behind neighboring countries in fertilizer consumption. For example, fertilizer consumption in 2013 stood at 157.5 kg per hectare in India, 208.7 kg per hectare in Bangladesh, 160 kg per hectare in Sri Lanka, 135.2 kg per hectare in Pakistan, and 364.3 kg per hectare in China. The only country in Figure 3.4 which Nepal has leapfrogged is Afghanistan, and this is mainly because it is a war-torn country with an extremely weak input delivery system. With regard to improved seeds, the proportion of farmers using improved seeds increased by more than 8 percentage points for potato, wheat, and paddy between 2002/3 and 2009/10 (see Table 3.1). But that was before the program was introduced. It is difficult to estimate the impact of NSCL on seed replacement rate because it

**Table 3.1 Percentage of Households Using Improved Seeds and Fertilizer**

| | *Year* | *Paddy* | *Wheat* | *Maize* | *Lentil* | *Potato* |
|---|---|---|---|---|---|---|
| Seed | 1995/96 | 5.15 | 7.91 | 4.47 | — | 7.5 |
| Seed | 2003/04 | 5.3 | 5.4 | 4.1 | — | 15.5 |
| Seed | 2010/11 | 14.7 | 13.2 | 8.1 | 29.1 | 25.5 |
| Fertilizer | 1995/96 | 55.5 | 51.11 | 21.98 | — | 13.36 |
| Fertilizer | 2003/04 | 66.1 | 55.7 | 34.3 | 9.8 | 20.9 |
| Fertilizer | 2010/11 | 69.6 | 51.4 | 36.2 | 6.6 | 30.2 |

*Source:* National Living Standards Surveys (I, II, III).

is not the only distributor of subsidized seeds in Nepal. Other channels include many donor supported projects that work through District Agriculture Development Offices and multiply seeds through various registered seed multipliers, including farmer groups and cooperatives.

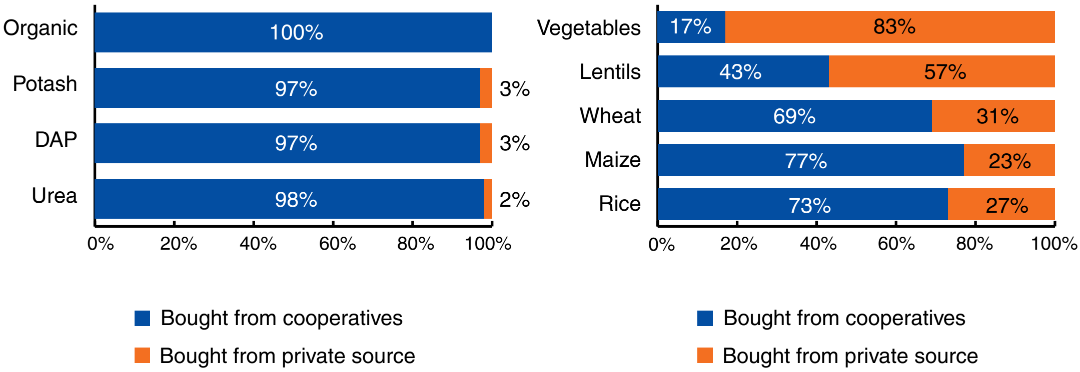
### 3.3.3 Demand and Supply Gap

**Although supply of fertilizers and improved seeds have increased remarkably since the subsidy program was introduced, the demand still far exceeds supply.** Recent estimates of the actual demand for fertilizers in Nepal have produced varying figures, including the official estimate provided by MoAD that demand is more than 700,000 tons. This demand estimate would translate to a fertilizer application rate of about 164.8 kg per hectare—which is about 10 kg per ha more than the application rate in India. The seed replacement rate measures the proportion of area covered by improved seeds that are truthfully labeled. It is therefore a useful indicator for demand for improved seeds. The seed replacement rate for rice is estimated to be about 4 percent, for wheat between 4 and 8 percent, for maize 3.8 percent, and about 1.6 percent for pulses. According to Basnyat (2010) the generally accepted norm for seed replacement rate is about 25 percent, which means the current seed replacement rates for major crops (4 percent for rice, between 4 and 8 percent for wheat, 3.8 percent for maize, and about 1.6 percent for pulses) still remain far below what the farmers are expected to demand (25 percent).

### 3.3.4 Private Sector Participation

**The fertilizer subsidy program has eliminated the private sector from the business of importing fertilizers. In addition, private traders have been eliminated from distributing fertilizers as the distribution channel is through the quasi-private cooperatives.** The government subsidizes imports through two public companies. Private importers cannot compete with these public companies unless they are also subsidized. And although the government subsidizes only Urea, Diammonium Phosphate (DAP), and Muriate of Potash, it is not plausible that private importers could compete on other types of fertilizers. This is because the government is essentially subsidizing importation of the nutrients in fertilizers (N, P, and K) and all fertilizers carry the same nutrients, albeit in varying amounts. On the distribution side, the program mandates that subsidized fertilizers should be distributed through cooperatives, which effectively crowds-out private traders from the distribution business. Cooperatives may be regarded as quasi-private because they are owned by private individuals (farmers) but greatly influenced by the government. They don't operate under the rules for the private sector. However, there is a small alternative chain where farmers are buying fertilizers. Based on the survey data, the quantity of fertilizers purchased from the alternatives sources were zero for organic fertilizers, 3 percent of the quantity of potash fertilizers, 3 percent for DAP, and 2 percent for Urea (see Figure 3.5). Distribution of improved seeds

**Figure 3.5 Sources of Fertilizers and Improved Seeds in 2015**




*Source:* Authors based on data from PETS.

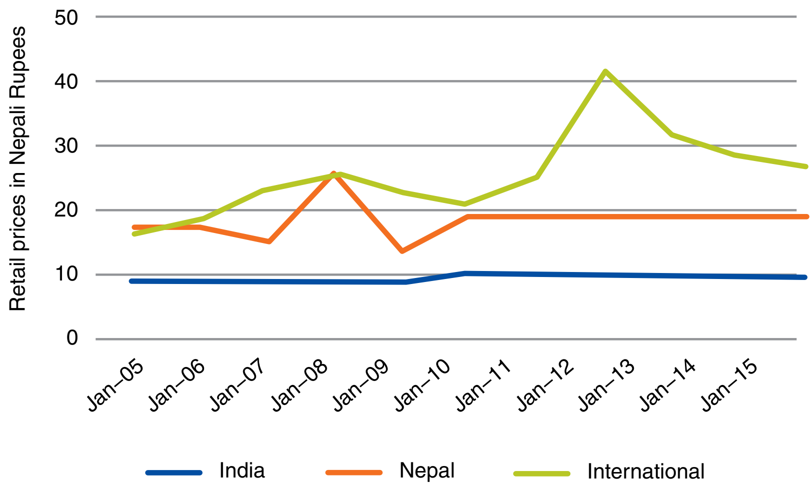
follows multiple channels. However, the cooperatives appears to be the most dominant channel for staple grains as the proportion of seeds bought from cooperatives were 77 percent for maize, 73 percent for rice, 69 percent for wheat. Seeds development for these crops is with the public sector, beginning with production of breeder and foundation seeds by the Nepal Agricultural Research Council (NARC). On the other hand, the private sector is significant in seed development for vegetables. This explains why only 43 percent of vegetable seeds and 17 percent of lentils seeds was bought from cooperatives.

### 3.3.5 Retail Fertilizer Prices

**Overall, it seems that the government is able to keep fertilizer prices above Indian retail prices, especially for Urea which takes the largest share of imports and is the most commonly used fertilizer in Nepal.** While the government is keen to provide farmers with subsidized fertilizers, there is risk that if the prices are too low subsidized fertilizers might be resold across the border to India. This risk is mitigated by setting the subsidized border prices at least 20 percent higher than retail prices prevailing across the border in India. In April 2014 the border prices for subsidized fertilizers in Nepal were: 18 Nepali Rupees (NRs) per kg for Urea, 45 NRs per kg for Diammonium phosphate (DAP), and 31 NRs per kg for Muriate of Potash (Economic Survey, 2014/15)—which was more than 100 percent higher than Indian retail prices for Urea, 22 percent higher than Indian retail prices for DAP, and 9 percent higher than Indian retail prices for Muriate of Potash (MoP).

**The program is providing substantial subsidy relative to international markets.** Figure 3.6 provides a comparison of Urea prices between Nepal, India, and international prices from 2005 to 2015. The data from 2005 and 2008 reflect the prevailing prices before the subsidy program was introduced, while prices after 2008 capture the period after the program was introduced. The data suggests that Nepal retail prices and international prices were at par when

**Figure 3.6 Comparison of Urea Retail Prices between India and Nepal with International Prices**




*Source:* Nepal prices are from Economic Survey F.Y. 2014/15, Ministry of Finance in Nepal—while India prices are from Annual Report 2014/15, Department of Fertilizer, Ministry of Chemical and Fertilizer, India. International prices are from World Bank database—see http://www.worldbank.org/en/research/commodity-markets.

the program was introduced in 2008. That changed after the subsidy program was introduced and since 2009 the international prices have been higher than retail prices in Nepal. The largest wedge was in April 2012 when international prices were more than twice the retail price in Nepal. With the subsidy program the nominal retail prices for urea fertilizers have stabilized at lower levels than international prices, which indicates that the program has not only been providing substantial subsidy but also shielding farmers from volatile prices in international markets. This is consistent with official data which indicates that the program provides substantial subsidy to farmers (see Table 3.2). In particular the official data suggests that the subsidy rate for Urea was more than 60 percent in 2008/09, 59 percent in 2009/10, 46 percent in 2010/11, 57 percent in 2011/12, and 61 percent in 2012/13.

### *3.3.6 Cost of Distribution Services*

**The cost of transport per-unit of fertilizer is high because of value chain inefficiencies and this reduces the actual subsidy received by farmers.** A cost build-up conducted to study the prices of subsidized fertilizers at various points in the chain is summarized in Table 3.3. It shows that cooperatives charged farmers a mark-up of about 22 percent more than the price they had bought Urea fertilizers from AICL, while the mark-up for DAP and MoP was much less at 8 percent and 13 percent respectively.

Discussions with AICL head office in Kathmandu and AICL branches suggested that there is enough fertilizers available in the AICL branches and

**Table 3.2 Subsidy Rate for Chemical Fertilizers (2008/09 to 2012/13) Provided by MoAD**

| *Year* | *Fertilizer type* | *Average full cost (Rs/M ton)* | *Subsidized selling price (Rs/M ton)* | *Amount of subsidy (Rs/M ton)* | ***Subsidy rate*** |
|---|---|---|---|---|---|
| 2008/09 | Urea | 31429 | 12500 | 18929 | **60** |
| | DAP | — | — | — | **—** |
| | Potash | — | — | — | **—** |
| | Complexal | 31258 | 20560 | 10698 | **34** |
| 2009/10 | Urea | 30252 | 12500 | 17752 | **59** |
| | DAP | 43055 | 27260 | 15795 | **37** |
| | Potash | 42320 | 14500 | 27820 | **66** |
| 2010/11 | Urea | 33356 | 18000 | 15356 | **46** |
| | DAP | 53752 | 32000 | 21752 | **40** |
| | Potash | 38938 | 20000 | 18938 | **49** |
| 2011/12 | Urea | 41557 | 18000 | 23557 | **57** |
| | DAP | 63949 | 36000 | 27949 | **44** |
| 2012/13 | Urea | 45644 | 18000 | 27644 | **61** |
| | DAP | 62812 | 45000 | 17812 | **28** |
| | Potash | 54779 | 31000 | 23779 | **43** |

*Source:* MoAD.

**Table 3.3 Cost Build-Up for Urea Fertilizers**

| *Fertilizer* | *Selling prices at Nepal entry points* | *Average AICL selling prices to cooperatives* | *Average selling prices by cooperatives to farmers* | *Price differences* | *Price-mark up* |
|---|---|---|---|---|---|
| Urea | 18.00 | 19.01 | 23.07 | 4.07 | 21 percent |
| DAP | 45.00 | 46.13 | 49.91 | 3.78 | 8 percent |
| Potash | 31.00 | 32.32 | 36.62 | 4.30 | 13 percent |

| | |
|---|---|
| Cost build up for 50 Kg bag of urea sold to a farmer in Nepal | |
| Average cost price | NRS. 1974 |
| Subsidy | NRs. 1074 |
| Price at AICL branch less transport and other charges by AICL branch | NRs. 900 |
| Price at Cooperative +Transport cost | NRS (900 + 1.25x50) = 962.5 |
| Price to farmer + 21percent Price mark up | NRS (962.5 + (962.5 × 21)/100) = 1164.6 |
| Cost per Kg of urea | NRS. 1164.6/50 = 23.2 |
| Retail price in India | NRs 8.58 |
| Ratio of Nepal farmer price to Indian farmer price | 23.2/8.6 = 2.7 |

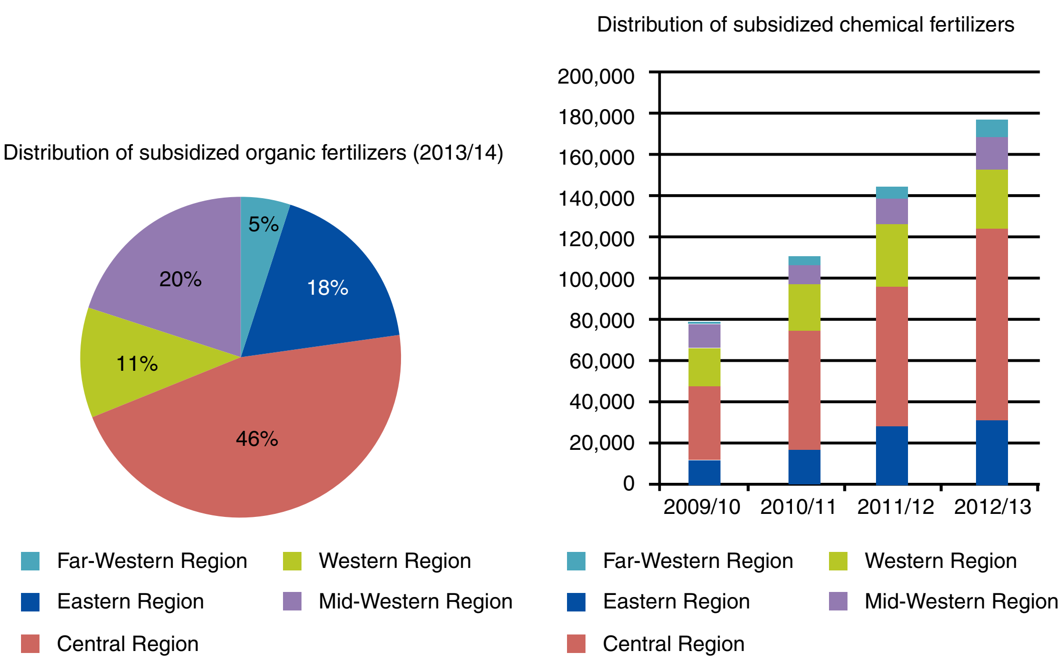
*Source:* Nepal prices are from Economic Survey F.Y. 2014/15, Ministry of Finance in Nepal and complemented with survey data.

that the cooperatives can buy as much as they need and whenever they need. However, visits with different cooperatives in the sampled districts suggested otherwise—that cooperatives do not get enough fertilizers and on many occasions are not able to fill the trucks with fertilizers. This increases the per-unit cost of transportation from AICL depots/branches to cooperatives. The cost is passed over to the farmer, which reduces the subsidy received by the farmer.

### *3.3.7 Consistency with the Distribution of Poverty and Food and Nutrition Security*

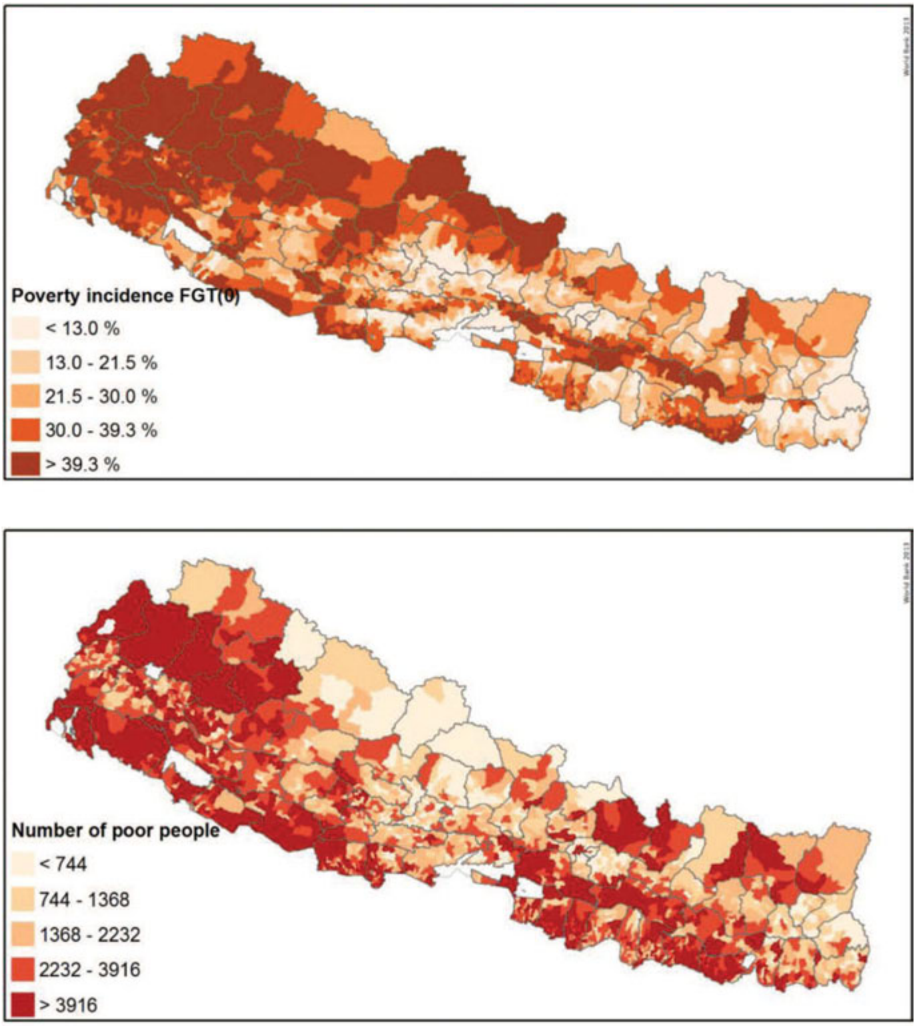
**The distribution of subsidized fertilizers is not targeted to address poverty, food insecurity, or nutrition status.** The Central region has consistently received most of the chemical fertilizer every year since the program was introduced in 2008 and its share has ranged from 45 percent in 2009/10 to 53 percent in 2010/11 and 2012/13 (see Figure 3.7). A similar pattern is observed with organic fertilizers where the Central region received about 46 percent of organic fertilizers distributed in 2013/14. This pattern appears inconsistent with the distribution of indicators for poverty, food insecurity, and nutrition status. For example, Figure 3.8 shows that both the proportion of poor people and the absolute number of poor people is highest in Western region and significantly lower in Central region. Furthermore, data from the National Demographic and Health Surveys show that food and nutrition security indicators are worse in the Western region of Nepal. For example, the rate of stunting among children

**Figure 3.7 Regional Distribution of Subsidized Chemical and Organic Fertilizers**




*Source:* MoAD.

**Figure 3.8 Regional Distribution of Poverty**



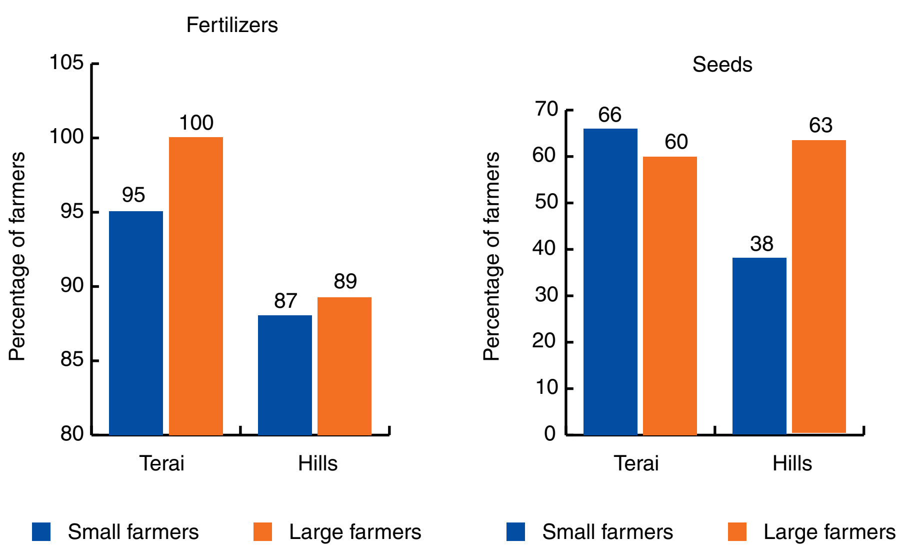

*Source:* May, Ernesto 2013.

under five years old is about 55 percent in Western region compared to the national average of 41 percent. The main implication of the regional distribution of fertilizer subsidies is that the program does not seem to be consistent with addressing regional disparities in poverty and food and nutrition security—and therefore it does not promote shared prosperity. Instead the program is likely to aggravate inequality among the rural population.

### 3.3.8 Relative Access between Large and Small Farmers

**Large farmers are more likely to access the subsidized fertilizers and seeds compared to small farmers.** The initial rules were that these programs would target small farmers, which were defined as those with land-holding less than 4 hectares in Terai and less than 0.75 ha (15 Robani) in Hills. But this rule was not tenable and it was later rescinded, in part because its implementation meant that farmers who did not meet the criteria would have no sources of fertilizer. The program had eliminated the private sector from the business of importing and distributing fertilizers. The targeting of specific crops (paddy, wheat, maize, and millet) was also rescinded for similar reasons—because regardless of whether farmers were targeted or not, they could not find an alternative supply of fertilizers to be used on other crops. The removal of the targeting criteria that was based on land-holding appears to have improved access to larger farmers at the expense of small farmers. This conclusion is based on data collected from a sample of 240 farmers across Terai and hill districts (see Figure 3.9). The analysis mimicks the original targeting criteria and categorizes farmers with land-holding less than 4 hectares in Terai as small farmers and those more than the threshold were classified as large farmers, and in the Hills farmers with less than 0.75 ha were categorized as small and the rest large. In Terai the data shows that 100 percent of large farmers purchased subsidized fertilizers while the proportion of small farmers accessing the subsidy was about 95 percent. And in the hills, about 89 percent of large farmers accessed the subsidy compared to 87 percent of small farmers. Similar patterns are observed on distribution of subsidized improved seeds in the Hills region where about 63 percent of large farmers received subsidized seeds compared to 38 percent of small farmers. However, in the Terai a larger proportion of small farmers (66 percent) received subsidized seeds compared to 60 percent of small farmers. The reasons for this break from the pattern is likely due to larger farmers in Terai having alternative sources of improved seeds, including their own retained seeds

**Figure 3.9 Access to Subsidized Fertilizers and Seeds by Farm Size**




*Source:* PETS survey 2015.

as more of them could also be seed multipliers as well as other various programs for seed distribution.

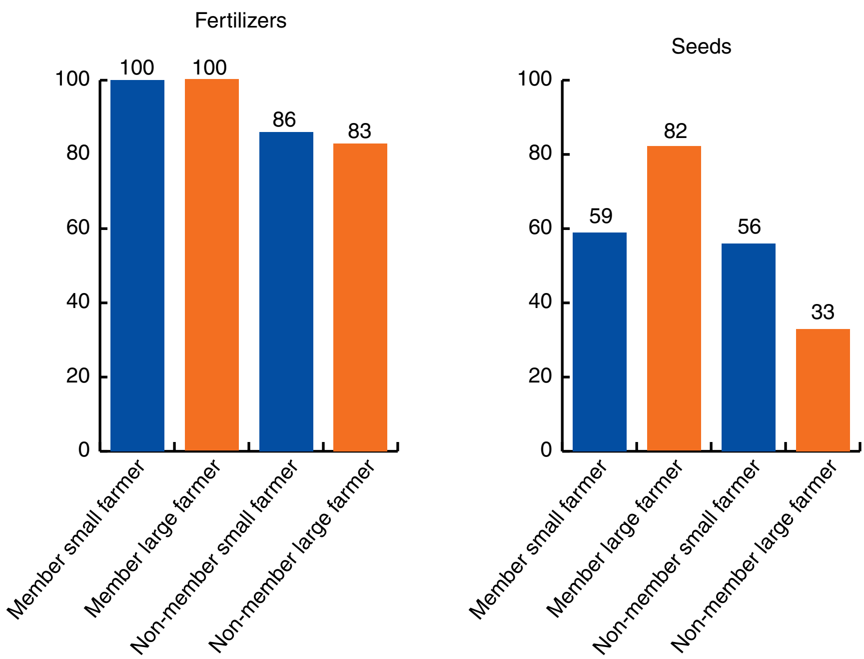
### *3.3.9 Relative Access between Members and Non-Members of Cooperatives*

All farmers, large or small, who were members of cooperatives had managed to access the subsidized fertilizers. But this was not the case for non-members (see Figure 3.10). About 14 percent of non-member small farmers were not able to access subsidized fertilizers and about 17 percent of non-member large farmers could not access the inputs. The patterns for access to subsidized improved seeds are somewhat different. Among members, only about 59 percent of small farmers were able to access the seeds, which is substantially lower than the 82 percent of large farmers who accessed the inputs. Among non-members, a larger proportion of small farmers (56 percent) accessed subsidized seeds compared to 33 percent of large farmers.

### *3.3.10 Effectiveness of Information Dissemination, Governance Systems, and Accountability*

**Many farmers remain unaware that subsidized inputs are available, and for those that are aware, many do not know much about the related**

**Figure 3.10 Access to Subsidized Seeds by Membership to Cooperative**




*Source:* PETS survey 2015.

**governance systems.** This was particularly so among farmers who are not members of cooperatives. For those who were aware of the program, most learned about it through word of mouth as opposed to more reliable and formal mechanisms. There are more effective ways of sharing information such as community radio, because it could cost-effectively reach community members who cannot read or write. There is a District Fertilizer Management Committee under the chairmanship of Chief District Officer (CDO) where the District Agriculture Development Officer (DADO) is the member secretary of the Committee. This Committee did not appear to be working very effectively. It was also observed that some cooperatives do not have the capacity to provide farmers with advisory services on appropriate and safe use and handling of fertilizers.

## 3.4 Recommendations

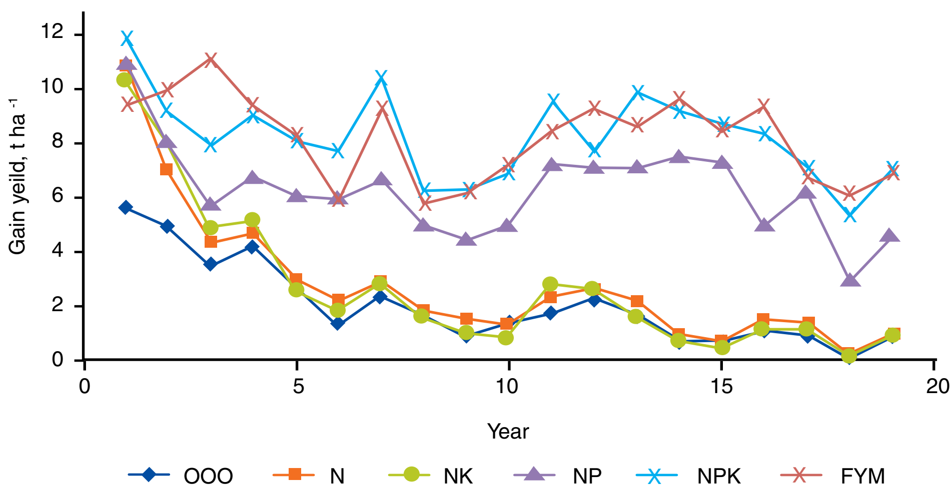
**Develop a soil fertility management program to redress imbalanced use of fertilizers, introduce efficient and profitable use of fertilizers, and reorient the current subsidy program towards smart subsidies.** The government subsidy program is supplying about 50 percent of the estimated demand for fertilizers. It's unlikely that the subsidy could be expanded to cover all demand without imposing major pressures on the national treasury, which is exactly what led to the disbanding of the previous subsidy program in 1996/97. Furthermore, the current program is supplying only Urea, DAP, and potash fertilizers with Urea occupying more than 60 percent of the subsidized quantities. Urea (46:0:0) constitutes of only nitrogen (N) and no phosphorous (P) or potassium (K). It means there has been imbalanced use of fertilizers for the past several years that requires to be corrected through a national soil fertility management program. Addressing the imbalances would increase efficiency in the use of fertilizers and improve farm profitability. Table 3.4 shows that long-term soil fertility and sustaining yields requires balanced use of fertilizer nutrients (N, P, and K) rather than predominantly N as has been the case in Nepal. Farmers that could use fertilizers profitably without subsidy should not be subsidized and the proposed soil fertility management program could help identify such farmers. The ongoing subsidies could be transformed into smart subsidies with the following principles: (a) target farmers that need to learn about proper use of fertilizers; (b) target farmers could use fertilizers profitably but are not able to do so due to working capital constraints; and (c) deliver the subsidy through the private sector by adopting voucher systems that have worked in other countries. A good example of successful voucher programs is in Senegal where the World Bank funded West Africa Agricultural Productivity Program is delivering smart subsidies through e-vouchers (see Box 3.1). Other examples of voucher schemes are in Nigeria, Burkina Faso, Cote d'Ivoire, and Liberia.

**Consider using the smart subsidy program with the features described above to also redress the regional disparities in poverty and food and nutrition security.** Governments often use instruments such as employment

**Box 3.1 Example of Smart Subsidy e-Voucher Scheme in Senegal**

The West Africa Agricultural Productivity Program (WAAPP) has developed a new e-voucher platform which exploits cell phone technology. It started with a pilot where 20,000 farmers were enrolled in 2012. In 2013 the program was scaled up to 200,000 farmers. By 2015 the program had expanded country-wide with approximately 800,000 farmers enrolled. A huge database has been built through the program including farmer's cell phone number, gender, crop variety, area, location and organizational status (head of village or producer organization or cooperative or simple member). The fertilizer is delivered through private sector agro-dealers or suppliers (including seed cooperatives). They have contact persons in the community. Each supplier is registered and mandated to distribute a pre-agreed volume of inputs. Distribution is usually through producers' organizations (PO) or local committees that include representatives from local authorities. The electronic platform uses SMS and Interactive Voice Response (IVR) to: (i) notify various persons (the contact person of the PO or the local committee) about availability of the input at a locally mapped agro-dealer; (ii) send e-vouchers to farmers; (iii) validate vouchers and (iv) distribute the subsidy. The web-based e-voucher platform instantaneously tracks the subsidy from the time throughout the chain.

**Figure 3.11 Cereal Yield Response to Nutrients**




*Source:* Pandey 2014.

guarantee programs, conditional cash transfers, and pension schemes to reduce poverty. Input subsidies may also be designed for this purpose, as well as to address food security and nutrition related objectives. Smart subsidies can also be used to channel more supply to the Western region, where both the proportion and absolute number of poor people are highest, and where food and nutrition security indicators are the lowest. For example, the rate of stunting among children under five years old is about 55 percent in Western region compared to the national average of 41 percent. Furthermore, both the proportion of poor people and the absolute number of poor people are highest in Western region and lower in Central region. But it is the Central region which has consistently received most of the fertilizer subsidy since the program was introduced in 2008, with its share ranging from 45 percent in 2009/10 to 53 percent in 2012/13. This leads to the conclusion that the current regional distribution of the fertilizer program is not consistent with addressing national goals of poverty reduction and equality.

CHAPTER 4

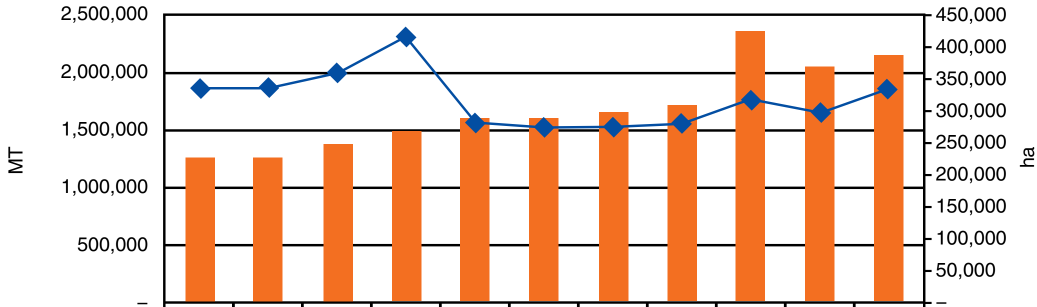
# Lessons on Policy and Investments to Improve Export Competitiveness

## 4.1 Why Study Ginger Value Chain

**The Nepal Trade Integration Strategy (2015) identified ginger as one of the priority products with export potential.** Ginger is one of the most cultivated spice crops in Nepal, with around 19,376 ha under cultivation and 235,033 MT of production in 2012/13 (NSCDP, 2014). It is one of the major spice crops traditionally grown in the middle mountain areas of Nepal to generate cash incomes to rural communities. It plays an important role in supporting rural livelihoods, including for the poor, marginal and disadvantaged communities. It is estimated that over 66,000 families in Nepal have been cultivating ginger, out of which many are smallholder farmers (NEAT, 2011). Ginger has proven to be more lucrative than cereal crops.

**The global ginger industry is rapidly expanding, driven by growing demand and increased productivity.** On the supply side, the global ginger production is increasing each year with an average annual growth rate of 6.25 percent per annum from 2003 to 2013 (FAOSTAT, 2014). The production was around 1.24 million MT in 2003 and reached up to 2.14 million MT in 2013. However, the annual growth rate of area harvested is negative (–1.50 percent) from 2003 to 2013 (Figure 4.1). The area harvested, which was around 334,935 hectare in 2003 reached 415,512 hectares in 2006 and then declined to 336,440 hectares in 2013. Production trends also reveals a steady increase in the global average productivity with an annual yield growth rate of 7.86 percent from 2003 to 2013. Global yield was 3.72 MT per ha in 2003 and increased to 6.36 MT per ha in 2013. On the demand side, the global consumption of ginger is increasing due to its human health benefits, increasing population and changing food habits. Many value added products have been developed from ginger—such as ginger tea, ginger candy, ginger beer, and ginger cough syrup—and these products have contributed to increased consumption (FAO, 2002).

**Figure 4.1 Trend of Area and Volume of Production of Ginger**




| | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Production (MT) | 1,247,014 | 1,226,166 | 1,361,318 | 1,472,577 | 1,581,570 | 1,596,385 | 1,643,455 | 1,692,581 | 2,335,062 | 2,035,073 | 2,140,451 |
| Area harvested (ha) | 334,935 | 335,304 | 361,749 | 415,512 | 281,904 | 275,954 | 278,974 | 278,787 | 318,085 | 296,548 | 336,440 |

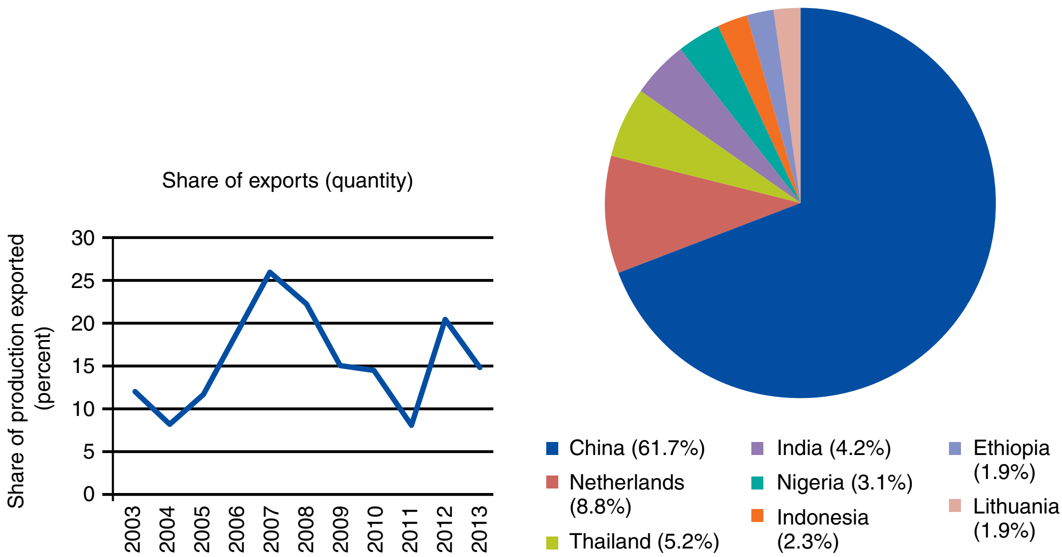
*Source:* FAOSTAT, 2014.

**India, China, and Nepal are the leading countries in ginger production.** India and China alone accounted for 54 percent (India 34 percent, China 20 percent) of the world's total production in 2012. Nepal is in the third position with a share of 12 percent of the total world production. Other leading countries in terms of production are Nigeria, Thailand, Indonesia, Bangladesh, Japan, Cameroon and Taiwan. The production of ginger in India has increased significantly by about 80 percent in quantity between 2008 and 2011. China has increased production by 43 percent during the same period and likewise production in Nepal has increased steadily during this time frame by 58 percent. Japan, Cameroon and Taiwan are also increasing ginger production but the other leading producers namely Nigeria, Thailand, Indonesia and Bangladesh are experiencing declining trends. In 2008 to 2012 India accounted for 47 percent (150,000 ha) of the world's total cultivation area (322,157 ha), whereas Nigeria, China, Indonesia accounted for 15 percent, 12 percent and 8 percent respectively. Nepal is fifth in the world in terms of area harvested for ginger with 6 percent of the world's cultivation area.

**Nepal ranks third in the world in ginger production, but it is placed eighth in terms of export quantity and is far lower in the rank in terms of export value.** Nepal mostly trades in fresh ginger but some quantity of dried ginger is also traded, mostly from the western part of the country. In 2013, Nepal exported 35,506 MT of fresh ginger, 397 MT of dried ginger and 7 MT of powdered ginger—see Trade and Export Promotion Center (TEPC) 2014. China has remained the major ginger exporter for more than a decade and accounts for 61.7 percent of world exports—see Figure 4.2. The Netherlands is second, however, it mostly re-exports the ginger to other countries. Thailand and India are the third and the fourth largest exporters.

**Ginger exports from Nepal fetch the lowest prices due to poor quality and lack of Sanitary and Phyto Sanitary Standards (SPS).** Nepal fetches

**Figure 4.2 Share of Production Exported from Nepal and Share of Global Export Market**




*Source:* FAOSTAT and ITC 2014.

**Table 4.1 Comparison of Export and Import Prices Realized by Different Countries**

| *Countries* | *Export unit value (USD/unit)* | *Import unit value (USD/unit)* |
|---|---|---|
| The World | 1134 | 1073 |
| China | 1052 | 676 |
| Netherlands | 1884 | 1355 |
| Thailand | 834 | 514 |
| India | 1355 | 411 |
| Nigeria | 1552 | 3348 |
| Indonesia | 663 | 655 |
| Ethiopia | 1100 | 1270 |
| Lithuania | 2362 | 1926 |
| Germany | 3845 | 2273 |
| Peru | 2166 | NA |
| **Nepal** | **205** | **617** |

*Source:* FAOSTAT.

low prices since it has not been able to access high-value export markets. This is mainly due to lack of proper regulatory provisions, infrastructure and expertise for compliances to SPS matters related to IPPC and Codex. For example, Nepal cannot identify pest free areas as per International Standards of IPPC. The only external market Nepal has traditionally been able to access is India.

If Nepal wants to enter remunerative markets, and perhaps earn at least as much as India, it has to invest in SPS. The potential gains are huge—from US$205 per unit to US$1,355 per unit—which is more than 500 percent increase in export prices.

## 4.2 Benchmarking with EU Quality and Safety Standards

### *4.2.1 Categories of Ginger Imports*

**Ginger products exported from Nepal to the EU would be subject to no tariff, and this applies for both fresh and dried ginger.** The EU uses the Combined Nomenclature (CN) for the customs classification of goods. The CN 8-digit code numbers are based on the Harmonized System (HS) nomenclature: the first six digits refer to the HS headings and then two digits follow to represent the CN subheadings. In the EU, ginger is imported under two categories: (a) HS 0910-11, which refers to ginger, neither crushed nor ground; and HS 0910-12, which refers to ginger, crushed or ground. The fresh ginger consignment directly goes to Plant Quarantine section while dried ginger is sent for Customs Inspection. Based on the inspection and testing status the consignment is either cleared for domestic distribution, disposed, or reshipped to the country of origin. Documents required from the exporter in Nepal include Certificate of Origin of the product and Phytosanitary certificate. In terms of sampling the cargo, the EU inspection requires volume equal to the "square root" of the bags to be checked randomly. This means that if there are 400 bags, 20 bags must be taken randomly and sent to external labs for analysis. However, in the case of new supplying countries such as Nepal, it is very likely that the first few consignments will be more thoroughly checked.

**The EU regulations focus on safety and traceability.** The EU legislation sets the basis for legal requirements in its member countries, but some member states may have their own additional regulations or there may be some differences in the way EU regulations are implemented across its member states within the context of national legislation. For example, the Netherlands, which is an EU member that recently imported a small quantity of ginger from Nepal, follows EU legislation and does not have any additional requirements regarding ginger. Food imported into the EU must comply with the import requirements that apply to the type of food concerned. These can be requirements regarding:

- Health control (e.g. food law, hygiene, microbiological criteria, contaminants, pesticides and veterinary medicinal products);
- Plant health (phytosanitary) control against harmful organisms;
- Other requirements (e.g. food additives, vitamins/minerals, food contact materials, food irradiation, nutrition claims, novel foods, radioactivity, GMOs, packaging, labelling and organic products).

In addition, the EU can decide, on the basis of risk assessments, to increase the level of control for food products of plant origin (e.g. fruits and vegetables, spices and herbs, rice and pulses) that have a high risk for non-compliance when originating in a particular country. Such controls would focus on the presence of a certain contaminant, pesticide residue, and unauthorized food additive or labeling problems. They always include a full check, covering documentary, identity and physical controls. Annex I of Regulation (EC) 669/2009 lists the food products subject to the increased control regime. Ginger imported from India is subject to such checks and 50 percent of all ginger consignments from India entering the EU have been checked. In the EU, there is a warning system through which EU member states communicate with each other on unsafe food products detected on their national markets. The system is called Rapid Alert System for Food and Feed (RASFF).

### 4.2.2 Maximum Residue Levels (MRLs) of Pesticides

**The EU has strict criteria for approval of pesticides and controls the maximum residue levels (MRLs) in imported foodstuffs.** The EU has set maximum residue levels (MRLs) of pesticide in and on food products. Products that exceed the maximum residue level of a pesticide are not allowed to enter the EU market. The details of various MRLs for ginger set by EU are given in Annex 4.1. The Regulation summarizes all products covered in the document in 10 groups. Fresh ginger and dried ginger are included in these products. The EU list of MRL is an exhaustive one and the exporters must have precise data on pesticides sprayed on ginger and their relevance and requirements in EU import conditions.

**To meet the EU requirements Nepalese ginger growers and exporters would need to answer the following questions:**

- Which are the pesticides that they used (if any) in their ginger production?
- Are there MRLs in the EU for the pesticide varieties that they used?
- If there are MRLs in the relevant EU legislation, have Nepalese growers used them within the EU MRLs limits?

The problem in addressing the above questions is that there are a lot of pesticides in the market that have been banned by the government or are fake replicas. Examples of banned pesticides include: Chloride, DDT, dieldrin, andrin, aldrin, hectochlore, mirex, texaphene, BHC, linden, organomercury fungicides, methyl parathion, and monocrotophus. Although these products are banned, many of them are available in the Nepali market, and this is according to the Pesticides Registration Division. The problem is mainly that of enforcement because the Pesticide Act 1991 and its first amendment in 2008 have a provision of a nominal fine only, which is clearly not commensurate with the damage caused by using banned or fake pesticides. To address this issue, there has to be: (a) better information management on pesticides used in ginger fields to verify that those are in the approved list (green list) of EU and (b) capacity in terms of both expertise and infrastructure to detect MRLs as per EU/Codex standards.

### 4.2.3 Aflatoxins and Other Contaminants

**Aflatoxin, which is a type of mycotoxin, is the most critical contaminant in ginger.** Aflatoxins are genotoxic carcinogenic substances which develop at high temperatures and humidity levels. Other mycotoxins are ochratoxin A, Patulin and Fusarium mycotoxins. The Netherlands requirements are fully based on the existing EU legislation. However, Germany and the UK have set additional requirements which are often stricter than the EU levels. These must be checked in advance. For Ginger, aflatoxin levels in parts per billion are: (a) Aflatoxin B1 (< 5 ppb), and (b) Aflatoxin B1 + B2 + G1 + G2 (< 10 ppb). More generally, the EU food safety policy has set maximum levels for many other contaminants in specified products or product groups. Contaminants are those substances that are not intentionally added to food but may be present in food as a result of improper handling during production, manufacture, processing, preparation, treatment, packing, transport or holding of the food as a result of environmental contamination. The regulations are set in Regulation (EC) 1881/2006 and should not be confused with the MRLs of pesticides in food. These substances include:

- Nitrates: Commission Regulation 1882/2006
- Mycotoxins: Commission Regulation 401/2006 http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32010R0165
- Dioxins: Commission Regulation 252/2012
- Heavy metals, Tin, 3-MCPD and benzo(a)pyrene: Commission Regulation 333/2007 as amended by Commission Regulation 836/2011

The EU Regulation 2011/1130/EU regulates the usage of additives in food. In the case of ginger, sulfur dioxide ($SO_2$) is the most common reported additive. The levels of usage of $SO_2$ for bleaching dried ginger are set at: ML = 150 mg/kg, only dried ginger. A list of authorized food additives and their conditions of use approved for use in food can be consulted via the food additives database. https://webgate.ec.europa.eu/sanco_foods/main/index.cfm

## 4.3 International Standards for Ginger Quality

### 4.3.1 International Standards

**Most export market use the Codex Alimentarius, American Spice Trade Association (ASTA) and European Spice Association (ESA).** These standards are influenced by the standards set by the major importing countries. Various types of tests make up the range of international standards and these tests include cleanliness, ash level, acid insoluble ash (AIA), volatile oil (V/O) determination, moisture content, microbial measures, pesticides level, mycotoxin level and particle size.

*The Codex Alimentarius* international food standards, guidelines and codes of practice contribute to the safety, quality and fairness of international food trade (http://www.codexalimentarius.org/about-codex/en/). Consumers can trust the safety and quality of the food products they buy and importers can trust that the food they ordered will be in accordance with their specifications. The Codex

Standard for Ginger (CODEX STAN 218-1999)—includes provisions on quality, size, tolerance and presentation. It also provides standards for marking or labelling, and determining contaminants and hygiene. This Standard applies to the rhizome of commercial varieties of ginger grown from *Zingiber officinale roscoe*, of the *Zingiberaceae* family, to be supplied fresh to the consumer, after preparation and packaging. Ginger for industrial processing is excluded. Among others, the produce covered by this Standard shall comply with the maximum levels of the Codex General Standard for Contaminants and Toxins in Food and Feed (CODEX STAN 193-1995). The produce covered by this Standard shall comply with the maximum residue limits for pesticides established by the Codex Alimentarius Commission.

*The International Organization for Standardization (ISO)* is an international non-governmental organization developing International Standards according to principles stipulated by the World Trade Organization's Technical Barriers to Trade Committee (WTO/TBT), especially: transparency, openness, impartiality and consensus. ISO also addresses the concerns of developing countries (http://www.iso.org/iso/home/about.htm). The following ISO applies: (a) ISO 16928:2014 Essential oil of Ginger [*Zingiber officinale Roscoe*]—specifies certain characteristics of the essential oil of ginger (*Zingiber officinale Roscoe*) cultivated in China, India and West Africa, in order to facilitate assessment of its quality; (b) ISO 1003:2008 specifies requirements for ginger (*Zingiber officinale Roscoe*)—the method for the determination of calcium are identified, as well as recommendations for storage and transport conditions; (c) ISO 13685:1997 ginger and its oleoresins—Determination of the main pungent components (Gingerols and shogaols) Method using high-performance liquid chromatography.

*The South Asian Regional Standards Organization* (SARSO, 2008) is a SAARC Specialized Body that became operational on April 3, 2014. All standards finalized by SARSO will have a distinct identity and will be known as SAARC Regional Standards (SARS) with a specific number like SARS 0001. Nepal is a member of SARSO. However, no standards are developed for ginger so far.

### 4.3.2 Requirements for Export and Quality Assurance in USA (FAO, 2002)

***Cleanliness Specifications for Spices.*** In 1969, the US Food and Drug Administration (FDA) came to an agreement with spice importers in the United States that the industry would control spice sampling and analysis prior to entering the food consumer market. Since then, the American Spice Trade Association (ASTA) has established standards for cleanliness specifications and assured through its approved laboratories that no spices would enter the food market without meeting the criteria. Contaminated or adulterated spices would need proper sanitation and reconditioning, or would be returned to the exporting country. The standards were changed over the years to also reach FDA requirements for foods. The ASTA Cleanliness Specifications (Table 4.2) have become a standard for most exporting countries, who have built their facilities

**Table 4.2 The American Spice Trade Association Cleanliness Standards for Ginger**

| *Whole insects, dead* | *Excreta, mammalian* | *Excreta, other* | *Mold* | *Insect defiled/ infested* | *Extraneous foreign matter* |
|---|---|---|---|---|---|
| By Count | By mg/kg | By mg/kg | No more than 3 percent moldy pieces and/or insect infested pieces by weight | | percent by weight |
| 4 | 6.6 | 6.6 | | | 1.00 |

*Note:* extraneous matter includes but is not restricted to: stones, dirt, wire, string, stems, sticks, non-toxic foreign seeds, excreta, manure, and animal contamination.

**Table 4.3 Food Chemical Codex Standards for Ginger Oil**

| *Standard value* | *Standard value* | *ISO method* |
|---|---|---|
| Relative density at 20ºC | 0.870-0.882 | ISO 279-1981 |
| Refractive index | 1.488-1.494 | ISO 280-1976 |
| Optical rotation | –47º to –28º | ISO 592-1981 |
| Saponification number | Not more than 20 | — |

**Table 4.4 Oleoresins Standards in US**

| | |
|---|---|
| Volatile oil content | 18-35 ml per 100 g |
| Refractive index | 1.488–1.498 |
| Optical rotation | –30º to –60º |

to meet those requirements. Importing countries that do not have specified standards may use ASTA's specifications. For ginger oil, the US has also adopted Food Chemical Codex standards—which have also been adopted by EU (see Table 4.3). And in addition, the U.S. Essential Oil Association has defined the following oleoresins standards—see Table 4.4.

Ginger oil and oleoresins may be standardized to meet specific product requirements. However, when this procedure is done, the product must be labeled WONF (With Other Natural Flavors), with the added natural flavor identified.

### 4.3.3 Requirements for Organic Spices and Products

**A product must be certified by an accredited certification body before it is labelled and sold as "organic."** There are slight differences in standards between countries. The International Federation of Organic Agriculture Movement (IFOAM) has established organic production, processing and trading standards, and tried to harmonize certification systems worldwide. National and regional governments are also trying to work under a compatible minimum set of standards. The European Union (EU) has established basic regulations for organic products in 1991 (Council Regulation 2092/91), which apply to all products marketed as "organic," "biologic," "ecologic," "biodynamic," or similar terms. Imports may be accepted through procedures conforming to the exporting country's regulations, or by review of the certification documents, which accompany each shipment. The EU regulation sets a minimum standard, and member states or private certification bodies may certify standards that meet or exceed EU regulation 2092/91. In the United States, the Organic Food Production Act (OFPA) was passed into law in 1990, and since October 2002 has made organic production and processing uniformly regulated across all of the United States. The Agricultural Marketing Service (AMS) branch of the U.S. Department of Agriculture is administering the National Organic Program.

**A common thread in different standards is that for a product to be labeled "organic" it must be grown following organic agricultural practices, and its post-harvest handling and processing must be done in certified facilities, whether on the farm or in food packing or processing facilities.** Only mechanical, thermal or biological methods can be used in organic processing. The use of genetically modified organisms (GMO) (plants, animals or bacteria) and products of GMO are prohibited in organic production. Likewise, ionizing radiation and sewage sludge are prohibited from organic agricultural practices. Labels of organic products must identify the certification body. In general, the Japanese organic standards (Japan Agricultural Standards, JAS) follow the U.S. NOP standards. However, JAS does not allow organic labeling on products that contain less than 95 percent organic ingredients (the EU and NOP allow labeling "made with organic ingredients" for products that contain between 70 percent and 95 percent organic ingredients).

**To access external organic markets, Nepal needs to identify countries (markets) that mutually recognize the organic standards adopted in Nepal.** Information on the standards of different countries need to be disseminated through workshops involving all value chain actors and all the relevant stakeholders to encourage Nepalese farmers and traders to comply with the standards. The organic certification bodies in Nepal include: (a) Organic Certification Nepal (OCN) Pvt. Ltd—a Third Party Certification Body is the first private initiative to certify organic agricultural production, wild production, processing and inputs for production in Nepal (www.certificationalliance.org/ver1/partners.html); (b) The Himalayan Bio-organic Agriculture Center Nepal (HIMBOAC-NEPAL)—Third Party Certification Body (www.himalayabio-organic.com); (c) Coffee Co-operative Union Ltd—Third Party Certification Body, see Organic Coffee Certification (www.coffeecullnepal.org).

## 4.4 Capacities and Constraints in the Institutional Framework for Food Safety

### *4.4.1 Roles and Responsibilities of Government Departments*

**Food safety and quality management is under the jurisdiction of Ministry of Agricultural Development (MoAD) and Ministry of Livestock Development (MoLD), and the Department of Food Technology and Quality Control (DFTQC) under MoAD is the major government institution responsible for food safety and quality management.** Enforcement of Food Act 1966 is the major regulatory activity of the DFTQC. It has the following major activities regarding food safety and quality management:

- Food inspection and checking compliance of food industry and retailers.
- Licensing and record keeping of food industries.
- Work as SPS inquiry point and communicate about SPS related rules, regulations and standards.
- Standardization and harmonization of food safety norms.
- Certification for export and import of food items.
- Execution of consumer awareness activities about food safety and quality.
- Development of appropriate food technology and training.

Although food safety related matters are mostly handled by the DFTQC, the Department of Agriculture (DoA) and Department of Livestock Services (DLS) share some responsibilities to regulate food safety. DoA is generally responsible to enforce food safety related rules and regulation in pre-harvest agriculture production system. Enforcement of Plant Protection Act 1972 comes under the jurisdiction of DoA. Extension of GAPs to the farmers, pest surveillance, pest risk analysis and management of plant quarantine check posts are some of the major activities of the DoA to ensure safety of plant origin food.

**The Nepal Council for Standards (NCS) and Nepal Bureau of Standards and Metrology (NBSM) are the governing body for food related standards and their mandate include developing standards for food safety.** In addition, consumer groups are involved in creating awareness to the general public and influencing the government in the formulation and implementation of the rules and regulation. The NCS is the government body responsible to approve and endorse Nepalese Standards. The NBSM under the Ministries of Industry and of Commerce and Supplies acts as the secretariat for the NCS which prepares the country standards of food products and methods of food processing. There are more than 100 standards in Nepal for food, food processing, transport and storage of which two are for ginger: NS 12:2037 Dry Ginger (Nepali Name: Sutho) and NS 448:2061 Ginger (http://www.nbsm.gov.np).

### *4.4.2 Coordination Mechanisms Are Lacking*

**The Residue Monitoring Plan is one area where there is a need for active coordination as all departments (DFTQC, DoA, and DLS) are involved.** Residue monitoring at production and post-harvest levels is key to meeting safety standards. The DFTQC is mandated for post-harvest activities and DoA/DLS are concerned with pre-harvest activities, but there are important overlaps in these roles and responsibilities. An active coordination among different departments is needed for export certification. The information generated by all the involved departments have a technical link and need to be shared at one platform which then becomes the basis for export promotion.

**The SPS Enquiry Point, which is housed at DFTQC, is the single government body which interfaces with both DoA and DLS, and therefore its relevance depends on coordinated actions.** The SPS Enquiry point is responsible to provide answers to all reasonable questions from interested countries as well as providing relevant documents. The SPS Enquiry Point also organizes stakeholders meetings, notifies rules and regulations and guidelines related to SPS for plant, animal and human health. The SPS Enquiry point has recently prepared guidelines for agro-products to be addressed by different Food Quarantine Laboratories and also prepared the Performance Based Incentive System for Food Quarantine laboratory as well as Plant and Animal Quarantine staff. There is need for better coordination, especially in the following areas: (a) epidemiologic surveys and link to food—better coordination between Ministry of Health and Population and DFTQC; (b) import controls where single window would need coordination between different Departments of MoAD and customs; (c) codex related activities on detection of MRLs, microbial contaminants, etc.; (d) testing and networking of laboratories; and (e) recognition of voluntary certifications given by NBSM and private certification bodies.

### *4.4.3 Laboratory Capacity for Testing and Human Capacity Are Not Sufficient*

**The laboratories do not have sufficient capacity for testing presence of important contaminants.** There is no laboratory capacity for testing and monitoring pesticide residues, mycotoxins, and microbial contamination as per Codex standards/EU requirements. The existing laboratories lack both high precision and basic instruments and equipment's to test for diseases, pesticide levels, microbial contaminations, heavy metals, etc. For example, the Central Food Research Laboratory was granted accreditation as per ISO 17025 by National Accreditation Board for Testing and Calibration laboratories in 2012, but the scope of accreditation is limited to 27 parameters and does not include microbial contaminants and heavy metals. The ability to test for these contaminants is crucial to complying with various standards in export markets—for example the EU standards discussed in previous section—and is therefore necessary for promoting Nepal's products and ultimately accessing export markets. Both DoA and DFTQC have mandates on pesticides testing. There is a need for better coordination in implementing the pesticide monitoring plan (PMP), especially because of the overlapping roles—PMP implementation before the produce comes to the domestic market is handled by DoA and the testing for MRL prior to export is responsibility of DFTQC.

**The human capacity for conducting testing, coordinating SPS issues, and enforcing inspections is weak.** There is a lack of advance level trainings to personnel involved in laboratory testing and inspections, especially as it relates to Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Global Health Partnerships (GHP), and production and processing systems. To address these gaps sufficient training modules should be developed. Furthermore, there is

**Box 4.1 Organization and Capacity of DFTQC**

At the central level, the DFTQC has two divisions: (a) Food Quality Control Division—which undertakes market inspection and legal actions, industry inspection, food industry licensing, food expert import inspection and certification, food standardization, inspection of hotels, restaurants and sweet shops, joint monitoring with other local agencies, consumer awareness and laboratory analysis of food/feed; and (b) Food Technology Development and Training Division—which undertakes product development and trial studies, food processing training, and consultancy services. Between 2012 and 2014 the department conducted trials for ginger candy preparation, evaluation of ginger pate quality, and evaluation of quality of ginger wine.

The DFTQC has the following laboratories programs and laboratory facilities at the central level: (a) Central Food Research Laboratory—which was granted accreditation as per ISO 17025 by National Accreditation Board for Testing and Calibration laboratories in 2012. However, the scope of the accreditation is limited to 27 parameters and does not include microbial contaminates and heavy metals. The lab undertakes major activities with respect to accreditation requirements such as internal audit, surveillance audit, etc. (b) National Nutrition Programme—which conducts nutritional analysis of non-conventional and traditional agro and forest based food, food and nutrition education and communication, weaning food promotion programme and training on food and nutrition. (c) SPS Enquiry Point—which is the single government body responsible to provide answers to all reasonable questions from interested countries, as well as for the provision of relevant documents. In addition, there are several regional offices which undertakes activities of the main two divisions of DFTQC. These include: (a) Biratnagar—five Food Inspection Units, (b) Hetauda—seven Food Inspection Units; (c) Nepalgunj—three Food Inspection Units; (d) Bhairwaha—four Food Inspection Units; (e) Dhangadi—one Food Inspection Unit; (f) Four Food Quarantine Laboratories (Kakarvitta, Tatopanai, Birgunj and Mahindranagar); (g) Tribhuawan International Airport Customs Inspection Unit; (h) Food Inspection Units in twenty districts; and Apple Processing Centre at Jumla.

limited size of manpower, especially at regional and district levels. In addition, there is a lack of attention towards Standard Operation Procedures (SoPs) for inspection and sampling of consignments and certification system. Capacity of the staff is weak on proper sampling procedures and methods for laboratory and field testing of samples, in particular MRLs, microbial contamination, toxin, heavy metals, etc. For example, the DFTQC has recently brought out a Sampling Manual for NTIS Agro-food Commodities. The document describes sampling methods for both fresh and dried ginger to be used in determining the quality of particular characteristics of fresh ginger and dried/powdered ginger as per ISO (1003:2008-Spices) norms (DFTQC, 2013 a). However, the capacity to adopt these norms is weak and this is partly the reason these norms have not been applied.

### 4.4.4 National Ginger Standards Are Inconsistent with Standards in Lucrative Export Markets

**Nepal does not follow the Codex Standard on Ginger rhizomes, which describes quality specifications for the rhizome—in terms of size, tolerance, marking or labelling, contaminants and hygiene.** The standards also are required to comply with the maximum levels of the Codex General Standard for Contaminants and Toxins in Food and Feed (CODEX STAN 193-1995)—including the need to comply with the maximum residue limits (MRLs) for pesticides established by the Codex Alimentarius Commission. (Annex 4.2 describes these standards). Nepal cannot access lucrative export markets without meeting these standards as meeting these standards is necessary for facilitating accreditation by exporters. In addition, it would improve domestic food safety standards. Instead of the Codex standards, Nepal has defined Mandatory National Standards for dried ginger and Dried ginger powder (DFTQC, 2013). Dried Ginger (Sutho) means the clean and dried rhizomes of Zingiber officinale which may not be uniform in shape and which may be peeled or unpeeled. It should have the following properties (a) it should contain extraneous matter not more than 2.0 percent (w/w); (b) it should contain volatile oil not less than 1.0 percent v/w on dry weight basis; (c) it should contain calcium oxide not more than 4.0 percent (on dry basis) of calcium used; and (d) it should be free from added color. On the other hand, Dried Ginger means the powder obtained by grinding the dried ginger. It should have the following properties: (a) it should contain moisture not more than 13.0 percent (w/w); (b) it should contain total ash not more than 8.0 percent (w/w); (c) it should contain acid insoluble ash not more than 1.0 percent; (d) it should contain cold water soluble extract not less than 10.0 percent (w/w); (e) it should contain alcohol (90 percent v/w) soluble extract not less than 4.5 percent (w/w); (f) it should contain volatile oil not less than 1.0 percent (v/w); (g) it should contain calcium (as calcium oxide) not more than 4.0 (w/w); and (h) it should be free from added colour.

## 4.5 Capacities and Constraints in Policy and Regulatory Environment

### 4.5.1 Nepal Continues to Follow a Traditional Food Safety and Regulatory Framework

**Despite some recent progress in regulations, Nepal continues to follow a traditional food safety and regulatory framework based on inspecting and analyzing end products for food safety, instead of the modern food safety approach of total quality management from farm to fork.** The regulations for food safety in Nepal began in 1966 with the Food Act (1966). These regulations became even more important during the 1990s due to increased economic liberalization and international trade. The food safety related rules and regulations are based on inspecting and analysing end products to ensure safety of the food. This is in contrast to modern food safety approaches of total quality management from 'farm to fork'—which focus on all level of production, processing, transportation and trading. Modern food safety related regulations and policies have been generally formulated following codex principles and guidelines focussing on preventive measures to produce safe food. There is some progress in that existing regulations and standards have been reviewed towards complying with codex standards, wherever feasible, but this effort has been slowed down by traditional national regulations and weak infrastructure (e.g. laboratories that lack necessary accreditation). The main regulatory framework consists of Food Act 1966 and Food Rules 1970, Plant Protection Act 2007 and Plant Protection Rules 2010, Pesticides Act 1991 and Pesticides Rules 1993, and Animal Health and Livestock Services Act 1998.

**The Food Act and inspections are not following a preventive risk based approach.** A preventive risk based approach calls for a shift in preventing food safety problems rather than reacting to them after they occur. For example, food legislation in the European Union and elsewhere includes both hazard and risk-based approaches for ensuring safety. In hazard-based approaches, simply the presence of a potentially harmful agent at a detectable level in food is used as a basis for legislation and/or risk management action. Risk-based approaches allow consideration of exposure in assessing whether there may be unacceptable risks to health. Both types of approach have their place, depending on the context (Barlow et al., 2015). A risk-based, preventive food-safety system can be developed by leveraging HACCP, which is the primary risk-management system used by the food industry. HACCP provides a systematic preventive approach to food safety from various types of hazards in production processes that can cause the finished product to be unsafe. It also helps to design measurements to reduce these risks to a safer level. A recent example of preventive risk approach is The Food Safety Modernization Act (FSMA) of US, which applies to certain unintentional hazards, such as microbiological, chemical, physical, or radiological hazards that may occur at a food facility that manufactures, processes, packs, or holds human food. Therefore, Nepal needs to draft food safety policy which should include establishing of a Food Safety Authority to develop safety norms from production to consumption level encompassing complete control of food chain.

### *4.5.2 The Regulatory Framework Have No Provision to Enforce Traceability*

**The regulatory framework have no provision to enforce traceability of the food items, which is one of the mandatory requirements for export of products to developed country markets like EU.** Traceability means the ability to track any food, feed, food-producing animal or substance that will be used for consumption, through all stages of production, processing and distribution. Traceability is a way of responding to potential risks that can arise in food and feed in order to ensure that all food products are safe for citizens to eat. The EU's General Food Law makes traceability compulsory for all food and feed businesses. It requires that all food and feed operators implement special traceability systems. They must be able to identify where their products have come from and where they are going to and to rapidly provide this information to the competent authorities. The EU has published guidelines (available on the European Commission website) which require business operators to document the names and addresses of the supplier and customer in each case, as well as the nature of the product and date of delivery. Operators are also encouraged to keep information on the volume or quantity of a product, the batch number if there is one, and a more detailed description of the product, such as whether it is raw or processed. For a summary of the requirements see the following link—http://ec.europa.eu/food/safety/docs/gfl_req_factsheet_traceability_2007_en.pdf).

**Much of the capacity for quality testing in Nepal is not relevant for international food safety requirements.** Existing legislation and the policy framework for food safety do not have provisions for testing for MRLs and microbial contaminations which are important criteria to be met for exporting to lucrative markets. The EU has rejected consignments from many countries during 2014 due to microbial contaminations alone. Although Nepal has mandatory standards on 27 quality parameters (ash, insoluble ash, moisture, volatile oil, extraneous material, etc.), the standards on essential food safety parameters (MRLs, aflatoxins, microbial contaminants, and heavy metals) are yet to be developed. There is no mention for compliances to Codex (CAC) as the Food Act was made before WTO came to existence. In the modern globalized world, the bilateral and multilateral agreements of international trade should affects the policy, rules and regulations of a country. Nepal is already a member of several important international organizations, and therefore it has a platform to upgrade its food safety related policy, rules and regulations. The organizations for which Nepal is a member include WTO, IPPC, Codex Alimentarius Commission (CAC), World Organization for Animal Health (OIE), FAO, South Asian Association for Regional Cooperation (SAARC), Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC).

**Kenya is one good example with a traceability mechanism in place for ensuring food safety that Nepal could learn from.** Food-borne diseases are still a major problem in Kenya because of the enormous informal sector in the food industry. The responsibility for coordinating the multiple institutions (agencies) involved in food safety management rests on the Department of Public Health (DPH) under the Ministry of Public Health and Sanitation. Most Kenyan standards are adopted from international ones, such as ISO and Codex. In the food supply chain, farmers have to apply GAPs, sellers of commodities/raw materials at local or international level have to apply Good Distribution Practices, and manufacturers have to apply Good Manufacturing Practices. Food supply chain operators have to apply either national (mandatory) standards or private (voluntary) standards. Chain supporters provide the necessary impetus while chain enablers provide the control and/or regulation. Kenya Bureau of Standards is the major chain enabler. It is the National Codex Contact Point, serves as the secretariat of the National Codex Committee, and is the National Enquiry Point of the WTO (Oloo, 2010). Kenya provides a good example for Nepal to consider while developing its traceability mechanism.

## 4.6 Recommendations for Policy and Investments

### *4.6.1 Addressing Constraints in the Technology of Production*

**A national program for quality ginger seed production should be developed, perhaps as part of a national horticulture seed program because the issues in ginger seed cut across other horticulture crops.** This would help alleviate the current practice of most farmers using locally available seed materials retained from previous crops. It is estimated that farmers keep between 20 to 25 percent of their production to use as seeds for the next growing season. New growers purchase seeds from neighboring farmers or local markets. Ginger farmers in the mountains mostly preserved ginger seed from their last season crop, and it was learnt that many generally do not use pesticides on ginger. A consequence of the lack of a national seed development program is that only two major types of ginger are grown in Nepal. The two are known by the following local names: *nashe* (rich in fibre) and *boshe* (less fibre and thick rhizomes). The *boshe* varieties are mostly grown in and around Makwanpur and Salyan areas whereas *nashe* is most common in other parts. Due to less fibre content, the *boshe* varieties are priced higher than *nashe*. Fibre content of ginger is said to depend on soil type and climatic conditions. For example, *boshe* varieties from one location can produce highly fibrous rhizome when grown in other locations (HVAP, 2011). The difficulties in obtaining improved and certified seeds leaves farmers with seeds that are many times infected with seed borne diseases.

**Develop a national program for adoption of Good Agricultural Practices (GAP) for ginger and other commodities.** The benefits of developing and then adopting GAPs include not only fulfilling trade and government regulatory requirements on food safety and quality, but more importantly meeting specific requirements of high value specialty or niche markets and improving food safety for domestic consumers. An expansion of GAP based ginger production would help to obtain better quality and healthier ginger products. GAP standards are crop and region specific. The recently concluded STDF project developed ginger growing manual and other training materials on GAPs, including for ginger cultivation, post-harvest handling of ginger, and SPS requirements suitable for target beneficiaries. Training programs are envisaged on value chain actors of GAPs, initially at Eastern region of Jhapa. These efforts need to be expanded to other ginger growing areas of the country. The adoption of GAPs may help reduce the risk of non-compliance with national and international regulations, standards and guidelines regarding permitted pesticides, maximum levels of contaminants (including pesticides and mycotoxins) in food and non-food agricultural products, as well as other chemical, microbiological and physical contamination hazards. The lesson from the Ginger Competitiveness Project in Eastern Region is that establishment of Farmer's Field School has resulted in an increase in ginger productivity and adoption of improved practices. These efforts should be replicated throughout the country.

**Develop an operational plan for monitoring contamination in value chains of major commodities.** This may involve both broadly defined as well as commodity specific operational plans for avoiding, detecting and monitoring the contamination levels of pests and pesticides in major commodities. To implement such a plan there would be need to (i) develop specific training modules and build capacity of government staff, and (ii) partnership program with the private sectors (growers and traders) to share information and jointly develop programs to improve traceability.

### *4.6.2 Addressing SPS Issues along Ginger Value Chain*

**Develop the capacity of laboratories to test presence of important contaminants.** There is no laboratory capacity for testing and monitoring pesticide residues, mycotoxins, and microbial contamination as per Codex standards/ EU requirements. The existing laboratories lack both high precision and basic instruments and equipment's to test for diseases, pesticide levels, microbial contaminations, heavy metals, etc. For example, the Central Food Research Laboratory was granted accreditation as per ISO 17025 by National Accreditation Board for Testing and Calibration laboratories in 2012, but the scope of accreditation is limited to 27 parameters and does not include microbial contaminants and heavy metals. The ability to test for these contaminants is crucial to complying with various standards in export markets and is therefore necessary for promoting Nepal's products and ultimately accessing export markets. Both DoA and DFTQC have mandates on pesticides testing. There is a need for better coordination in implementing the pesticide monitoring plan. It's important for DFTQC to have sufficient capacity for testing all contaminants that are important because the DFTQC is designated as the CODEX Contact point and National SPS Enquiry Point for Nepal.

**Build human capacity for conducting testing, coordinating SPS issues, and enforcing inspections.** There is a lack of advance level trainings to personnel involved in laboratory testing and inspections, especially as it relates to Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Global Health Partnerships (GHP), and production and processing systems. To address these gaps sufficient training modules should be developed. Furthermore, there is limited size of manpower, especially at regional and district levels. In addition, there is a lack of attention towards Standard Operation Procedures (SoPs) for inspection and sampling of consignments and certification system. Capacity of the staff is weak on proper sampling procedures and methods for laboratory and field testing of samples, in particular MRLs, microbial contamination, toxin, heavy metals, etc.

**Establish a local laboratory accreditation board to facilitate Mutual Recognition Agreements (MRA).** There is no local accreditation board to engage with international accreditation institutions such as the International Laboratory Accreditation Cooperation (ILAC) and other relevant bodies such as International Accreditation Forum (IAF). Nepal relies on India's National Accreditation Board for Testing and Calibration Laboratories (NABL) for accreditation of its facilities. A local accreditation body would be able to promote Mutual Recognition Agreements (MRA) with potential export markets. An MRA is important to facilitate trade as it provides a forum to define what is acceptable among trading partners. On the other hand the lack of MRA may not prevent poor quality imports coming into the country as there are no accredited facilities to conduct tests with enforceable results.

**Operationalize Pesticide Residue Monitoring Plan.** The recently developed Residue Monitoring Plan needs to be formalized and operationalized as a national program and linked with monitoring at primary production level. Detection of contaminations at this level will contribute significantly to ensure that only clean material goes to the market.

**Build capacity for post-harvest storage and handling.** This would involve the DoA developing training modules for all value chain participants, including farmers, extension workers of DADOs, traders, organized collection centers, etc. The modules will highlight the importance of washing, grading and drying of harvested Ginger rhizomes. In addition, there is scope for partnering with producer organizations—Nepal Ginger Producers and Traders Association—to establish such facilities at appropriate locations. For example, one such facility has been developed at Birtamond, Jhapa under STDF/FAO project.

**Comply with international standards for pest management—International Plant Protection Convention (IPPC)/International Standards for Phytosanitary Measures[1] (ISPM)—and the key actions for compliance include conducting pest risk analysis and identifying pest free areas or areas with low pesticides.** There is no proper national survey and surveillance of ginger diseases and pests in Nepal nor is there a regular practice of pest reporting, although certain piecemeal efforts have been carried out in certain projects several years ago. A number of pests are reported but without much scientific data on their occurrence, epidemiology, management, etc. Only Rhizome rot with its visible symptoms and impact is considered as a major threat in production and export and all national efforts revolve around this disease. However, the ginger crop in the field was observed to suffer from yellow leaves and stems, brown discoloration of water conducting tissue within stem (indicative of rhizome rot), light yellow lower leaf tips, drooping, withered leaves and plants becoming stunted (indicative of bacterial rot or wilt), and also the apparent associations of insect pests such as white grubs, shoot borers and weevils in different intensities in various fields. There is lack of comprehensive documentation on occurrence and incidences of various diseases on ginger in Nepal. An investment is needed to conduct systematic study to investigate and document various diseases and pests and their incidences in different ginger growing areas. The International Standards for Phytosanitary Measures (ISPMs 06, 08, 17 and 22) of IPPC needs to be adopted with local adaptation as National standards to undertake this activity.

**Strengthen the SPS enquiry point at DFTQC.** The SPS Enquiry Point needs to be strengthened to take up all matters related to SPS with importing countries and to facilitate trade negotiations based on scientific principles. The SPS Enquiry point would also inform any SPS Agreement made with trade partners. At present there is only one dedicated staff in the SPS Enquiry point, which is insufficient not only for responding to queries from importing countries and domestic industry, but also far from the capacity required to create and update an effective knowledge base of all the SPS related information.

**Align domestic standards for ginger with codex standards.** Nepal does not follow the Codex Standard on Ginger rhizomes, which describes quality specifications for the rhizome—in terms of size, tolerance, marking or labelling, contaminants and hygiene. The standards are required to comply with the maximum levels of the Codex General Standard for Contaminants and Toxins in Food and Feed (CODEX STAN 193-1995)—including the need to comply with the maximum residue limits (MRLs) for pesticides established by the Codex Alimentarius Commission. (Annex 4.2 describes these standards). Nepal cannot access lucrative export markets without meeting these standards. In addition, adopting these standards would improve domestic food safety standards.

**Conduct SPS diplomacy for export promotion.** The main element of SPS diplomacy is engaging with regional and international organizations, particularly those setting international standards, and the WTO SPS Committee. Developing countries are often weak in this area and act as receivers of standards set by others. SPS diplomacy is also essential in bilateral market access negotiations between trade partners, and in resolving problems or disagreements which arise during trade. SPS diplomacy relies on scientific capacity. There is need to develop capacity for SPS diplomacy by training a batch of key experts on: (i) policy and regulatory affairs with special reference to compliances to SPS/WTO, (ii) technical skills on pest reporting and risk analysis, (iii) mitigation measures identified by IPPC and other reference standards, (iv) risk communications as per IPPC and Codex, (v) marketing and trade promotion, and (vi) communication and negotiation skills.

**Develop a national strategy for SPS information management, SPS risks communication, and traceability system.** The information management system would bring together, in one platform, all information (legal, technical, institutional, export promotion, global markets) related to SPS matters of different Ministries and Departments along with national standards and extent of compliances to various IPPC/Codex Standards. Such a platform would also cover risk assessment protocols and updates on SPS issues at different parts of the chains.

In addition, once the SPS Risks are identified through risk assessment and results of field/laboratory tests during quality control or quarantine, there is need for a strategy to communicate risks to all value chain actors along with the related mitigation measures of risks. Furthermore, the Food Act under preparation could include a provision to manage traceability of the food items. There are very good lessons on establishing traceability systems from countries such as Kenya.

**Develop a national strategy to access high value niche organic markets, including branding of organic ginger from Nepal.** With the growing demand in organic products in the international markets, organic ginger from Nepal could be branded and marketed to serve the growing demand. Already farmers are practicing some important principles of organic farming, including low chemical pesticides and fertilizers, which indicates tremendous potential to further adopt organic principles. Efforts in this direction have been initiated in the recent past where certain private companies such as Annapurna Organic Agriculture Industry (Kapilvastu, Nepal) have exported Ginger to Netherlands, Japan and Dubai. It may be noted that in those cases the exporter has focused on quality control of the produce (that helped in eliminating the SPS risks). This seems to be an interesting example where the Codex Standards were not followed in strict sense but the importer and the importing countries were convinced that organic ginger did not pose safety and health risks. In the light of above, efforts in this direction should be made to develop GAP for organic ginger and then brand organic ginger as a separate product from other ginger.

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## Note

1. The intention of ISPMs is to harmonize phytosanitary measures for the purpose of facilitating international trade. ISPMs can cover a wide range of issues including; surveillance, pest risk analysis, establishment of pest free areas, export certification, phytosanitary certificates and pest reporting. The IPPC encourages adoption of these standards, but they only come into force once contracting (members) and non-contracting parties to establish requirements in national legislative instruments. IPPC standards generally fall into three categories: 1) Reference standards, such as the Glossary of phytosanitary terms; 2) Conceptual standards, such as the Guidelines of pest risk analysis; 3) Specific standards, which typically directed at a specific pest or pathogen (e.g. surveillance for citrus canker).

CHAPTER 5

# Lessons on Policy and Investments to Substitute Imports—Case Study of the Cut-Flower Value Chain

## 5.1 Why Study Cut-Flower Value Chain?

**The floriculture industry in Nepal grew by about 540 percent over 10 years between 2003/04 and 2013/14.** The size of the industry—including plants, seasonal flowers, and cut-flower—and estimated in terms of value of transactions, is NRs. 1.28 billion (approximately USD 12.8 million[1]) in 2013/14. This represents a tremendous 540 percent growth from about NRs. 0.2 billion (approximately USD 2 million) in 2003/2004. Cut-flower forms the largest segment of the floriculture sector. Number of cut-flower showrooms in the country has increased from 56 in 2003/2004 to 87 in 2014/2015.[2] Total investment in the Nepalese floriculture sector stands at US $9 million in 2015. There are a total of 309 entrepreneurs involved in floriculture in Nepal, of which 132 are in Kathmandu and 48 in Lalitpur. Total employment generation in the sector is not very significant at the moment as it is still an emerging sector. Production is largely in leased private land and in small pocket areas. The largest single production unit is about 8.3 hectares of land. There are only a handful of producers who have more than one hectare of cultivated area. About 50 percent of the districts in Nepal are involved in floriculture and about 25 percent in cut-flower production. The floriculture sector occupies 147 hectares.[3] Due to favorable topographic and climatic conditions of Kathmandu valley, commercial production of floriculture products is mainly concentrated in and around the valley.

**Domestic production for floriculture products has not been able to keep up with the increasing market demand, and as a result imports have increased by over 600 percent in ten years—from NRs. 1.3 million in 2003/2004 to NRs. 82 million in 2013/2014.** Nepal imports floriculture products from China, Israel, India, USA, Netherlands, Spain, Ukraine, Italy, Finland, Columbia, Australia, Japan and Turkey. The different categories of imports

**Figure 5.1 Floriculture and Cut-Flower Production Districts of Nepal**

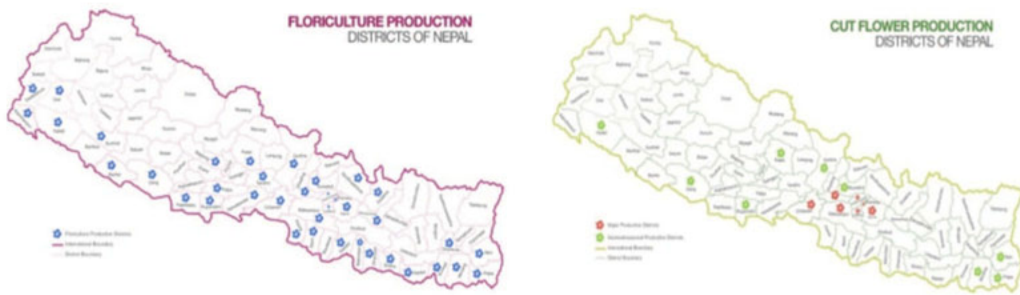



**Table 5.1 Production Areas of Major Cut-Flowers**

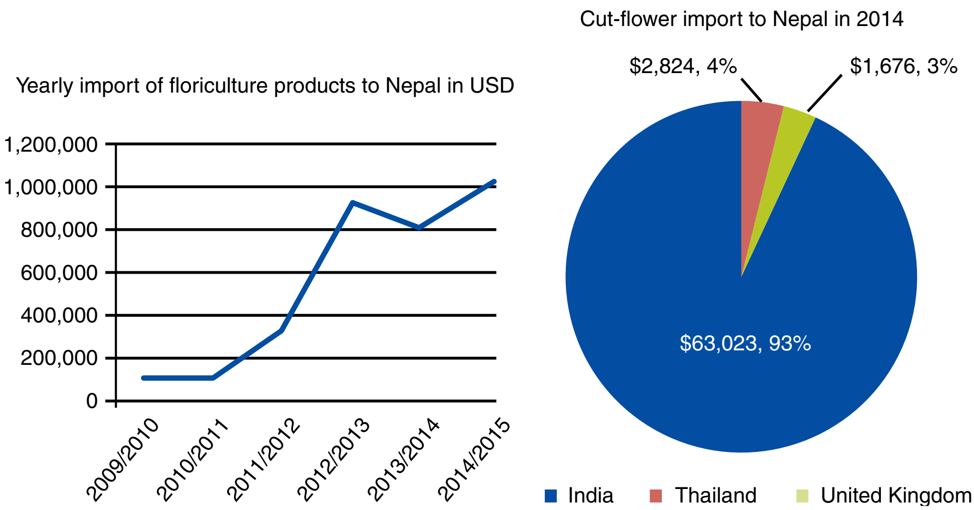
| | *2009/2010* | *2010/11* | *2011/12* | *2012/013* | *2013/14* | *2014/015* | *Percent change from 2009/2010* |
|---|---|---|---|---|---|---|---|
| *Area in Ha* | *110* | *120* | *120* | *137* | *141* | *147* | |
| | | | *Total area occupied by 6 flowers* | | | | |
| Gladiolus | 18 | 18 | 14 | 14 | 14 | 14 | –22.2 percent |
| Rose | 14 | 14 | 9 | 9 | 5 | 5 | –64 percent |
| Carnation | 2 | 4 | 5 | 5 | 5 | 6 | 200 percent |
| Gerbera | 2 | 2 | 2 | 4 | 4 | 6 | 200 percent |
| Tuberose | 1 | 2 | 2 | 3 | 3 | 4 | 300 percent |
| Orchid | 3 | 3 | 3 | 3 | 3 | 3 | 0 percent |
| **Total** | **23** | **27** | **22** | **25** | **23** | **26** | **13.0 percent** |

*Source:* Floriculture Scenario in Nepal 2015, FAN.

include live trees and plants, bulbs, roots, cut-flowers and ornamental foliage, etc. In some years there has been isolated imports of cut-flowers from Kenya, Israel, the Netherlands, Columbia, and Australia. The main flowers imported from India are Rose, Carnation, Crysanthemum, Lili, and Orchids while Orchid is the only product imported from Thailand. Imports of floriculture products in 2014/2015 stood at NRs. 100 million (USD 1 million). However, the industry players believe that the actual values exceed the official values by several times.

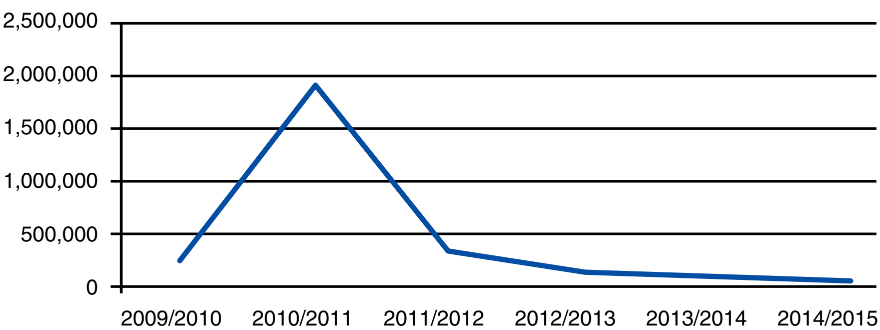
**Floriculture exports are low and have been declining in the past five years, except in 2010/11 when Nepal exported flowers worth about $2 million.** There are approximately 50 varieties of cut-flowers that are produced commercially. A Floriculture sector study conducted by ITC in 2007 identified Gladiolus, Rose, Carnation, Gerbera, Orchids, Chrysanthemum, Lily, Cymbidium, Tuberose, etc., as having export potential. Past export records confirm Gladiolus, Rose, Carnation and Gerbera as leading the exports of cut-flowers from Nepal. However, export of floriculture products over the last 10 years has been on the decline with some unexplained surges in a few years—for example in 2010/2011 (see figure 5.3 above).[4] Overall, there has been an 88 percent decline in export between 2009/2010 and 2014/2015. Exports in 2014/15 were a mere $25,400 with the cut-flower segment even lower at $5,000. According

**Figure 5.2 Yearly Import Trend of Floriculture Products to Nepal**




*Source:* Trade and Export Promotion Center and UN Comtrade.

**Figure 5.3 Yearly Export of Cut-Flowers from Nepal (2009–2015)**




*Source:* Trade and Export promotion center.

to industry sources the export figures for cut-flowers are for samples exported rather than commercial exports.

## 5.2 The Global Floriculture Industry

**The global floriculture industry is growing and over the last decade the leading flower exporting countries have been Netherlands, Colombia, Kenya, Ecuador and Israel.** Floriculture products comprising of cut-flowers, cut foliage, living plants and flower bulbs are traded worldwide. Trading is dominated by the cut-flower group followed by living plants. Global cut-flower trade has achieved significant growth over the last decade. Developed countries in Europe, America and Asia comprise of 90 percent of markets for world cut-flowers. The EU is the single largest importer of cut-flowers. According to

Eurostat, a total of 415 thousand tons of cut-flowers worth € 1.59 billion was imported by the EU in 2014.[5] Production continues to be dominated by the Netherlands, which produces about 83 percent of the world's cut-flower followed by Colombia, Ecuador and Kenya. The African, Middle Eastern and European countries dominate supply in the EU markets. According to EUROSTAT, Kenya is positioning itself as a supplier of quality products and Ethiopia is also continuing to increase its importance as an exporter to the EU.[6] Columbia and Ecuador are the principal suppliers to the US market. Asia Pacific Countries including Thailand, Malaysia and Vietnam are the major suppliers to Japan and Hong Kong.

**Investments in the global floriculture industry are shifting away from developed countries due to increasing production costs and shrinking margins, and towards developing countries where production costs are lower due to better climatic conditions and cheap labor.** Traditionally strong producers like the Netherlands are losing market share to developing countries such as Kenya, Ecuador, Colombia, Ethiopia and Malaysia. These countries have accelerated the technology of production and developed knowledge systems that have improved their competitiveness. Producers are able to achieve economies of scale through large production units for good quality flowers which has enabled them to offer competitive prices. However, the Netherlands continues to hold strong as an auction hub for imports and exports of cut-flowers in Europe. Another major structural change in the global cut-flower market is the transport of cut-flowers by sea replacing air transport, which has traditionally been used to move cut-flowers. The major driver for this development is the price difference between air and sea transport—the latter is increasingly becoming cost effective and there is increasing progress in the technology of preservation that keeps flowers fresh during transportation by ship.

## 5.3 Global Sanitary and Phyto-Sanitary Standards

**Consumption patterns in European mass markets are characterized with increasing importance of Sanitary and Phytosanitary (SPS) standards as well as social and environmental concerns.** Buyers in the world market are increasingly interested in conditions under which flowers are grown in developing countries. As a result a multitude of certification schemes, consumer labels and codes of conduct have been set up. Producer countries are increasingly required to adopt these standards and labels depending on their markets and distribution channels. The requirements in the EU mass markets can be divided into three categories: (a) mandatory requirements to enter the market; (b) common requirements that are needed to remain competitiveness in the market; and (c) niche market requirements.

*Phytosanitary Certifications issued by the exporting country.* The mandatory requirements include the Phytosanitary Certifications issued by the exporting country. If the exporting flower falls under the endangered species according to international CITES convention, such as in the case of certain orchids, an export permit is required to be obtained from the exporting country as well as import permit from the importing country.

*Global Gap is another certificate related to good agricultural practices.* Cut-flowers that are sold through supermarkets increasingly require Global GAP certificate. In addition, there are other standards that could apply depending on the markets such as the ETI (Ethical Trading Initiative) in the UK, and Business Social Compliance Initiative in other European countries. Developing and implementing cold chain protocols is increasingly becoming important to cut-flower exporters as this has a direct effect on the quality and vase life of the flowers. Another category of standards that is gaining importance in niche markets are Fair Flowers Fair Plant, Fairtrade International, Florverde and Rainforest Alliance and organic. Besides certification, buyers and consumers have very specific demands on the product quality, delivery time and quantity.

## 5.4 Salient Features of the Cut-Flower Value Chain

**Nearly all the planting materials and agro-chemicals are imported and most greenhouses are of low technology using local materials because of the high investment costs of importing high technology greenhouse.** The variable inputs in the production of cut-flowers include planting materials (seeds, bulbs, saplings) and agrochemicals (fertilizers, pesticides, herbicides, fungicides, etc.). Most of the planting materials for gerbera, gladiolus, carnation and rose are imported. The main suppliers of inputs are SIAM Floritech, Crop Pro-Tech, Flora Nepal and Floriculture Cooperative. The first three companies mostly import planting materials from the Netherlands (Gerbera, Carnation, Rose, Limonium), Germany (Rose), Poland (Gerbera), Israel (Carnation, Gypsophila, Chrysanthemum and Asters) and India (Gerbera, Carnation). These companies are sole authorized importers in Nepal for the breeding companies they import from. In the past, mother plants for roses used to be imported directly from the Netherlands, Spain, Israel and other destinations. But this has changed as most of these global suppliers now have plant propagation centers in India, China, and Kenya. Input suppliers believe that planting materials sourced directly from European breeders are consistent and superior in quality than those sourced from propagation sites. However, the main advantages of importing through India-based propagation sites are: (i) price advantage to the importer due to transportation and currency conversion, and (ii) the input supplier companies also provide technical support. Another key input supplier is the Floriculture Cooperative, which mostly imports planting materials through other importers and then supplies to producers. The Cooperative also imports directly when planting materials are required in large quantities.

Small producers either buy the greenhouse system from importers such as Crop Pro-Tech or buy greenhouse materials by parts. For example, importers bring in ultraviolet (UV) plastic sheets and insect nets. However, small growers largely use silpaulin covering sheet that is easily available in local markets. Silpaulin is a cheaper option to the UV plastic film but does not have the same protective effect on plants. Most small growers locally build greenhouse structures using bamboo. Bamboo is an easily available alternative to GI or aluminum structures and it is attractive because of the low investment cost. However, in the long run bamboo could be more expensive due to the high maintenance costs. Although most producers currently use bamboo structures, they are eager to shift to the GI or aluminum structures. The greenhouses locally built by producers often work as mere shades and have little or no environment control mechanisms that are essential to grow cut-flowers. There are also input supply companies such as SIAM Floritech that design and fabricate manually operated greenhouses using aluminum or galvanized iron structures and offer option of silpaulin or UV plastic sheet covering depending on demand. Locally designed and fabricated greenhouses are not temperature or humidity controlled, and therefore come with manually operated ventilation. Drip irrigation has gained popularity among commercial cut-flower producers in recent times and in some cases it has replaced canal irrigation. Suppliers for drip irrigation system import from India. The main suppliers are Nepal Thopa Sichai (translated as Drip Irrigation) and Crop Protect.

**Cut-flowers are not part of NARC special commodity research programs:** NARC is a government run research center dedicated to agricultural research under the umbrella of the Ministry of Agriculture Development. Its research priorities are decided upon by the Council—a decision making body within NARC and the research priorities are implemented by the five regional research stations. There are different disciplinary divisions within NARC that is relevant to the cut-flower sector such as plant pathology, soil science, soil science, commercial crops. NARC also has special commodity research programs. However, cut-flower is not one of them.

**Overall, production of cut-flowers in Nepal is a low technology affair.** In total, there are about 544 entrepreneurs who are involved in floriculture, of which 63 producers are involved in commercial production of cut-flowers. Among the 63, about 43 producers use greenhouses or plastic covered shades while the remaining 20 produce in open areas. Even among the 43 using greenhouses, only about 5 of them use high-tech or semi high-tech greenhouses. The main reason behind low technology is that the investment costs for imported high-tech greenhouses are high for an average producer. However, there are many benefits associated with such technologies, including (i) metal structure that is more durable than the locally made bamboo, (ii) temperature and humidity control features, (iii) pest control nets that offers benefits of reduced use of pesticides. Production of cut-flowers is dominated by small scale entrepreneurs. Some migrants who have returned home have also made investments in the cut-flower production. Producers also fulfill the role of transporters up to the wholesale point. There is no dedicated mode of transport for cut-flowers. Producers use any vehicle available such as local busses, vans, taxis and motorbikes.

**Most transactions occur under some form of vertical coordination.** There are many ways to organize transactions in a value chain. One approach is through spot markets where buyers and sellers have little or no coordination arrangement and the terms of a transaction are negotiated on the spot and physical delivery also takes place on the spot. This is one end of the spectrum. At the other end is Vertical Integration where numerous stages of transforming inputs into products are conducted by the same actor. In between spot markets and vertical integration, there are various forms of vertical coordination that could be employed. An example of near vertical integration is Flora Nepal, which is involved in everything from input supplies to wholesaling. The company imports planting materials and greenhouses, operates its production, runs a wholesale unit, and then supplies to retailers. Flora Nepal imports planting materials directly from European companies when the quality of supplies from the propagation unit in India is not good. An example of vertical coordination is the cooperative model of United Flora and Global Flora where different actors in the value chain (producers, retailers, etc.) have jointly invested. In this coordination arrangement, no single player controls the price, and there is a deliberate pricing mechanism that involves the producers, wholesalers, and retailers.

## 5.5 Why the Nepal Flower Industry Is Uncompetitive

### *5.5.1 Constraints in the Technology of Production*

**There are no local suppliers of planting materials and Nepal producers have to rely on imports.** About 90 percent of the inputs required for the cut-flower industry are imported. Planting materials for the leading four cut-flowers—rose, gerbera, gladiolus and carnation—have to be imported from the Netherlands, Spain, Italy, Israel, Poland, Japan and India. Most often they are imported through their plant propagation sites in India because that offers transportation and currency exchange advantages. Nonetheless, having to import planting materials increases cost of production incurred by Nepalese producers and this makes it difficult for them to compete with those in neighboring India. Furthermore, when planting materials are required in large quantities, the Floriculture Cooperative collects demand from producers and imports directly from India to take advantage of the import duty free provision provided to producers. However, the practical challenge with this arrangement is that in the absence of cold storage facility for planting materials, all planting materials have to be planted at the same time. Consequently, large amount of cut-flowers will be ready for the market at the same time and a lot of the produce do not get sold. The benefit producers derive from economies of scale in the import of planting materials is canceled out by the loss they incur in sales of cut-flowers.

**Weak enforcement leads to poor quality imports of planting materials and the quality is further jeopardized by lack of cold storage.** Planting materials sourced from plant propagation sites from India are not of the same quality as those imported directly through Europe based companies. Often times, products delivered do not match the quality of products ordered. Almost all producers from Nepal are small and do not have the capacity, knowledge or the resources required to contest these issues legally with suppliers in India. There is no government agency where the producers can approach for help in such a situation. Therefore, they are forced to accept the inferior quality supplied. Planting materials for Gladiolus or its bulbs need to be preserved in controlled temperature and properly ventilated space during off season so that it may be planted in the succeeding season. Planting materials are currently stored under normal conditions due to lack of chilled rooms. Consequently, many bulbs are destroyed or produce poor yields.

**The government ban on importation of water soluble fertilizers and other micronutrients inhibits adoption of better technology of production.** Cut-flowers require water soluble fertilizers such as potassium nitrate and calcium nitrate. Unfortunately, the same chemicals can be used to make explosives. The difference is that fertilizers come in a commercial grade and explosives do not. This is however not differentiated and the government has imposed a complete ban on importing these chemicals. As a result producers end up having to use either organic fertilizers such as compost, or pay a premium to buy illegally imported water soluble fertilizers, or regular chemical fertilizers available in the market such as DAP and urea. The regular fertilizers are not ideal for commercial production of cut-flowers. Furthermore, even these fertilizers are not always available in the market. Availability is important because each production cycle of cut-flowers is short and any delay in application of fertilizers means low productivity. Producers also complain there are fake chemicals in the market and that they do not have the knowledge or means to differentiate the fake chemicals from real ones, so they end up using whatever is available. Fake chemicals do more damage to the soil and reduce both productivity and quality of the cut-flower produced.

**Lack of soil testing and soil treatment due to banned chemicals.** Before any soil is used in production of cut-flowers it has to be tested for its alkalinity, pH value, and pathogens—especially some kinds of bacteria and fungus. Methyl Bromide is used for soil alkalinity treatment as well as soil fumigation. Soil fumigation is a treatment that is required every 3 years for the production of Gerbera, Gladiolus and Carnation and every 7 years for Rose to maintain good quality production. However, Methyl Bromide also falls on the list of chemicals banned by the government. An alternative to Methyl Bromide treatment that is widely used in other cut-flower producing countries is steam fumigation. However, the technology and equipment for steam fumigation are expensive for individual farmers to own and are not available in Nepal.

**Uncertainties in the enforcement of land rental contracts discourage large scale investments.** Nepal has a wide variety of topographical and climatic conditions suitable for production of cut-flowers. The climatic conditions in and around Kathmandu especially creates opportunities for the production of cold climate flowers such as carnation, Lilium, Limonium and Chrysanthemum. Given the high and increasing levels of imports, there is immense potential for import substitution if the production potential is leveraged. Currently, most producers involved in cut-flowers are smallholders and they lease land for production—with the exception of 2 or 3 integrated firms. Although legal contracts are signed for land lease, there is almost always a provision to end the contract prematurely by either party with prior notice. This clause is required to safeguard the producer in case of a loss, but it also allows the landlord to switch renters whenever a better rental offer emerges. Furthermore, this clause has been used by landlords to sell land already rented without compensating the renter for their investment. The land rental market has many inherent risks that has kept investors away, especially in enterprises that are already risky such as floriculture.

**Lack of climate controlled production technology.** Climate controlled greenhouses are crucial for export oriented commercial production. The government provides for tax import of greenhouses, but the technology remains beyond the reach of most growers. Instead, growers employ cheaper local substitutes that compromise quality of production—for example use of silpaulin plastic covering for greenhouses as opposed to UV plastics. If growers are to export to markets overseas, the produce has to meet specific demand parameters such as color shade, diameter of the flower, length of the stem, diameter of the stem, etc. Consistent production of flowers with these attributes requires not only modern greenhouses, but also meticulous application of inputs such as fertilizers, pesticides, fungicides—and proper monitoring of the effect of inputs on the flower. Currently, Nepal lacks a laboratory facility (whether public or private) to carry out tests on nutrients, pesticide levels in plants, soil testing for pH levels, etc.

**Dwindling supplies of unskilled labor.** The youth have migrated to seek employment abroad at unprecedented levels over the last decade. This has resulted in loss of workforce in the agriculture sector, especially in such as commercial cut-flower cultivation where labor is important. With dwindling supplies of youthful labor, some commercial producers have employed local women in the farms.

### *5.5.2 Constraints in Post-Harvest Management*

**Lack of cold storage and post-harvest treatment of cut-flowers.** Producers harvest their flowers, pack it and transport it to Kathmandu wholesale markets on the same evening. The flowers do not undergo any post-harvest treatment, which is contrary to standard international practice. Storing freshly harvested flowers in chilled room and treating it with chemical before transporting is a standard international practice to kill undesired micro-organisms, reduce damage and prolong vase life. This practice is lacking among producers. As a result, producers incur post-harvest losses of as much as 10 percent of total production and it is not possible to tell whether or not the cut-flowers produced are free from diseases and pests. Storing flowers in the cold rooms is a standard practice to increase shelf life of flowers from 3 to 10 days depending on the cut-flower type.

**Lack of climate controlled transportation services.** Currently cut-flowers are transported from production sites to wholesalers and from wholesalers to retailers in local transport such as busses, vans, taxis, motorcycles and bicycles. None of the current modes of transport has any means of temperature or humidity control suitable for cut-flowers. As a result, the quality of cut-flowers deteriorates during transportation. Producers do not have the capacity to invest in temperature controlled vehicles. They have put in proposals for co-investment for such vehicles from Project for Commercialization of Agriculture and Trade (PACT)—a World Bank funded project. Maintaining a cold chain requires having chilled rooms for storage at harvesting sites, temperature and humidity controlled vehicles for transport and cold cargo compartments in aircrafts. Due to unavailability of these infrastructures and lack of technical knowhow in Nepal, meeting quality requirements for overseas markets is a challenge for entrepreneurs.

### 5.5.3 Constraints in Financial and Risk-Sharing Markets

**Access to credit is crippled by stringent regulations and access to insurance is weakened by a thin risk pool.** Smallholders currently cultivate cut-flowers in small pockets and therefore cannot benefit from economies of scale. Smallholders struggle to access agriculture loans due to the requirement of fixed asset collaterals and other conditions. For example, banks require land with access to road infrastructure for it to qualify as collateral. This has crowded-out many producers from not only access to loans but also support schemes earmarked for agriculture sector. Furthermore, commercial banks can only extend credit to entrepreneurs based on business viability if the business is insured. There is a policy for farm and crop insurance in agricultural production where premium costs up to 75 percent is paid by the government and up to 90 percent of costs can be recovered in case of crop loss. Through the program, insurers have covered major agricultural crops where the risk pool is wide. However, this is not the case with cut-flowers because there are relatively few producers scattered around the country.

### 5.5.4 Constraints in the Policy and Regulatory Environment

**Although the government provides various incentives for procurement of inputs, the farmers cannot access the incentives because they don't import directly.** The Nepal government provides support to producers by exempting tax and VAT on imports of planting materials and insecticides. VAT is exempted and only 1 percent duty is applied on the import of greenhouses. However, most producers are small and require these materials in small quantities. Furthermore, the administrative procedures for import are time consuming and costly. The transaction costs for each small producers to import the materials by themselves are high. Therefore, the producers buy these inputs from traders or input supply companies. But the government does not provide the same tax and VAT exemptions on imports of same inputs by traders who supply the producers. Therefore, producers cannot take advantage of the provision. For small producers, the cost of greenhouses is beyond their investment capacity. Instead of importing greenhouses, they would prefer importing some of the raw materials used in greenhouses and then fabricating locally—either by themselves or through local fabricating companies. But raw materials for greenhouses are subject to 13 percent VAT and a total of 25 percent import duty. Therefore majority of producers, especially small producers, are unable to take advantage of the duty free provision.

**Furthermore, competing farmers in India receive enormous support from state and central governments which increase the competitiveness of imports in the domestic market.** Cut-flower producers in neighboring India receive between 60 percent and 80 percent subsidy for their investment on production depending on the state they are in. They also receive strong technical support. In contrast, the Nepal government does not subsidize any part of producer's investment, except for the largely unutilized exemption on VAT in importing production equipment. The unequal playing field enables cut-flowers from India to compete in the Nepal market. It forces the wholesalers to bid down prices of domestically produced cut-flowers. For example, if the wholesale price for a stem of rose in Nepal is calculated to be NRs. 12 based on producers cost of production, the wholesaler will enquire the price of rose in Delhi wholesale market "Mandi" on the same day. If the price in Delhi market is IRs. 3 (which is equivalent to NRs. 4.8), the wholesaler will add the freight and other charges to it which comes to about NRs. 3–4. It means the price of Indian rose would be around NRs. 9 if sold in Kathmandu market. In order to beat competition from the Indian rose, the wholesaler will reduce the price of Nepalese rose for that day and sells it for NRs. 9–10. The wholesaler will then deduct 10 percent of its marketing charge and pay about NRs. 8.1 to NRs. 9 to Nepalese producers, which is below the price of NRs. 12 needed to cover production costs and pay remunerative margins to the local producer.

**Public expenditures in floriculture development are not targeted to flowers with potential for import substitution.** Under the implementation plan of the Floriculture Policy 2069, resources are allocated for priorities identified in the sector each year for the next 5 years. In the fiscal year 2015/2016, a total of NRs. 30 million has been allocated for the development and promotion of Gypsophila. It is not clear whether a full market research or a technical feasibility study for production of Gypsophila were undertaken to justify the investment. Furthermore, this allocation could have been targeted to flowers with import substitution potential i.e., Rose, Carnation, Gerbera, Gladiolus and Lilium, etc.

**Lack of accredited laboratories to test for various contaminants required to be tested as per Sanitary and Phytosanitary standards of export markets.** Local entrepreneurs make remarkable attempts to export cut-flowers in different countries, including sending samples to export markets. But the current quality from Nepal cannot compete in the international markets such as the European countries, US, Japan, etc. This is because these countries have very strict phytosanitary requirements. The phytosanitary certificate issuing authority in Nepal is not equipped with labs with capacity to carry out stringent tests required in export markets. Instead, certificates are issued on the basis of ad-hoc observation. This is well known by potential importers. Therefore, the Phytosanitary certificate issued by the government of Nepal is not accepted in most countries and any exports of Nepalese cut-flowers would have to be subject to various tests in the importing country. And if the products fail the phytosanitary tests, the exporters would have to pay for costs related to the destruction of the consignment. According to exporters, the cost of destruction of consignments is higher than the cost of exporting the consignment. The risk for exporters is prohibitively high.

### *5.5.5 Constraints in Physical Access to Major Import Markets*

**Major technological developments on global trade in floriculture, coupled with the country's geophysical conditions, are severely hampering the export potential of Nepal's flower industry.** Landlocked and far away from most traditional (e.g. Netherlands, USA) and emerging (e.g. Russia) markets for flowers, the geophysical conditions of Nepal are a major impediment to a rapid integration of its floriculture industry with global markets. The shift to transport of cut flowers from air to sea container has put Nepal at a competitive disadvantage relative to other flower exporting countries from Asia which have direct access to the sea (e.g. Vietnam and Malaysia, who export flowers by sea container to Japan). Transport by sea container is not new to floriculture, although it had long been restricted to products with a relatively long shelf life (e.g. cut foliage or flower bulbs). It is now the most common and cost efficient means of transporting cut flower over long distances. Most exporters to the large markets in the US and the EU have been able to considerably cut their total costs (production and export marketing) and further enhance their export competitiveness.

The rapid expansion of sea container shipments in cut flowers is driven by various factors including the price difference between sea and air freight (with the latter up to twice as costly), the ability to control temperature conditions and humidity levels within the container, and the growing availability of port facilities and reefers. Today, favorable agro-ecological conditions and a counter-cyclical production pattern is no longer enough to gain a strong foothold on the global floriculture market. New cut-flower market entrants like Nepal need to build a comparative advantage over established competitors either through product differentiation or competitive cost structure. With its largely temperate climate, Nepal's flower products do not present enough exclusive features (e.g. like the tropical varieties from Kenya or Colombia) and the prohibitively high costs of air transportation to the far away markets of the EU and USA would continue to affect the export competitiveness of Nepal's cut flowers. Even where Nepal may have a comparative advantage in the cost of production for some varieties due to relatively low labor costs, these lower production costs would not offset the costs of air transportation to the end markets, and would still result in un-competitively high CIF prices.

## 5.6 Conclusions and Recommendations

### *5.6.1 The Potential for Nepal Flower Production to Meet Local Demand*

**Domestic demand for floriculture products has increased considerably over the last few years but growth in domestic production has not kept pace with demand, leading to a rise in imports from India.** Imports of floriculture products have grown consistently over the last few years and the reported import value is estimated to be as much as US$1 million per year. Most of these imports originate from India, and to a lesser extent, from Thailand (for orchids only). There is a widespread sense that the official data on imports from India are actually under-reported and that the real volume of floriculture products (particularly cut-flowers and ornamental flowers) crossing from India into Nepal is in fact much higher than the official statistics. In any case, domestic demand for flowers is growing rapidly, fueled by an increase in the purchasing power of Nepal's emerging middle class.

**In order to meet the growing domestic demand for cut flowers and ornamental flowers, Nepal's floriculture industry should capitalize on its comparative advantage over imported flowers from India.** Notwithstanding the need to address the constraints faced by Nepal's flower industry, a quick comparison of some key data on the production and marketing of roses in Nepal and India, provides some interesting pointers on the potential for increasing competiveness over imports from India. Investment costs in India, per unit of production area, are much higher than in Nepal, due to the higher level of sophistication in the production system. Most commercial rose growers in India operate on a much higher level of technology than their counterparts in Nepal, and more capital investment is therefore required to cover the irrigation infrastructure, on site grading and packaging unit, cold storage and chilled van. As depicted in the table below, production costs of roses from India are more than three times higher than production costs from local roses.

**Table 5.2 Price and Productivity Performance of the Rose Value Chain in Nepal and India**

| | | *Nepal (farm > 0.5ha)* | *India* |
|---|---|---|---|
| Investments costs | Million NRs per ha | 8.25 | 18.62 |
| Ann. Production costs | Million NRs per ha, yr | 2.97 | 9.78 |
| Yields | Rose stems per ha | 750,000 | 2,162,663 |
| Net returns | NRs per ha | 4,530,367 | 5,134,842 |
| Net return per stem | NRs | 6.04 | 2.37 |

*Source:* Interview with value chain actors (Nepal); International Journal of Business and Management Invention, Vol.2, Issue 5, 2013 (India).

### *5.6.2 The Potential for Nepal to Export Cut-Flowers*

**According to the industry, flowers, especially rose and carnation, produced in the hills of Nepal are of higher quality due to favorable agro climatic conditions prevailing in that area.** As a result, favorable quality features for Nepal grown flowers include a bigger flower bud size, longer stem, and thicker and sturdier stem, compared to flowers imported from India. Indian traders also recognize Nepalese flowers to be of superior quality than their local products. However, quality parameters used in Nepalese and Indian markets are not sufficient to compete in international markets (such as Europe, USA or Japan) where customers, including wholesalers and retailers, have specific demands, e.g. on the color, length and diameter of stem and blossom. Producing flowers with consistent quality parameters over large quantities is a major challenge for Nepal with the current limited production technology, know-how and organization in the value chain.

**Phytosanitary certification issued in Nepal is not recognized in most countries, and yet it is essential for many import markets.** Phytosanitary certificates are issued by the Plant Quarantine Office under MoAD. There are 5 regional plant quarantine offices, 9 check posts on the Nepal-China and Indo-Nepal borders and one at the Tribhuvan International Airport, Kathmandu. An export permit needs to be obtained by the exporter before a phytosanitary certificate can be issued. Export permits are issued by the Plant Quarantine office upon recommendation of the Flower Development Center (FDC) located in Godavari. Obtaining an export permit is a time consuming affair. For perishable products like cut-flowers time is a critical factor that affects the end quality of the product. Additionally, random inspections of a consignment are conducted by the Plant Quarantine Office and are carried out on visual basis, upon which phytosanitary certificates are issued. Farm visits during harvesting or prior conduction of Pest Risk Analysis (PRA) for production zones is not practiced. The Plant Quarantine Office is equipped with laboratory to carry out testing for micro-organisms, growth of pathogens, and others, but cannot advise exporters on any treatment or unsuitability for export due to the presence of pest and/or disease. As a result, obtaining, a phytosanitary certificate issued by GoN is seen as a mere formality because the certificate would not be recognized in most importing countries. Moreover, the many standards and labels used in import markets are largely unknown to Nepal's floriculture stakeholders, nor does Nepal have the infrastructure or the human resources required for certification and accreditation of the certifying bodies.

**In the short run, a strategy for growth in exports of Nepali cut-flowers could focus on nearby countries, such as India and Bangladesh.** It is unlikely that in the short term, Nepal can become a major supplier of cut-flowers in the highly competitive traditional import markets (e.g. USA, EU) where other low-cost producing countries have increased their market shares over the last two decades (e.g. Kenya, Colombia, Ecuador, Ethiopia). Based on consultations with exporters, FAN and sector experts, analysis of export import data and literature review—it is clear that export of cut-flowers will be confined to only select countries. India is one of those key potential markets. Consumption of cut-flowers in Delhi is one of the highest in India and Delhi is only a 6-hour drive away from Nepal. In addition, Nepal can take advantage of the drop in flower availability in India during the winter months. Bangladesh is another potential market for Nepalese cut-flowers, specifically during the summer months. The demand for cut-flowers in Bangladesh is estimated at about USD 8.0 million, of which USD 5.0 million is met with local production while the rest is imported mainly from China and Indonesia. Bangladesh is about a 12-hour drive from eastern Nepal. It is conceivable that with an appropriate fleet of temperature and humidity controlled trucks, cut-flowers appropriately packaged and protected could be exported to Bangladesh.

Exporting cut-flowers to Middle Eastern countries is another alternative worth exploring. Beneficiaries from the PACT's matching grant scheme have reported to export parts of their cut flower production to those destinations and exporters have revealed that buyers from Qatar and the UAE have expressed interest in sourcing cut-flowers (especially carnation) from Nepal. Nepal appears to have a competitive advantage in supplying to that region as there is direct connectivity to these countries and air freight could potentially be relatively low because of the frequent travel of Nepali migrant workers to that region. However, the conditions for scaling up export of cut flowers to the Middle East should be carefully analyzed and a comprehensive assessment of those markets and of the import demand for flowers from Nepal should be undertaken. A simple competitiveness analysis based on Export Parity Price (EPP) calculations reveals a high profitability when selling cut flowers to Doha, Qatar. In the case of carnation, calculations indicate that average domestic price per stick is NPR10, against a calculated EPP for Doha, of NPR18.

### 5.6.3 Recommendations for Policy and Investment Priorities

**Strengthen enforcement to eradicate poor quality imports of planting materials and agrochemicals from the market.** Planting materials sourced from plant propagation sites from India are not of the same quality as those imported directly through Europe based companies. Often times, products delivered do not match the quality of products ordered. Almost all producers from Nepal are small and do not have the capacity, knowledge or the resources required to contest these issues legally with suppliers in India. Since the government mechanisms for redress are weak, the producers are forced to accept the inferior quality supplied, and this translates not only into low productivity but also safety and health risks for farmers, actors along the chain handling the flowers, and consumers. Producers also complain there are fake chemicals in the market and that they do not have the knowledge or means to differentiate the fake chemicals from real ones, so they end up using whatever is available. Fake chemicals do more damage to the soil and reduce both productivity and quality of the cut-flower produced.

**Reconsider the ban on importation of water soluble fertilizers and other micronutrients inhibits adopted of better technology of production.** Cut-flowers require water soluble fertilizers such as potassium nitrate and calcium nitrate for superior quality production. The same chemicals are used in making explosives. The difference is that fertilizers come in a commercial grade and explosives do not. This is however not differentiated and the government has imposed a complete ban on importing these chemicals. As a result producers end up having to use either organic fertilizers such as compost, or pay a premium to buy illegally imported water soluble fertilizers, or regular chemical fertilizers available in the market such as DAP and urea. The regular fertilizers are not ideal for commercial production of cut-flowers. There is also lack of soil testing and soil treatment due to banned chemicals. Before any soil is used in production of cut-flowers it has to be tested for its alkalinity, pH value, and pathogens—especially some kinds of bacteria and fungus. Methyl Bromide is used for soil alkalinity treatment as well as soil fumigation. Soil fumigation is a treatment that is required every 3 years for the production of Gerbera, Gladiolus and Carnation and every 7 years for Rose to maintain good quality production. However, Methyl Bromide also falls on the list of chemicals banned by the government. An alternative to Methyl Bromide treatment that is widely used in other cut-flower producing countries is steam fumigation. However, the technology and equipment for steam fumigation are expensive for individual farmers to own and are not available in Nepal.

**Strengthen enforcement of land rental contracts to encourage large scale investments in floriculture.** Nepal has a wide variety of topographical and climatic conditions suitable for production of cut-flowers. The climatic conditions in and around Kathmandu especially creates opportunities for the production of cold climate flowers such as carnation, Lilium, Limonium and Chrysanthemum. Given the high and increasing levels of imports, there is immense potential for import substitution if the production potential is leveraged. Currently, most producers involved in cut-flowers are smallholders and they lease land for production—with the exception of 2–3 integrated firms. Although legal contracts are signed for land lease, there is almost always a provision to end the contract prematurely by either party with prior notice. This clause is required to safeguard the producer in case of a loss, but it also allows the landlord to switch renters whenever a better rental offer emerges. Furthermore, this clause has been used by landlords to sell land during land tenure without compensating the renter for their investment. The land rental market has many inherent risks that has kept investors away, especially in enterprises that are already risky such as floriculture.

**Rationalize various government incentives for procurement of inputs so that they become accessible to farmers.** The Nepal government provides support to producers by exempting tax and VAT on the import of planting materials and insecticides. For example, VAT is exempted and only 1 percent duty is applied on the import of greenhouses. Most producers are small and require these materials in small quantities, because the administrative procedures for import are time consuming and costly, and the transaction costs for each small producers to import the materials by themselves are high. Therefore, the producers buy these inputs from traders or input supply companies. But the government does not provide the same tax and VAT exemptions on imports of same inputs by traders who supply the producers. Therefore, producers cannot take advantage of the provision. For small producers, the cost of greenhouses is beyond their investment capacity. Instead of importing greenhouses, they would prefer importing some of the raw materials used in greenhouses and then fabricating locally—either by themselves or through local fabricating companies. But raw materials for greenhouses are subject to 13 percent VAT and a total of 25 percent import duty. There is need to rationalize various government incentives for procurement of inputs so that they become accessible to farmers.

**Develop agribusiness incubation programs to incentivize investments in cold storage for planting materials and cut-flowers, post-harvest treatment of cut-flowers, and climate controlled transportation services.** Planting materials for Gladiolus or its bulbs need to be preserved in controlled temperature and properly ventilated space during off season. Currently, due to absence of chilled rooms, the practice is to preserve it under normal conditions. As a result many bulbs are destroyed. Producers harvest their flowers, pack and transport to Kathmandu wholesale markets on the same evening. The flowers do not undergo any post-harvest treatment. Storing freshly harvested flowers in chilled room and treating it with chemical before transporting is a standard international practice to kill undesired micro-organisms, reduce damage and prolong vase life. This technology, knowhow and practice is lacking among producers. As a result, producers incur post-harvest losses of as much as 10 percent of total production and it is not possible to tell whether or not the cut-flowers produced are free from diseases and pests. None of the current modes of transport has any means of temperature or humidity control suitable for cut-flowers. As a result, the quality of cut-flowers deteriorates during transportation.

**Rationalize credit and insurance services to floriculture.** Smallholders currently cultivate cut-flowers in small pockets and therefore cannot benefit from economies of scale. Smallholders struggle to access agriculture loans due to the requirement of fixed asset collaterals and other conditions. For example, banks require land with access to road infrastructure for it to qualify as collateral. This has resulted in the crowding out of many producers from not only access to loans but also support schemes earmarked for agriculture sector. Furthermore, commercial banks can only extend credit to entrepreneurs based on business viability if the business is insured. There is a policy for farm and crop insurance in agricultural production where premium costs up to 75 percent is paid by the government and up to 90 percent of costs can be recovered in case of crop loss. Through the program, insurers have covered major agricultural crops where the risk pool is wide. However, this is not the case with cut-flowers because there are relatively few producers scattered around the country.

**Rationalize targeting of public expenditures towards flowers with potential for import substitution.** For example, under the implementation plan of the Floriculture Policy 2069, resources are allocated for priorities identified in the sector each year for the next 5 years. In the fiscal year 2015/2016, a total of NRs. 30 million has been allocated for the development and promotion of Gypsophila. It is not clear whether a full market research or a technical feasibility study for production of Gypsophila were undertaken to justify the investment. Furthermore, this allocation could have been targeted to flowers with import substitution potential i.e., Rose, Carnation, Gerbera, Gladiolus and Lilium, etc.

## Notes

1. Floriculture Association Nepal (FAN) data 2015.
2. Ibid.
3. Including area occupied by nurseries.
4. The floriculture industry believes that this is a one-off export of orchids of medicinal values by individuals not related to the cut-flower industry. Such anecdotes cannot be verified as sources of TEPC collected data are not known.
5. Dr. Marriance Altman, Developments and trends in the flower and plants markets for 2015/2016. Oct 2015.
6. Colombia floral market, March 2015.

CHAPTER 6

# Recommendations for Policy and Investments

## 6.1 Recommendations for Broad-Based Productivity Growth in Agriculture

**While agriculture has proved to be important for poverty reduction and shared prosperity, most of the agricultural income has been from increased prices.** Most of the poverty reduction between 2003/04 and 2010/11 occurred in the rural areas and was driven by rising agriculture incomes, which on average registered about 24.4 percent increase. The impact of agriculture was highest among the bottom 40 percent (the lowest and second lowest income quintile) where agriculture contributed more than 40 percent of their income gains. On average, crop income alone increased by about 23 percent. A decomposition of this change in crop income indicates that on average about 78 percent was due to increased food prices, while yields contributed about 22 percent, and land contraction decreased crop income by about 9 percent. The data used to calculate these changes is from National Living Standards Surveys in 2003/04 and 2010/11—therefore it is not surprising that changes in food prices contributed the most to crop incomes because the food prices in 2010/11 were still recovering from the effects of the global food price inflation.

**Going forward any strategy for poverty reduction and shared prosperity for Nepal should be anchored by a national program for increasing broad-based agricultural productivity through developing new technologies, dissemination of technologies, and effective extension to ensure farmers are able to utilize technology appropriately.** Productivity could be increased through technical change, which is associated with release and application of new technology, or technical efficiency change which is about how well existing technologies are utilized by farmers. The findings indicate that technical change has been the main driver of productivity increase in all agro-ecological zones. The contribution of technical change is relatively higher in the Mountains and Hills compared to the Terai. It means that farmers are adopting new technologies and these new technologies are having a relatively large impact in the Mountains, followed by Hills, and then the Terai. These patterns are by the fact that traditionally there has been relatively more technologies developed for the Terai such that other regions are starting from a low base and any new technologies are likely to increase productivity relatively faster. Already the government is implementing the Agriculture and Food Security Project, but the project only covers mid and far western hills and mountain districts, and therefore should be expanded nationally. And since there are important differences across districts in terms of productivity, technical change, and technical efficiency change—even within similar agro-ecological zones—the proposed national program should be informed by a better understanding of the causes of these differences.

**Address the main constraints to private investment in agriculture: which include lack of technical knowledge on precision farming methods and lack of capital due to weaknesses in the financial sector.** This conclusion is informed by case study of returning immigrants who are investing in commercialized agriculture. The investments are driven by technical knowledge, which they acquired abroad, and investible funds from their own savings. Many returnees are investing in agriculture and have formed the Nepal Commercial Farmers Association. Its membership is currently about 400 farmers, out of which 80–90 percent (over 80 percent) are returnees. Majority of returnees came back from Israel, but there are also many returnees from South Korea, Korea, Japan, and Gulf countries—including Qatar and Saudi Arabia. A common thread among the returnees is that: (a) they were employed in farms abroad where they learned modern farming methods that are capital intensive and highly productive, (b) their initial investments in farming was self-financed through savings accumulated abroad, (c) most of them do not have their own land and are farming on rented farms, (d) most of them have become centers of technology dissemination such that they are earning income from teaching neighbors and college students about modern farming methods, and (e) they would like to expand operations but cannot access credit from formal sources in Nepal. The reason they are facing constraints in access to additional capital is that Banks don't provide loans unless it is collateralized with land. The returnee farms have become training centers and are actively involved in training other farmers in the country, hosting student interns, etc.

**A national soil fertility management program should be developed to address imbalanced use of fertilizers, introduce efficient and profitable use of fertilizers, and make subsidies smart.** The government subsidy program is supplying about 50 percent of the estimated demand for fertilizers. It's unlikely that the subsidy could be expanded to cover all demand without imposing major pressures on the national treasury, which is exactly what led to the disbanding of the previous subsidy program in 1996/97. Furthermore, the current program is supplying only Urea, DAP, and potash fertilizers—with Urea occupying more than 60 percent of the subsidized quantities. Urea (46:0:0) constitutes of only nitrogen (N) and no phosphorous (P) or potassium (K). It means there has been imbalanced use of fertilizers for the past several years that needs to be corrected through a national soil fertility management program. Addressing the imbalances would increase efficiency in the use of fertilizer use and improve farm profitability. This is important because long-term soil fertility requires balanced use of all fertilizer nutrients (N, P, and K) rather than predominantly N as has been the case in Nepal. The ongoing subsidies could be transformed into smart subsidies with the following principles: (a) target farmers that need to learn about proper use of fertilizers; (b) target farmers that could use fertilizers profitably but are not able to do so due to working capital constraints; and (c) deliver the subsidy through the private sector by expanding the voucher system being piloted.

**Smart subsidies can also be used for social welfare purposes, with inputs targeted to also address food insecurity and promote nutrition.** Often time's governments have implemented welfare programs aimed at addressing poverty and contributing to national development—for example employment guarantee programs, conditional cash transfers, and pension schemes. Input subsidies could also be designed as welfare schemes to address inequality in poverty, food insecurity, and nutrition status. In the context of Nepal, this would mean changing the geographical focus of the program. This is because the Central region has consistently received most of the chemical fertilizer every year since the program was introduced in 2008 and it's share has ranged from 45 percent in 2009/10 to 53 percent in 2010/11 and 2012/13. However, both the proportion of poor people and the absolute number of poor people are lower in Central region and highest in Western region. Furthermore, data from the National Demographic and Health Survey 2011 show that food and nutrition security indicators are worse in the Western region of Nepal. For example, the rate of stunting among children under five years old is about 55 percent in Western region compared to the national average of 41 percent. The main implication of the current regional distribution of fertilizer subsidies is that the program is not consistent with addressing regional disparities in poverty and food security, does not promote shared prosperity, and is likely to exacerbate regional disparities in income distribution.

## 6.2 Recommendations for Export Promotion

**The key interventions for export promotion could be anchored by a national horticulture development program with the following features:**

**National horticulture seed program.** This would help alleviate the current practice of most farmers using locally available seed materials retained from previous crops. It is estimated that farmers keep between 20 to 25 percent of their production to use as seeds for the next growing season. New growers purchase seeds from neighboring farmers or local markets. Ginger farmers in the mountains mostly preserved Ginger seed from their last season crop. A consequence of the lack of a national seed development program is that only two major types of ginger are grown in Nepal.

**National program for adoption of Good Agricultural Practices (GAP) for ginger and other commodities.** The benefits of developing and then adopting GAPs include not only fulfilling trade and government regulatory requirements on food safety and quality, but more importantly meeting specific requirements of high value specialty or niche markets and improving food safety for domestic consumers. An expansion of GAP based ginger production would help to obtain better quality and healthier ginger products. The adoption of GAPs may help reduce the risk of non-compliance with national and international regulations, standards and guidelines regarding permitted pesticides, maximum levels of contaminants (including pesticides and mycotoxins) in food and non-food agricultural products, as well as other chemical, microbiological and physical contamination hazards.

**Operational plan for monitoring contamination along value chains of major commodities.** This may involve both broadly defined as well as commodity specific operational plans for avoiding, detecting and monitoring the contamination levels of pests and pesticides in major commodities. To implement such a plan there would be need to (i) develop specific training modules and build capacity of government staff, and (ii) partnership program with the private sectors (growers and traders) to share information and jointly develop programs to improve traceability.

**Building the capacity of laboratories to test presence of important contaminants.** There is no laboratory capacity for testing and monitoring pesticide residues, mycotoxins, and microbial contamination as per Codex standards/EU requirements. The existing laboratories lack both high precision and basic instruments and equipment's to test for diseases, pesticide levels, microbial contaminations, heavy metals, etc. For example, the Central Food Research Laboratory is limited to 27 parameters and does not include microbial contaminants and heavy metals. The ability to test for these contaminants is crucial to complying with various standards in export markets and is therefore necessary for promoting Nepal's products and ultimately accessing export markets.

**Building human capacity for scientific testing, coordinating SPS issues, and enforcing inspections.** There is a lack of advance level trainings to personnel involved in laboratory testing and inspections, especially as it relates to Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Global Health Partnerships (GHP), and production and processing systems. To address these gaps sufficient training modules should be developed. Furthermore, there is limited size of manpower, especially at regional and district levels. In addition, there is a lack of attention towards Standard Operation Procedures (SoPs) for inspection and sampling of consignments and certification system. Capacity of the staff is weak on proper sampling procedures and methods for laboratory and field testing of samples, in particular MRLs, microbial contamination, toxin, heavy metals, etc.

**Establishing a local laboratory accreditation board to facilitate Mutual Recognition Agreements (MRA).** There is no local accreditation board to engage with international accreditation institutions such as the International Laboratory Accreditation Cooperation (ILAC) and other relevant bodies such as International Accreditation Forum (IAF). Nepal relies on India's National Accreditation Board for Testing and Calibration Laboratories (NABL) for accreditation of its facilities. A local accreditation body would be able to promote Mutual Recognition Agreements (MRA) with potential export markets. An MRA is important to facilitate trade as it provides a forum to define what is acceptable among trading partners. It is not clear if Nepal has MRA with any country and this is not surprising because there is no adequate capacity to certify technical quality parameters such as pesticides and veterinary drugs residues.

**Complinace with international standards for pest management—International Plant Protection Convention (IPPC)/International Standards for Phytosanitary Measures[1] (ISPM).** The key actions for compliance include conducting pest risk analysis and identifying pest free areas or areas with low pesticides. There is no proper national survey and surveillance of ginger diseases and pests in Nepal nor is there a regular practice of pest reporting, although certain piecemeal efforts have been carried out in certain projects several years ago. A number of pests are reported but without much scientific data on their occurrence, epidemiology, management, etc. There is need to conduct systematic study to investigate and document various diseases and pests and their incidences in different Ginger growing areas. The International Standards for Phytosanitary Measures (ISPMs 06, 08, 17 and 22) of IPPC needs to be adopted with local adaptation as National standards to undertake this activity.

**Strengthening the SPS enquiry point at DFTQC.** The SPS Enquiry Point needs to be strengthened to take up all matters related to SPS with importing countries and to facilitate negotiating trade based on scientific principles. At present there is only one dedicated staff in the SPS Enquiry point, which is insufficient not only for responding to queries from importing countries and domestic industry, but also far from the capacity required to create and update an effective knowledge base of all the SPS related information.

**SPS diplomacy for export promotion.** The main element of SPS diplomacy is engaging with regional and international organizations, particularly those setting international standards, and the WTO SPS Committee. Developing countries are often weak in this area and act as receivers of standards set by others. SPS diplomacy is also essential in bilateral market access negotiations between trade partners, and in resolving problems or disagreements which arise during trade. SPS diplomacy relies on scientific capacity. There is need to develop capacity for SPS diplomacy by training a batch of key experts on: (i) policy and regulatory affairs with special reference to compliances to SPS/WTO, (ii) technical skills on pest reporting and risk analysis, (iii) mitigation measures identified by IPPC and other reference standards, (iv) risk communications as per IPPC and Codex, (v) marketing and trade promotion, and (vi) communication and negotiation skills.

**National strategy for SPS information management, SPS risks communication, and traceability system.** The information management system would bring together, in one platform, all information (legal, technical, institutional, export promotion, global markets) related to SPS matters of different Ministries and Departments along with national standards and extent of compliances to various IPPC/Codex Standards. Such a platform would also cover risk assessment protocols and updates on SPS issues at different parts of the chains. In addition, once the SPS Risks are identified through risk assessment and results of field/laboratory tests during quality control or quarantine, there is need for a strategy to communicate risks to all value chain actors along with the related mitigation measures of risks. Furthermore, the Food Act under preparation could include a provision to manage traceability of the food items. There are very good lessons on establishing traceability systems from countries such as Kenya.

**National strategy to access high value niche organic markets, including branding of organic ginger from Nepal.** With the growing demand in organic products in the international markets, Organic Ginger from Nepal could be branded and marketed to serve the growing demand. Already farmers are practicing some important principles of organic farming, including low chemical pesticides and fertilizers usage based farming, which indicates tremendous potential to adopt any further organic principles.

## 6.3 Recommendations for Import Substitution

Many of the above-mentioned elements of the proposed national program would also facilitate import substitution. In addition, the following measures could be taken to develop value chains that meet domestic demand and substitute imports:

**Eradication of poor quality imports of planting materials and agrochemicals from the market.** Planting materials sourced from plant propagation sites from India are not of the same quality as those imported directly through Europe based companies. Often times, products delivered do not match the quality of products ordered. Almost all producers from Nepal are small and do not have the capacity, knowledge or the resources required to contest these issues legally with suppliers in India. Producers also complain there are fake chemicals in the market and that they do not have the knowledge or means to differentiate the fake chemicals from real ones, so they end up using whatever is available. Fake chemicals do more damage to the soil and reduce both productivity and quality of the cut-flower produced.

**Enforcement of land rental contracts to encourage large scale investments in floriculture.** Currently, most producers involved in cut-flowers are smallholders and they lease land for production—with the exception of 2–3 integrated firms. Although legal contracts are signed for land lease, there is almost always a provision to end the contract prematurely by either party with prior notice. This clause is required to safeguard the producer in case of a loss, but it also allows the landlord to switch renters whenever a better rental offer emerges. Furthermore, this clause has been used by landlords to sell land during land tenure without compensating the renter for their investment. The land rental market has many inherent risks that has kept investors away, especially in enterprises that are already risky such as floriculture.

**Improving delivery mechanisms of various government incentives for procurement of inputs so that they could actually be accessed by farmers.** The government provides support to producers by exempting tax and VAT on the import of planting materials and insecticides. For example, VAT is exempted and only 1 percent duty is applied on the import of greenhouses. Most producers are small and require these materials in small quantities, because the administrative procedures for import are time consuming and costly, and the transaction costs for each small producers to import the materials by themselves are high. Therefore, the producers buy these inputs from traders or input supply companies. But the government does not provide the same tax and VAT exemptions on imports of same inputs by traders who supply the producers. Therefore, producers cannot take advantage of the provision. For small producers, the cost of greenhouses is beyond their investment capacity. Instead of importing greenhouses, they would prefer importing some of the raw materials used in greenhouses and then fabricating locally—either by themselves or through local fabricating companies. But raw materials for greenhouses are subject to 13 percent VAT and a total of 25 percent import duty. There is need to rationalize various government incentives for procurement of inputs so that they become accessible to farmers.

**Developing agribusiness incubation programs to incentivize investments in cold storage for planting materials and cut-flowers, post-harvest treatment of cut-flowers, and climate controlled transportation services.** Planting materials for Gladiolus or its bulbs need to be preserved in controlled temperature and properly ventilated space during off season for replantation in the succeeding season. Currently, due to absence of chilled rooms, the practice is to preserve it under normal conditions. As a result many bulbs are destroyed or do not yield its maximum capacity in the succeeding cultivated season. Producers harvest their flowers, pack it and transport it to Kathmandu wholesale markets on the same evening. The flowers do not undergo any post-harvest treatment. Storing freshly harvested flowers in chilled room and treating it with chemical before transporting is a standard international practice to kill undesired micro-organisms, reduce damage and prolong vase life. This technology, knowhow and practice is lacking among producers. As a result, producers incur post-harvest losses of as much as 10 percent of total production and it is not possible to tell whether or not the cut-flowers produced are free from diseases and pests. Storing flowers in the cold rooms is a standard practice. It reduces damage in handling and increases shelf-life of flowers from 3–10 days depending on the cut-flower type.

**Alignining public expenditures towards flowers with potential for import substitution.** For example, under the implementation plan of the Floriculture Policy 2069, resources are allocated for priorities identified in the sector each year for the next 5 years. In the fiscal year 2015/2016, a total of NRs. 30 million has been allocated for the development and promotion of Gypsophila. It is not clear whether a full market research or a technical feasibility study for production of Gypsophila were undertaken to justify the investment. Furthermore, this allocation could have been targeted to flowers with import substitution potential i.e., Rose, Carnation, Gerbera, Gladiolus and Lilium, etc.

## Note

1. The intention of ISPMs is to harmonize phytosanitary measures for the purpose of facilitating international trade. ISPMs can cover a wide range of issues including; surveillance, pest risk analysis, establishment of pest free areas, export certification, phytosanitary certificates and pest reporting. The IPPC encourages adoption of these standards, but they only come into force once contracting (members) and non-contracting parties to establish requirements in national legislative instruments. IPPC standards generally fall into three categories: 1) Reference standards, such as the Glossary of phytosanitary terms; 2) Conceptual standards, such as the Guidelines of pest risk analysis; 3) Specific standards, which typically directed at a specific pest or pathogen (e.g. surveillance for citrus canker).

# Annexes

## Annex 2.1: Methodology for Decomposing TFP

Total factor productivity (TFP) measures the part of output growth that is not attributable to input growth—the difference between output growth and input growth. It captures the change in output that may be attributable to technical change and efficiency in combining factors. Broadly speaking there are two approaches to estimating TFP—parametric and non-parametric. The parametric approaches assume a known production function, which is specified and estimated to account for contribution of factors, and the residuals would be interpreted as estimates of TFP (see Arnade, 1998; Coelli et al., 2005; Ledena et al., 2007; Fugile 2010, etc.). Non-parametric approaches make no assumptions on the production function or the market structure or market imperfections, but rather allow the data to speak for itself using Data Envelopment Analysis (DEA) methods. Recent applications include Mugera et al., (2012a) and Mugera et al., (2012b). The DEA methods allow decomposing TFP into technical change (expansion or contraction of the production frontier) and efficiency gains (movement towards or away from production frontier). It provides a better understanding of the dynamics of productivity growth. In addition, factor productivity can similarly be decomposed into technical change and efficiency (see recent applications in Mugera et al., 2012a and Mugera et al., 2012b). The proposed study will use DEA methods to (a) estimate TFP and explain the relative importance of technical change and efficiency; and (b) decompose factor productivity for labor and fertilizers into technical change, efficiency, and factor intensity. The analysis will be conducted for the entire crop sector by ago-ecological zones and for specific crops by agro-ecological zones to prove a fuller understanding of what is happening to agriculture across different production environments.

### *Data*

The analysis utilizes data from Nepal Living Standard Survey (NLSS) II collected in 2003/2004 and NLSS III collected in 2010/2011 (referred to as 2003 data and 2010 data). NLSS is a stratified survey that oversamples households living in rural municipalities. NLSS covers an extensive array of household characteristics, including household member composition, housing characteristics, access to facilities, migration history, food and non-food expenditures, inventory of durable goods, education, health, marriage and maternity history, jobs and time use, unemployment, wage income, agricultural production, non-agricultural enterprises, credits and savings, transfers to and from absentee members, and anthropometrics of small children. In this study, our analysis primarily examines agricultural production data. The dataset provides geographical information on household locations at the district level. There are 75 districts in total in Nepal, and our sample covers 74 districts. In NLSS, each district is classified either a mountain, hill, or Terai (plain) agro-ecological zone.[1] All of our analyses are conducted separately for each agro-ecological zone.

NLSS II and III contain data on 3911 households and 5988 households respectively, of which 2851 and 5045 households produce agricultural outputs for self-consumption and/or marketing purposes. Removing outliers that report extreme values of inputs or outputs, 2832 and 4710 households remain for the 2003 and 2010 data respectively. A subset of the NLSS II and III provides balanced panel data of 386 agricultural households for our analysis.

In estimating DEA frontiers, we adjust for the difference in sample size to derive comparable estimates for 2003 and 2010 data. It is well-known that as a type of extreme-value estimator, the technically-feasible production set estimated by a DEA frontier becomes larger with the sample size. To obtain comparable DEA frontiers under a constant sample size, we use the sample size of 2003 data (i.e. smaller of the two years) for each agro-ecological zone for the frontier estimation with 2010 data. For this purpose, we draw 30 sets of stratified random samples from the 2010 data conditionally on district[2] and estimate 30 sets DEA frontiers for 2010. Then, for each data point, we use the median of efficiency estimates against those frontiers,[3] for which the calculation of the conventional MPI decomposition requires estimates of technical efficiency (TE) against the frontiers of the corresponding time periods and simulated technical efficiency (STE) against the frontiers of counterfactual years (i.e., 2003 data evaluated against 2010 frontier, and 2010 data evaluated against 2003 frontier). STE can be estimated only for the balanced panel subsample, or the households for whom we have observations in both 2003 and 2010 data.

We consider two alternatives to those conventional MPI measures which are restricted to a small subset of the data. One is to calculate the district-level MPI decomposition by averaging (unbalanced numbers of) producer-level TE and STE estimates. Another is to estimate mean MPI decomposition using the regression-based approach as described above.

### *Variable Construction*

We select farming households from NLSS and and analyze all farm-related activities as a single enterprise as opposed to a collection of crop-specific enterprises. Our definition of farming household is a household with strictly positive land use and household labor allocated to self-employment agriculture. NLSS provides detailed accounts of agricultural land use of owned or rented land area and the time use of each household member in economic activities. However, the information on resource allocations is not broken down to specific crops, making it infeasible to analyze distinct crop productions as separate enterprises. Consequently, we analyze productivity of the whole farm and compare the households with different crop mixes all at once.

The whole farm analysis in fact appears preferable to the crop-specific analysis, given a high degree of crop diversification in Nepal agriculture. More than 75 percent of farming households produced 6 or more varieties of crops in both 2003 and 2010. One important role of crop diversification is a buffer for various sources of uncertainties that can affect various crops differently. In a remote countryside where the household likely faces unstable supply of agricultural inputs and volatile prices of agricultural outputs, specializing in a few varieties of crops would be extremely risky. Without far-reaching and reliable networks of wholesalers and traders, shocks to the rural economy can easily disrupt the markets, leading to a shortage of crucial inputs or a temporary loss of marketing outlets. In addition, rural farmers in Nepal are directly exposed to general risks associated with agricultural markets and weather, which are increasingly managed through technologies, forward contracts, and financial instruments in developed economies. From a home-consumption standpoint, crop diversification may improve nutritional intakes of family members. A large portion of agricultural outputs in Nepal is consumed at home. Such non-market benefits of crop diversification are not directly measured in our analysis, but they are implicitly accounted for in the crop choice of individual households, who are compared with one another on a basis of similar crop mixes. On the other hand, the crop-specific analysis focusing on narrowly-defined efficiency concept can be misleading. Even if highly specialized agriculture is found to be the key to increase efficiency, some measures are likely needed to mitigate the exposure to risks and provide safety nets for rural households.

Empirically, production analysis requires a succinct representation of input-output variables. We construct 9 output variables by aggregating 62 out of 67 crop varieties in the NLSS data. For inputs, we consider six specifications, each containing 7 to 12 input variables,[4] that differ by the degree of aggregation of resources.

The output variables are constructed by aggregating the following components.

| *Outputs* | *Components* |
|---|---|
| Rice | early paddy, main paddy, upland paddy |
| Wheat | wheat |
| Other Cereals | spring/winter maize, summer maize, millet, barley, buckwheat, other cereals |
| Pulses, Legumes | soybeans, black gram, red gram, grass pea, lentil, gram, pea, green gram, coarse gram, cow pea, other legumes |
| Tubers, Bulbs | winter potato, summer potato, sweet potato, colocasia, other tubers |
| Oilseeds, Spices | mustard, ground nut, linseed, sesame, other oilseed, chilies, onions, garlic, ginger, turmeric, cardamom, coriander seed |

*(continues)*

*(continued)*

| *Outputs* | *Components* |
|---|---|
| Cash Crops, Tea | sugarcane, jute, tobacco, other cash crops, tea, Vegetables (winter vegetables, summer vegetables |
| Vegetables | winter vegetables, summer vegetables |
| Fruits | orange, lemon, lime, sweet lime, other citrus, mango, banana, guava, jack fruit, pineapple, lichee, pear, apple, plum, papaya, pomegranate, other fruit |

Outputs are constructed by summing up the revenue-equivalent values of their components and dividing the sums by the composite price index.[5] For example, output variable Rice is defined as the sum of revenue-equivalents of early paddy, main paddy, and upland paddy, divided by the (observation-specific) revenue-share weighted prices of the three components. When there is only one component, which is the case for Wheat, the unit of this output is kilogram; otherwise, the output is in a quasi-quantity unit. To obtain revenue-equivalents, we first convert harvest quantities reported in NLSS into kilogram equivalents and then assign estimated crop prices per kilogram. The price estimates are primarily the medians of reported sales values per kilogram.

The construction of input data is summarized as follows.

| *Inputs* | *Construction* |
|---|---|
| Irrigated land | Sum of self-cropped plot areas (owned or rented) that are irrigated |
| Non-irrigated land | Sum of self-cropped plot areas (owned or rented) that are not irrigated |
| Seed expense | Sum of seed expenditures in 2010 Nepali Rupees |
| Pesticide expense | Sum of pesticide expenditures in 2010 Nepali Rupees |
| Chemical fertilizer | Sum of chemical fertilizers (Urea, DAP, and Complex, Other Chemical Fertilizers) divided by a share-weighted price index |
| Non-chemical fertilizer | Sum of non-chemical fertilizers (Organic/Compost Fertilizers and Other Fertilizers) divided by a share-weighted price index |
| Capital rental expense | Sum of rental- and repair-related expenses (for draft animals, tractors, other machinery, irrigation charges, repair of equipment) in 2010 Nepali Rupees |
| Capital asset value | Sum of self-reported values of draft animals (including bullocks/cows and buffaloes) and equipment (including tractors, ploughs, water pumps, and generators) in 2010 Nepali Rupees |
| Hired labor | Sum of man-days of casual/daily labor and permanent labor (260.7-man day equivalent: 6 days/week for 10 months) converted into hours by the average working hours per day of wage-labor in agriculture (7.61 hours in mountains, 7.29 hours in hills, and 7.61 hours in Terai) |
| Household labor | Sum of hours that individual household members spent in self-employment agriculture |

1. The average inflation rate of 7.52 percent per year during 2003–2010 is calculated from the World Development Indicators.

2. The price of each fertilizer component is taken from the median of the reported expenditure per kilogram.

Several patterns of Nepal agriculture are observed across agro-ecological zones and two survey years. The average farming household in Terai produces larger quantities of Rice, Wheat, and Cash Crops than their counterparts in the mountains and the hills, who on the other hand produces larger quantities of Other Cereals and Tubers and Bulbs. Notable changes from 2003 to 2010 include an increase in Tubers and Bulbs in mountains and a decrease in Cash Crops in the Terai. As for inputs, the average farming household in the Terai uses more inputs of irrigated land, seed, capital, pesticide, fertilizer, and hired labor than their counterparts in the mountains and the hills. In all agro-ecological zones, the household labor allocated to self-employment agriculture has declined substantially from 2003 to 2010, possibly due to increased mechanization or increased use of capital-intensive inputs. In particular, female labor has declined disproportionately more in all agro-ecological zones. The use of hired labor remains very limited and is likely temporary like the assistance needed during the harvest season.

## Annex 2.2: District Wise Decomposition of Productivity into Technical Change and Technical Efficiency Change

**Table A2.2.1 District-Wise Decomposition of Productivity in Mountains**

| *District* | *MPI* | *TC* | *TEC* |
|---|---|---|---|
| Taplejung | 1.00 | 1.14 | 0.88 |
| Sankhuwasabha | 0.99 | 0.99 | 1.00 |
| Solukhumbu | 1.15 | 1.29 | 0.89 |
| Dolakha | 1.33 | 1.42 | 0.94 |
| Sindhupalchok | 1.32 | 1.36 | 0.97 |
| Rasuwa | | | |
| Manang | 2.30 | 1.87 | 1.23 |
| Dolpa | | | |
| Jumla | 1.00 | 0.96 | 1.04 |
| Kalikot | 1.01 | 1.20 | 0.84 |
| Mugu | 1.38 | 1.69 | 0.82 |
| Humla | | | |
| Bajura | 0.82 | 1.10 | 0.75 |
| Bajhang | 0.90 | 0.96 | 0.94 |
| Darchula | 1.03 | 1.09 | 0.94 |
| Sample size: 350 | | | |

**Table A2.2.2 District-Wise Decomposition of Productivity in Hills**

| *District* | *MPI* | *TC* | *TEC* |
|---|---|---|---|
| Panchthar | 1.64 | 1.23 | 1.33 |
| Ilam | 0.89 | 0.98 | 0.91 |
| Dhankuta | 1.37 | 1.09 | 1.26 |
| Tehrathum | 0.94 | 1.18 | 0.80 |
| Bhojpur | 1.21 | 1.07 | 1.14 |
| Okhaldhunga | 1.63 | 1.29 | 1.26 |
| Khotang | 1.12 | 1.17 | 0.96 |
| Udayapur | 1.36 | 1.15 | 1.19 |
| Sindhuli | 1.38 | 1.22 | 1.14 |
| Ramechhap | 1.61 | 1.15 | 1.41 |
| Kavrepalanchok | 1.41 | 1.01 | 1.40 |
| Lalitpur | 1.18 | 1.06 | 1.12 |
| Bhaktapur | 1.07 | 0.97 | 1.11 |
| Kathmandu | 0.91 | 0.93 | 0.97 |
| Nuwakot | 1.14 | 0.89 | 1.28 |
| Dhading | 1.42 | 1.26 | 1.13 |
| Makwanpur | 1.09 | 0.94 | 1.16 |
| Gorkha | 1.19 | 1.24 | 0.96 |
| Lamjung | 1.83 | 1.37 | 1.33 |
| Tanahun | 2.22 | 1.40 | 1.59 |
| Syangja | 1.29 | 1.05 | 1.24 |
| Kaski | 1.55 | 1.28 | 1.20 |
| Myagdi | 1.35 | 1.06 | 1.27 |
| Parbat | 1.06 | 1.06 | 1.00 |
| Baglung | 2.15 | 1.20 | 1.79 |
| Gulmi | 0.74 | 0.91 | 0.81 |
| Palpa | 1.89 | 1.30 | 1.45 |
| Arghakhanchi | 1.63 | 1.18 | 1.38 |
| Pyuthan | 0.67 | 1.00 | 0.67 |
| Rolpa | 1.34 | 1.27 | 1.05 |
| Rukum | 1.75 | 1.42 | 1.24 |
| Salyan | 0.72 | 1.00 | 0.71 |
| Surkhet | 1.17 | 1.28 | 0.91 |
| Dailekh | 1.07 | 1.28 | 0.84 |
| Jajarkot | 0.74 | 1.01 | 0.73 |
| Achham | | | |
| Doti | 1.19 | 1.53 | 0.78 |
| Dandeldhura | 0.99 | 1.73 | 0.57 |
| Baitadi | 1.30 | 1.46 | 0.89 |
| Sample size: 1321 | | | |

**Table A2.2.3 District-Wise Decomposition of Productivity in Terai**

| *District* | *MPI* | *TC* | *TEC* |
|---|---|---|---|
| Jhapa | 0.84 | 1.04 | 0.80 |
| Morang | 0.74 | 0.96 | 0.78 |
| Sunsari | 1.14 | 1.18 | 0.96 |
| Saptari | 0.96 | 1.14 | 0.85 |
| Siraha | 0.93 | 1.09 | 0.85 |
| Dhanusha | 0.69 | 0.89 | 0.77 |
| Mahottari | 0.85 | 1.02 | 0.83 |
| Sarlahi | 1.34 | 1.25 | 1.07 |
| Rautahat | 0.83 | 1.02 | 0.81 |
| Bara | 1.25 | 1.15 | 1.08 |
| Parsa | 0.83 | 1.01 | 0.82 |
| Chitwan | 1.12 | 1.27 | 0.88 |
| Nawalparasi | 1.10 | 1.16 | 0.95 |
| Rupandehi | 0.74 | 0.99 | 0.74 |
| Kapilbastu | 0.60 | 0.87 | 0.69 |
| Dang | 0.79 | 0.84 | 0.94 |
| Banke | 1.06 | 0.98 | 1.09 |
| Bardiya | 0.83 | 0.90 | 0.92 |
| Kailali | 0.76 | 0.89 | 0.86 |
| Kanchanpur | 1.01 | 1.02 | 0.99 |
| Sample size: 1039 | | | |

# Annex 2.3: Regression Results of Productivity Analysis

**Table A2.3.1 Regressions of ln (TE) on Household Characteristics, 2010 (1)**

| | *Mountains* | | | *Hills* | | | *Terai* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *(1)* | *(2)* | *(3)* | *(4)* | *(5)* | *(6)* | *(7)* | *(8)* | *(9)* |
| *Variables* | *M1* | *M2* | *M3* | *H1* | *H2* | *H3* | *T1* | *T2* | *T3* |
| Years of Education | 0.00 | −0.00 | 0.00 | −0.00 | −0.00 | −0.00 | 0.00 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| Land Owned | −0.00* | −0.00† | −0.00† | 0.00 | −0.00 | −0.00 | 0.00 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| HHI | 0.01 | 0.18 | 0.22 | 0.58‡ | 0.55‡ | 0.55‡ | −0.83‡ | −0.72‡ | −0.74‡ |
| | (0.25) | (0.25) | (0.27) | (0.13) | (0.12) | (0.12) | (0.14) | (0.15) | (0.14) |
| HH Size | −0.02* | −0.02* | −0.02 | −0.03‡ | −0.04‡ | −0.04‡ | −0.02† | −0.02‡ | −0.02‡ |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Age of HH Head | −0.02* | −0.02 | −0.02 | −0.01* | −0.01 | −0.01 | −0.03‡ | −0.02‡ | −0.02‡ |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) | (0.01) |
| Age of HH Head Sq. | 0.00* | 0.00* | 0.00* | 0.00 | 0.00 | 0.00 | 0.00‡ | 0.00‡ | 0.00‡ |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Male S. of Hired Labor | −0.14* | −0.12 | −0.14* | −0.22‡ | −0.20‡ | −0.20‡ | −0.17† | −0.17† | −0.12* |
| | (0.08) | (0.07) | (0.08) | (0.06) | (0.05) | (0.05) | (0.07) | (0.06) | (0.06) |
| Male S. of HH Labor | −0.08 | −0.07 | −0.05 | −0.06* | −0.12‡ | −0.12‡ | −0.02 | −0.02 | −0.01 |
| | (0.05) | (0.05) | (0.04) | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| Share of Irrigated Land | 0.19‡ | 0.19† | 0.21‡ | 0.39‡ | 0.41‡ | 0.42‡ | −0.11† | −0.13‡ | −0.13‡ |
| | (0.06) | (0.06) | (0.06) | (0.07) | (0.05) | (0.05) | (0.04) | (0.04) | (0.04) |
| Time to Paved Road | 0.00 | 0.00 | 0.00 | 0.00† | 0.00 | 0.00 | 0.00* | 0.00 | 0.00* |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Time to Local Shop | 0.00 | 0.00 | 0.00 | 0.00 | −0.00 | −0.00 | 0.00 | −0.00 | −0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Time to Ag Center | 0.00 | 0.00 | 0.00 | 0.00* | 0.00 | 0.00 | −0.00 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Time to Bank | 0.00 | 0.01‡ | 0.00* | 0.00 | 0.00 | 0.00 | 0.00† | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| District F.E. | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Ethnicity F.E. | No | No | Yes | No | No | Yes | No | No | Yes |
| Observations | 477 | 477 | 477 | 2,363 | 2,363 | 2,363 | 1,870 | 1,870 | 1,870 |
| R-squared | 0.090 | 0.145 | 0.195 | 0.109 | 0.235 | 0.247 | 0.101 | 0.153 | 0.201 |

1. Cluster-robust standard errors in parentheses: ‡ $p < 0.01$, † $p < 0.05$, * $p < 0.1$.
2. Land is measured in Ropani. Time is measured in hours. Marginal effects smaller than 0.00 are economically insignificant.

**Table A2.3.2 Estimates of Input Contributions to Aggregate Output**

| *Input variables* | *(1) Mountains* | *(2) Hills* | *(3) Terai* |
|---|---|---|---|
| ln(Irrigated Land) | 0.0803† | 0.0804‡ | 0.3094‡ |
| | (0.0318) | (0.0291) | (0.0307) |
| ln(Non-irrigated Land) | 0.1066† | 0.1760‡ | 0.2284‡ |
| | (0.050) | (0.0361) | (0.0333) |
| ln(Seed Expenses) | −0.0484‡ | 0.0517‡ | 0.0407‡ |
| | (0.0137) | (0.0116) | (0.0077) |
| ln(Pesticide Expenses) | 0.0468† | 0.0882‡ | 0.0603‡ |
| | (0.0233) | (0.0184) | (0.0103) |
| ln(Chemical Fertilizer) | −0.0183 | 0.0626‡ | 0.0473‡ |
| | (0.0199) | (0.0198) | (0.0181) |
| ln(Non-chemical Fertilizer) | 0.0184 | 0.0398 | 0.0525‡ |
| | (0.0183) | (0.030) | (0.0123) |
| ln(Capital Expenses) | 0.0029 | −0.0047 | −0.0235 |
| | (0.0136) | (0.0092) | (0.0167) |
| ln(Capital Assets) | 0.0371 | 0.0683† | 0.1355‡ |
| | (0.0398) | (0.0279) | (0.0166) |
| ln(Hired Labor) | 0.0004 | 0.0447‡ | 0.0178 |
| | (0.0159) | (0.0137) | (0.0119) |
| ln(Household Labor) | 0.3317‡ | 0.1989‡ | 0.0629* |
| | (0.0574) | (0.0368) | (0.0352) |
| Constant | −4.4971‡ | −3.9766‡ | −3.7137‡ |
| | (0.4196) | (0.2396) | (0.2682) |
| Num. Observations | 477 | 2363 | 1870 |

1. Standard errors in parentheses: ‡ $p < 0.01$, † $p < 0.05$, * $p < 0.1$.
2. Quantile regression estimates at 95th percentile.
3. Dependent variable is ln(S) where S is an aggregate-output index.

# Annex 3.1: Major Policies on Agricultural Inputs

| *Regulation* | *Main functions* | *Policy statements/objectives/aims* | *Strategies to achieve objectives* |
|---|---|---|---|
| Seed Act (1988) | It functions as the pioneer document to regulate quality seed production in Nepal. | The main objective of the act is to regulate the production, processing and laboratory testing of seeds to maintain the quality and enhance productivity of various crops in the farms. | • Formation of National Seed Board to formulate and implement policies as well as to advice the government<br>• Establishment of Seed Authentication Body for authentication of seeds<br>• Establishment of laboratories and hiring of personnel for inspection and analysis<br>• Control the use of pesticide treated seeds, provide permit for import and export, and penalize activities in contravention to the act |
| Agriculture Perspectives Plan (1995) | It is the guiding document for the agriculture strategy including preparation of periodic plans and programme between 1995–2015 in Nepal. | The major objectives of the APP are to alleviate poverty with increased agricultural growth, productivity and commercialization and diversification. | • Prioritize investment for the key identified inputs (irrigation, fertilizer, technology, roads and power) and outputs (livestock, high value crops, agribusiness and forestry)<br>• Minimize poverty incidence from 49 percent to 14 percent and enhance positive impacts on food security and environment of various ecological regions<br>• Promote private-public partnership and prioritize major policies and institutions vital for the investment and implementation of key areas identified in (1) above |
| Chemical fertilizer guideline (2000) | Formulated under the Chemical Fertilizer (control) Act by the Ministry of Agricultural Development to provide guidance for purchase, sales and distribution of chemical fertilizer | • Formulation of criteria for registration and renewal of chemical fertilizer trader<br>• Establishment and management of chemical fertilizer analysis including laboratory set-up and analysis procedures<br>• Provision of certified chemical fertilizer inspector for supply and quality control of chemical fertilizers | |
| National fertilizer policy (2001) | Introduced with a vision to manage the import (including production, sales and distribution) of standard quality chemical fertilizer in the country so as to support quality the agriculture production. | • Introduce policy improvements and infrastructural management for increased fertilizer usage<br>• Promote integrated crop nutrition management system to encourage balanced usage of chemical fertilizer | • Make the import reliable, competitive and transparent<br>• Competitively finalize the fertilizer price and subsidize the transportation cost<br>• Establish and manage reserve funds for future from the revenue generated by sales of chemical fertilizers<br>• Facilitate and encourage local production of chemical fertilizers<br>• Promote local investment in chemical fertilizer production in the neighboring countries |

| *Regulation* | *Main functions* | *Policy statements/objectives/aims* | *Strategies to achieve objectives* |
|---|---|---|---|
| | | | • Make more efficient, transparent and competitive the distribution and management of fertilizers<br>• Educate the consumers, introduce fertilizer act and establish laboratories to control the fertilizer quality<br>• Provision of integrated crop nutrition management system for balanced use of chemical fertilizer |
| Guidelines for Chemical Fertilizer and Seed Transportation Grant Subsidy (2004) | The guideline compliments the government's decision of 1972 to provide transportation subsidy to farmers from remote districts with an expectation to help them achieve self-sufficient status in food at local level with increased production. | The objective is to enhance the productivity of agricultural commodities through implementation of this programme and hence directly support the government's poverty alleviation programme | • Support farmers from districts with limited transportation facilities and located far from the road head with a subsidy on the transportation cost of the fertilizers and seed for selected commodities<br>• Identify annually the target districts by MoAD based on the accessibility survey on the transportation facilities, geographic location and poverty ranking<br>• Identify targeted chemical fertilizer and seeds: Any fertilizer directly used on the soil supplying single or combination of essential nutrients like nitrogen, phosphorus and potassium are eligible and seeds for staple crops like paddy, wheat, maize, millet<br>• Guide on the assigning of responsibilities, budget and duties to the ministry and districts for purchase, sales and distribution of the fertilizers and seed |
| Organic Fertilizer Subsidy Guidelines (2011) | The guidelines introduced with a vision to maintain the soil fertility with the use of organic fertilizers and manure as an alternate to the chemical fertilizer. | The main objective is to support farmers get a better access to the locally produced organic fertilizer. | Set quality criteria, price and other important norms for subsidies on organic fertilizers<br>Formation of Subsidy Distribution and Management Committee chaired by the Secretary of MoAD and a technical subcommittee to set criteria, prices, quantities for distribution and management<br>Formation of Fertilizer Supply and Distribution Management Committee at the districts to ensure regular supply, distribution and monitoring of activities |
| Organic Fertilizer Subsidy Directives (2011) | Same as organic fertilizer subsidy guidelines 2011 | | |

*(continues)*

*(continued)*

| *Regulation* | *Main functions* | *Policy statements/objectives/aims* | *Strategies to achieve objectives* |
|---|---|---|---|
| Organic and Bio-Fertilizer Regulating Working Procedure (2011) | Introduced to regulate the trade and usage of organic and bio fertilizer with regulations on production, examination, import, sales and distribution | • Set criteria and qualities for organic/bio-fertilizers registered under the ministry of agricultural development<br>• Formation of a task team to recommend and permit the registration, analysis and specification of fertilizers including design permissions for the fertilizers<br>• Set up criteria, permit analysis and field test of qualified fertilizers for import<br>• Set criteria and procedures for registration and renewal of it of imported or locally produced fertilizers | |

## Annex 3.2: Application of the PETS and QSDS Methodology to Study the Input Delivery System in Nepal

### *Description of PETS and QSDS*

PETS examines flows of funds and materials through different administrative level. It is used mainly to evaluate the proportion of public resources (financial, human and in-kind) that reach each level, in particular frontline service providers. QSDS are multi-purpose surveys that examine the efficiency of frontline service delivery and the dissipation of resources by collecting information on service providers and various agents in the system. These two instruments are often applied jointly to obtain a more complete picture of public service delivery.

In the context of this survey, PETS was to track funds for each of the two programs from MOF through MOAD to the two companies: AICL/STC and NSCL; and seed and fertilizers from the two companies through the cooperatives to final users: the farmers. QSDS would be used to examine the internal operations and effectiveness of the key institutions involved in the program. In particular, cooperatives play the role of service provider, in purchasing the subsidized seeds and fertilizers from the two companies for sale to farmers.

### *Target Groups for Subsidy*

At the beginning of the current fertilizer subsidy policy in 2009, eligible farmers for subsidized fertilizers were based on the size of landholding of less and equal to 4 hectares of land in Terai; and less than 0.75 ha (15 Robani) in the hills and mountains. The program covered four crops: paddy, wheat, maize, and millet from which famers can choose. Eligibility requirement applied remained the same when the seed subsidy program started in 2011. The seeds covered were for paddy, wheat, maize, millet, lentil, gram, pigeon pea, and green grams. During the consultation with MOAD, the survey team was informed that the eligibility criteria had been relaxed; and farmers needed to provide proof of landholding to buy subsidized fertilizers and seeds.

## *Survey Design*

Several activities were planned to implement the survey. Survey team was constituted. Literature review and preparatory work was done. World Bank mission to Nepal at end of June was organized to kick-start the survey and consult with key stakeholders in Nepal. A World Bank Mission in Nepal was organized to bring the survey team together. Meetings were organized with key stakeholders in Nepal to introduce the survey, understand their expectations, motivate their participation and foster ownership of the survey process. The survey team held meetings with key stakeholders in MOAD, the two companies and Project Coordinator of USAID/IFPRI and other stakeholders. The survey team presented PETS/QSDS methodology to key technical staff of MOAD involved in ESW to build a common understanding of the survey, and how it fitted into the ESW. In addition, Work Plan for the survey was presented; and insightful responses were provided to the survey team. In particular, MOAD requested incorporation of organic fertilizer subsidy into the survey; highlight areas for capacity building; and how MOAD and the two companies could effectively manage the two programs.

The sample used for the survey consisted of districts, cooperatives and farmers. Sample districts were selected based on agro-ecological zones in Nepal: Terai, hills/mountains. Three districts namely Morang and Nawalparasi representing Terai and Surkhet representing hills were selected.

In each sampled district, two cooperatives were sampled. Average of quantity of fertilizers sold to all cooperatives in a sampled district by AICL branch was computed. Cooperatives were divided into two categories: cooperatives which bought quantities of fertilizers above and below the district average. One cooperative was randomly selected from each category.

The selection of farmers was based on membership to a cooperative and landholding. Non-members were selected as next neighbour to sampled member. The final sample size for the survey consisted of 3 districts, 6 cooperatives and 240 farmers.

The farmer questionnaire consisted of two sections: one part for Fertilizer; and the other part on Seeds. Information sought included land available and used; supply sources for fertilizers and seeds; purchases of fertilizers and seeds by farmers during 2014/15; information dissemination and complaints redress mechanism; and proposals by farmers to improve the two programs. The questionnaire for cooperatives consisted of two parts: one for fertilizer; the other for seeds. Data sought was characteristics of the cooperatives; sources of fertilizers and seeds bought by cooperatives; purchases and sales of seeds by cooperatives in 2014/15; stock of seeds and fertilizers when cooperatives were visited; information dissemination and complaints redress mechanism; and advisory services; governance and oversight of cooperatives; and proposals by cooperatives to improve the two programs. A datasheet was used to obtain data on fertilizers received from AICL entry points to AICL branch; and fertilizers sold to sampled cooperatives by AICL branches. Focus Group Discussion (FGD) conducted at each sampled cooperatives supplemented questionnaires. Field supervisors facilitated participants to reach a consensus on key changes needed to improve the two programs. Participants in FGD included cooperative officials, VDC officials, local knowledgeable persons and lead farmers. Findings of the FGD are presented in Survey Implementation Report prepared by NEW ERA.

The Limitations of this survey were:

- The survey covers only three districts out of 75 districts of Nepal and within sample districts only two cooperatives are included.
- The sample of 240 farmers includes only 10 large farmers (> 4ha.) from Terai (all from Morang and none from Nawalparasi) and 19 from hills district (in hill large farmer is defined as > 0.75ha.).
- The fertilizer and seed use data is for only F.Y. 2014/15. There are annual variations in fertilizer supply situation and weather conditions which influence crop coverage which in turn affects fertilizer and seed use.
- Budget data and financial statements for the two companies could not be accessed due to limited time available and language barriers to review available records.
- Limited time to interface with AICL branches, entry points and NSCL outlets to fully appreciate constraints in distribution chain at these levels.

## Annex 4.1: MRL Levels of European Union for Various Pesticides

**(Pesticide residues and maximum residue levels (mg/kg) on Ginger.**
[Pesticides Web Version—EU MRLs (File created on 04/04/2016)]

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| 1,1-dichloro-2,2-bis(4-ethylphenyl)ethane (F) | 0.02 |
| 1,2-dibromoethane (ethylene dibromide) (F) | 0.02* |
| 1,2-dichloroethane (ethylene dichloride) (F) | 0.02* |
| 1,3-Dichloropropene | 0.05* |
| 1-methylcyclopropene | 0.02* |
| 1-Naphthylacetamide | 0.05* |
| 1-Naphthylacetic acid | 0.05* |
| 2,4,5-T (sum of 2,4,5-T, its salts and esters, expressed as 2,4,5-T) (F) | 0.05* |
| 2,4-DB (sum of 2,4-DB, its salts, its esters and its conjugates, expressed as 2,4-DB) (R) | 0.05* |
| 2,4-D (sum of 2,4-D, its salts, its esters and its conjugates, expressed as 2,4-D) | 0.1* |
| 2-naphthyloxyacetic acid | 0.05* |
| 2-phenylphenol | 0.1* |
| 8-hydroxyquinoline (sum of 8-hydroxyquinoline and its salts, expressed as 8-hydroxyquinoline) | 0.01* |
| Abamectin (sum of avermectin B1a, avermectin B1b and delta-8,9 isomer of avermectin B1a, expressed as avermectin B1a) (F) (R) | 0.02* |

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Acephate | 0.2* |
| Acequinocyl | 0.02* |
| Acetamiprid (R) | 0.05* |
| Acetochlor | 0.05* |
| Acibenzolar- S- methyl (sum of acibenzolar- S- methyl and acibenzolar acid (free and conjugated), expressed as acibenzolar- S- methyl) | 0.05* |
| Aclonifen | 0.05* |
| Acrinathrin (F) | 0.05* |
| Alachlor | 0.05* |
| Aldicarb (sum of aldicarb, its sulfoxide and its sulfone, expressed as aldicarb) | 0.05* |
| Aldrin and Dieldrin (Aldrin and dieldrin combined expressed as dieldrin) (F) | 0.1 |
| Ametoctradin (R) | 0.01* |
| Amidosulfuron (A) (R) | 0.05* |
| Aminopyralid | 0.02* |
| Amisulbrom | 0.01* |
| Amitraz (amitraz including the metabolites containing the 2,4 -dimethylaniline moiety expressed as amitraz) | 0.1* |
| Amitrole | 0.05* |
| Anilazine | 0.05* |
| Anthraquinone (F) | 0.02* |
| Aramite (F) | 0.1* |
| Asulam | 0.1* |
| Atrazine (F) | 0.1* |
| Azadirachtin | 0.01* |
| Azimsulfuron | 0.05* |
| Azinphos-ethyl (F) | 0.05* |
| Azinphos-methyl (F) | 0.5* |
| Azocyclotin and Cyhexatin (sum of azocyclotin and cyhexatin expressed as cyhexatin) | 0.05* |
| Azoxystrobin | 0.05* |
| Barban (F) | 0.05* |
| Beflubutamid | 0.05* |
| Benalaxyl including other mixtures of constituent isomers including benalaxyl-M (sum of isomers) | 0.1* |
| Benfluralin (F) | 0.1* |
| Benfuracarb | 0.1* |
| Bentazone (Sum of bentazone, its salts and 6-hydroxy (free and conjugated) and 8-hydroxy bentazone (free and conjugated), expressed as bentazone) (R) | 0.1* |
| Benthiavalicarb (Benthiavalicarb-isopropyl(KIF-230 R-L) and its enantiomer (KIF-230 S-D) and its diastereomers(KIF-230 S-L and KIF-230 R-D), expressed as benthiavalicarb-isopropyl)(A) | 0.05* |
| Benzalkonium chloride (mixture of alkylbenzyldimethylammonium chlorides with alkyl chain lengths of C8, C10, C12, C14, C16 and C18) | 0.1 |
| Bifenazate (sum of bifenazate plus bifenazate-diazene expressed as bifenazate) (F) | 0.05* |
| Bifenox (F) | 0.05* |
| Bifenthrin (F) | 0.1* |
| Binapacryl (F) | 0.1* |

*(continues)*

*(continued)*

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Biphenyl | 0.05* |
| Bitertanol (F) | 0.05* |
| Bixafen (R) | 0.01* |
| Bone oil | 0.01* |
| Boscalid (F) (R) | 0.5 |
| Bromide ion | 400 |
| Bromophos-ethyl (F) | 0.05* |
| Bromopropylate (F) | 0.05* |
| Bromoxynil and its salts, expressed as bromoxynil | 0.05* |
| Bromuconazole (sum of diasteroisomers) (F) | 0.05* |
| Bupirimate | 0.05* |
| Buprofezin (F) | 0.05* |
| Butralin | 0.05* |
| Butylate | 0.05* |
| Cadusafos | 0.01* |
| Camphechlor (Toxaphene) (F) (R) | 0.05* |
| Captafol (F) | 0.1* |
| Captan (R) | 0.05* |
| Carbaryl (F) | 0.1 |
| Carbendazim and benomyl (sum of benomyl and carbendazim expressed as carbendazim) (R) | 0.1* |
| Carbetamide | 0.05* |
| Carbofuran (sum of carbofuran (including any carbofuran generated from carbosulfan, benfuracarb or furathiocarb) and 3-OH carbofuran expressed as carbofuran) (R) | 0.05* |
| Carbon monoxide | 0.01* |
| Carbosulfan | 0.1* |
| Carboxin | 0.05* |
| Carfentrazone-ethyl (determined as carfentrazone and expressed as carfentrazone-ethyl) | 0.02* |
| Chlorantraniliprole (DPX E-2Y45) (F) | 0.02* |
| Chlorbenside (F) | 0.1* |
| Chlorbufam (F) | 0.05* |
| Chlordane (sum of cis- and trans-chlordane) (F) (R) | 0.02* |
| Chlordecone (F) | 0.02 |
| Chlorfenapyr | 0.05* |
| Chlorfenson (F) | 0.1* |
| Chlorfenvinphos (F) | 0.05* |
| Chloridazon | 0.1* |
| Chlormequat | 0.1* |
| Chlorobenzilate (F) | 0.1* |
| Chloropicrin | 0.025* |
| Chlorothalonil (R) | 0.05* |
| Chlorotoluron | 0.05* |
| Chloroxuron (F) | 0.05* |
| Chlorpropham (F) (R) (A) | 0.05* |
| Chlorpyrifos (F) | 1 |

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Chlorpyrifos-methyl (F) | 5 |
| Chlorsulfuron | 0.05* |
| Chlorthal-dimethyl | 0.05* |
| Chlorthiamid | 0.05* |
| Chlozolinate (F) | 0.05* |
| Chromafenozide | 0.02* |
| Cinidon-ethyl (sum of cinidon ethyl and its E-isomer) | 0.1* |
| Clethodim (sum of Sethoxydim and Clethodim including degradation products calculated as Sethoxydim) | 0.1 |
| Clodinafop and its S-isomers and their salts, expressed as clodinafop (F) | 0.1* |
| Clofentezine (R) | 0.05* |
| Clomazone | 0.05* |
| Clopyralid | 0.5 |
| Clothianidin | 0.05* |
| Copper compounds (Copper) | 40 |
| Cyanamide including salts expressed as cyanamide | 0.01* |
| Cyazofamid | 0.05* |
| Cyclanilide (F) | 0.1* |
| Cycloxydim including degradation and reaction products which can be determined as 3-(3-thianyl)glutaric acid S-dioxide (BH 517-TGSO2) and/or 3-hydroxy-3-(3-thianyl) glutaric acid S-dioxide (BH 517-5-OH-TGSO2) or methyl esters thereof, calculated in total as cycloxydim | 0.05* |
| Cyflufenamid: sum of cyflufenamid (Z-isomer) and its E-isomer | 0.05* |
| Cyfluthrin (cyfluthrin including other mixtures of constituent isomers (sum of isomers)) (F) | 0.1* |
| Cyhalofop-butyl | 0.1* |
| Cymoxanil | 0.05* |
| Cypermethrin (cypermethrin including other mixtures of constituent isomers (sum of isomers)) (F) | 0.2* |
| Cyproconazole (F) | 0.05* |
| Cyprodinil (F) (R) | 1.5 |
| Cyromazine | 0.1* |
| Dalapon | 0.1 |
| Daminozide (sum of daminozide and 1,1-dimethyl-hydrazine (UDHM), expressed as daminozide) | 0.1* |
| Dazomet (Methylisothiocyanate resulting from the use of dazomet and metam) | 0.02* |
| DDT (sum of p,p´-DDT, o,p´-DDT, p-p´-DDE and p,p´-TDE (DDD) expressed as DDT) (F) | 1 |
| Deltamethrin (cis-deltamethrin) (F) | 0.5 |
| Desmedipham | 0.1* |
| Di-allate (sum of isomers) (F) | 0.05* |
| Diazinon (F) | 0.5 |
| Dicamba | 0.05* |
| Dichlobenil | 0.05* |
| Dichlorprop: sum of dichlorprop (including dichlorprop-P) and its conjugates, expressed as dichlorprop | 0.05* |
| Dichlorvos | 0.1* |

*(continues)*

*(continued)*

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Diclofop (sum diclofop-methyl and diclofop acid expressed as diclofop-methyl) | 0.05* |
| Dicloran | 0.05* |
| Dicofol (sum of p, p´ and o,p´ isomers) (F) | 0.1* |
| Didecyldimethylammonium chloride (mixture of alkyl-quaternary ammonium salts with alkyl chain lengths of C8, C10 and C12) | 0.1 |
| Diethofencarb | 0.05* |
| Difenoconazole | 0.3 |
| Diflubenzuron (F) (R) | 0.2 |
| Diflufenican (F) | 0.05* |
| Dimethenamid including other mixtures of constituent isomers including dimethenamid-P (sum of isomers) | 0.05* |
| Dimethipin | 0.1* |
| Dimethoate (sum of dimethoate and omethoate expressed as dimethoate) | 0.1 |
| Dimethomorph (sum of isomers) | 0.05* |
| Dimoxystrobin (R) (A) | 0.05* |
| Diniconazole (sum of isomers) | 0.05* |
| Dinocap (sum of dinocap isomers and their corresponding phenols expressed as dinocap) (F) | 0.1* |
| Dinoseb (sum of dinoseb, its salts, dinoseb-acetate and binapacryl, expressed as dinoseb) | 0.1* |
| Dinoterb (sum of dinoterb, its salts and esters, expressed as dinoterb) | 0.05* |
| Dioxathion (sum of isomers) (F) | 0.05* |
| Diphenylamine | 0.05* |
| Diquat | 0.1* |
| Disulfoton (sum of disulfoton, disulfoton sulfoxide and disulfoton sulfone expressed as disulfoton) (F) | 0.05* |
| Dithianon | 0.01* |
| Dithiocarbamates (dithiocarbamates expressed as CS2, including maneb, mancozeb, metiram, propineb, thiram and ziram) | 0.1* |
| Diuron | 0.05* |
| DNOC | 0.05* |
| Dodemorph | 0.01* |
| Dodine | 0.1* |
| Emamectin benzoate B1a, expressed as emamectin | 0.02* |
| Endosulfan (sum of alpha- and beta-isomers and endosulfan-sulphate expresses as endosulfan) (F) | 0.5 |
| Endrin (F) | 0.1 |
| Epoxiconazole (F) | 0.1 |
| EPTC (ethyl dipropylthiocarbamate) | 0.05* |
| Ethalfluralin | 0.01* |
| Ethametsulfuron-methyl | 0.02* |
| Ethephon | 0.1* |
| Ethion | 0.3 |
| Ethirimol | 0.05* |
| Ethofumesate (sum of ethofumesate and the metabolite 2,3-dihydro-3,3-dimethyl-2-oxo-benzofuran-5-yl methane sulphonate expressed as ethofumesate) | 0.5 |

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Ethoprophos | 0.02* |
| Ethoxyquin (F) | 0.1* |
| Ethoxysulfuron | 0.05* |
| Ethylene oxide (sum of ethylene oxide and 2-chloro-ethanol expressed as ethylene oxide) (F) | 0.1* |
| Etofenprox (F) | 0.01* |
| Etoxazole | 0.05* |
| Etridiazole | 0.05* |
| Famoxadone (F) | 0.05* |
| Fenamidone | 0.05* |
| Fenamiphos (sum of fenamiphos and its sulphoxide and sulphone expressed as fenamiphos) | 0.05* |
| Fenarimol | 0.05* |
| Fenazaquin | 0.01* |
| Fenbuconazole | 0.05* |
| Fenbutatin oxide (F) | 0.1* |
| Fenchlorphos (sum of fenchlorphos and fenchlorphos oxon expressed as fenchlorphos) | 0.1* |
| Fenhexamid (F) | 0.05* |
| Fenitrothion | 0.05* |
| Fenoxaprop-P | 0.1 |
| Fenoxycarb | 0.05* |
| Fenpropathrin | 0.02* |
| Fenpropidin (sum of fenpropidin and its salts, expressed as fenpropidin) (R) (A) | 0.05* |
| Fenpropimorph (R) | 0.1* |
| Fenpyrazamine | 0.01* |
| Fenpyroximate (F) | 0.1 |
| Fenthion (fenthion and its oxigen analogue, their sulfoxides and sulfone expressed as parent) (F) | 0.05* |
| Fentin acetate (F) (R) | 0.1* |
| Fentin (fentin including its salts, expressed as triphenyltin cation) (F) | 0.1* |
| Fenvalerate and Esfenvalerate (Sum of RS & SR isomers) (F) | 0.05* |
| Fenvalerate (any ratio of constituent isomers (RR, SS, RS & SR) including esfenvalerate) (F) (R) | 0.1* |
| Fipronil (sum fipronil + sulfone metabolite (MB46136) expressed as fipronil) (F) | 0.005* |
| Flazasulfuron | 0.05* |
| Flonicamid (sum of flonicamid, TNFG and TNFA) (R) | 0.05* |
| Florasulam | 0.05* |
| Fluazifop-P-butyl (fluazifop acid (free and conjugate)) | 4 |
| Fluazinam (F) | 0.05* |
| Flubendiamide (F) | 0.02* |
| Flucycloxuron (F) | 0.05* |
| Flucythrinate (flucythrinate including other mixtures of constituent isomers (sum of isomers)) (F) | 0.05* |
| Fludioxonil (F) (R) | 1 |
| Flufenacet (sum of all compounds containing the N fluorophenyl-N-isopropyl moiety expressed as flufenacet equivalent) | 0.05* |

*(continues)*

*(continued)*

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Flufenoxuron (F) | 0.05* |
| Flufenzin | 0.1* |
| Flumioxazine | 0.1* |
| Fluometuron | 0.02* |
| Fluopicolide | 0.02* |
| Fluopyram (R) | 0.3 |
| Fluoride ion | 5 |
| Fluoroglycofene | 0.02* |
| Fluoxastrobin | 0.1* |
| Flupyrsulfuron-methyl | 0.1* |
| Fluquinconazole (F) | 0.05* |
| Flurochloridone | 0.1* |
| Fluroxypyr (sum of fluroxypyr, its salts, its esters, and its conjugates, expressed as fluroxypyr) (R) (A) | 0.05* |
| Flurprimidole | 0.05* |
| Flurtamone | 0.05* |
| Flusilazole (F) (R) | 0.05* |
| Flutolanil (R) | 0.05* |
| Flutriafol | 0.05* |
| Fluxapyroxad | 0.01* |
| Folpet (R) | 0.05* |
| Fomesafen | 0.05* |
| Foramsulfuron | 0.05* |
| Forchlorfenuron | 0.05* |
| Formetanate: Sum of formetanate and its salts expressed as formetanate(hydrochloride) | 0.05* |
| Formothion | 0.05* |
| Fosetyl-Al (sum of fosetyl, phosphonic acid and their salts, expressed as fosetyl) | 400 |
| Fosthiazate | 0.05* |
| Fuberidazole | 0.05* |
| Furathiocarb | 0.05* |
| Furfural | 1 |
| Glufosinate-ammonium (sum of glufosinate, its salts, MPP and NAG expressed as glufosinate equivalents) | 0.1* |
| Glyphosate | 0.1* |
| Guazatine | 0.1* |
| Halauxifen-methyl (sum of halauxifen-methyl and X11393729 (halauxifen), expressed as halauxifen-methyl) | 0.1* |
| Halosulfuron methyl | 0.02* |
| Haloxyfop including haloxyfop-R (Haloxyfop-R methyl ester, haloxyfop-R and conjugates of haloxyfop-R expressed as haloxyfop-R) (F) (R) | 0.05 |
| Heptachlor (sum of heptachlor and heptachlor epoxide expressed as heptachlor) (F) | 0.1 |
| Hexachlorobenzene (F) | 0.02 |
| Hexachlorociclohexane (HCH), sum of isomers, except the gamma isomer | 0.02* |
| Hexaconazole | 0.05* |
| Hexythiazox | 0.05* |

| *Pesticide* | *MRL (parts per million-ppm)* |
| --- | --- |
| Hymexazol | 0.05* |
| Imazalil | 0.1* |
| Imazamox (Sum of imazamox and its salts, expressed as imazamox) | 0.1* |
| Imazapic | 0.01* |
| Imazaquin | 0.05* |
| Imazosulfuron | 0.05* |
| Imidacloprid | 0.05* |
| Indoxacarb (sum of indoxacarb and its R enantiomer) (F) | 0.05* |
| Iodosulfuron-methyl (sum of iodosulfuron-methyl and its salts, expressed as iodosulfuron-methyl) | 0.05* |
| Ioxynil (sum of Ioxynil, its salts and its esters, expressed as ioxynil (F)) | 0.05* |
| Ipconazole | 0.02* |
| Iprodione (R) | 0.05* |
| Iprovalicarb | 0.05* |
| Isoprothiolane | 0.01* |
| Isoproturon | 0.05* |
| Isopyrazam | 0.01* |
| Isoxaben | 0.02* |
| Isoxaflutole (sum of isoxaflutole and its diketonitrile-metabolite, expressed as isoxaflutole) | 0.1* |
| Kresoxim-methyl (R) | 0.05* |
| Lactofen | 0.05* |
| Lambda-Cyhalothrin (F) (R) | 0.05* |
| Lenacil | 0.1* |
| Lindane (Gamma-isomer of hexachlorociclohexane (HCH)) (F) | 0.5 |
| Linuron | 0.1* |
| Lufenuron (F) | 0.02* |
| Malathion (sum of malathion and malaoxon expressed as malathion) | 0.02* |
| Maleic hydrazide | 0.5* |
| Mandipropamid | 0.02* |
| MCPA and MCPB (MCPA, MCPB including their salts, esters and conjugates expressed as MCPA) (F) (R) | 0.1* |
| Mecarbam | 0.05* |
| Mecoprop (sum of mecoprop-p and mecoprop expressed as mecoprop) | 0.1* |
| Mepanipyrim | 0.05* |
| Mepiquat | 0.1* |
| Mepronil | 0.05* |
| Meptyldinocap (sum of 2,4 DNOPC and 2,4 DNOP expressed as meptyldinocap) | 0.1* |
| Mercury compounds (sum of mercury compounds expressed as mercury) (F) | 0.02* |
| Mesosulfuron-methyl | 0.05* |
| Mesotrione (Sum of mesotrione and MNBA (4-methylsulfonyl-2-nitro benzoic acid), expressed as mesotrione) | 0.1* |
| Metaflumizone (sum of E- and Z- isomers) | 0.05* |
| Metalaxyl and metalaxyl-M (metalaxyl including other mixtures of constituent isomers including metalaxyl-M (sum of isomers)) | 0.1* |

*(continues)*

*(continued)*

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Metaldehyde | 0.1* |
| Metamitron | 0.1* |
| Metazachlor: Sum of metabolites 479M04, 479M08, 479M16, expressed as metazachlor (R) | 0.1* |
| Metconazole (sum of isomers) (F) | 0.1* |
| Methabenzthiazuron | 0.05* |
| Methacrifos | 0.05* |
| Methamidophos | 0.1* |
| Methidathion | 0.1* |
| Methiocarb (sum of methiocarb and methiocarb sulfoxide and sulfone, expressed as methiocarb) | 0.1* |
| Methomyl and Thiodicarb (sum of methomyl and thiodicarb expressed as methomyl) | 0.1* |
| Methoprene | 0.1* |
| Methoxychlor (F) | 0.1* |
| Methoxyfenozide (F) | 0.05* |
| Metolachlor and S-metolachlor (metolachlor including other mixtures of constituent isomers including S-metolachlor (sum of isomers)) | 0.05* |
| Metosulam | 0.01* |
| Metrafenone (F) | 0.05* |
| Metribuzin | 0.1* |
| Metsulfuron-methyl | 0.05* |
| Mevinphos (sum of E- and Z-isomers) | 0.02* |
| Milbemectin (sum of milbemycin A4 and milbemycin A3, expressed as milbemectin) | 0.1* |
| Molinate | 0.05* |
| Monocrotophos | 0.05* |
| Monolinuron | 0.05* |
| Monuron | 0.05* |
| Myclobutanyl (R) | 0.05* |
| Napropamide | 0.05* |
| Nicosulfuron | 0.05* |
| Nicotine | 4 |
| Nitrofen (F) | 0.02* |
| Novaluron (F) | 0.01* |
| Orthosulfamuron | 0.01* |
| Oryzalin | 0.02* |
| Oxadiargyl | 0.05* |
| Oxadiazon | 0.05* |
| Oxadixyl | 0.02* |
| Oxamyl | 0.05* |
| Oxasulfuron | 0.05* |
| Oxycarboxin | 0.05* |
| Oxydemeton-methyl (sum of oxydemeton-methyl and demeton-S-methylsulfone expressed as oxydemeton-methyl) | 0.05* |
| Oxyfluorfen | 0.05* |
| Paclobutrazol | 0.02* |
| Paraffin oil (CAS 64742-54-7) | 0.01* |

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Paraquat | 0.05* |
| Parathion (F) | 0.2 |
| Parathion-methyl (sum of Parathion-methyl and paraoxon-methyl expressed as Parathion-methyl) | 3 |
| Penconazole (F) | 0.1* |
| Pencycuron (F) | 0.05* |
| Pendimethalin (F) | 0.05* |
| Penoxsulam | 0.02* |
| Penthiopyrad | 0.02* |
| Permethrin (sum of isomers) | 0.1* |
| Pethoxamid | 0.02* |
| Petroleum oils (CAS 92062-35-6) | 0.01* |
| Phenmedipham (R) | 0.1* |
| Phenothrin (phenothrin including other mixtures of constituent isomers (sum of isomers)) (F) | 0.05* |
| Phorate (sum of phorate, its oxygen analogue and their sulfones expressed as phorate) | 0.1* |
| Phosalone | 3 |
| Phosmet (phosmet and phosmet oxon expressed as phosmet) (R) | 0.1* |
| Phosphamidon | 0.02* |
| Phosphines and phosphides:sum of aluminium phosphide, aluminium phosphine, magnesium phosphide, magnesium phosphine, zinc phosphide and zinc phosphine | 0.05 |
| Phoxim (F) | 0.02* |
| Picloram | 0.01* |
| Picolinafen | 0.05* |
| Picoxystrobin (F) | 0.05* |
| Pinoxaden | 0.05* |
| Pirimicarb: sum of pirimicarb and desmethyl pirimicarb expressed as pirimicarb | 0.05* |
| Pirimiphos-methyl (F) | 0.05* |
| Prochloraz (sum of prochloraz and its metabolites containing the 2,4,6-Trichlorophenol moiety expressed as prochloraz) | 0.2 |
| Procymidone (R) | 0.05* |
| Profenofos (F) | 0.05* |
| Profoxydim | 0.1* |
| Prohexadione (prohexadione (acid) and its salts expressed as prohexadione-calcium) | 0.05* |
| Propachlor: oxalinic derivate of propachlor, expressed as propachlor | 0.1* |
| Propamocarb (Sum of propamocarb and its salts, expressed as propamocarb) (R) | 0.05* |
| Propanil | 0.05* |
| Propaquizafop | 0.05* |
| Propargite (F) | 0.05* |
| Propham | 0.05* |
| Propiconazole | 0.1* |
| Propineb (expressed as propilendiamine) | 0.1* |
| Propisochlor | 0.05* |
| Propoxur | 0.1* |

*(continues)*

*(continued)*

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Propoxycarbazone (A) (propoxycarbazone, its salts and 2-hydroxypropoxycarbazone expressed as propoxycarbazone) | 0.1* |
| Propyzamide (F) (R) | 0.05* |
| Proquinazid | 0.05* |
| Prosulfocarb | 0.05* |
| Prosulfuron | 0.05* |
| Prothioconazole (Prothioconazole-desthio) (R) | 0.02* |
| Pymetrozine (A) (R) | 0.1* |
| Pyraclostrobin (F) | 0.1* |
| Pyraflufen-ethyl (A) (Sum of pyraflufen-ethyl and pyraflufen, expressed as pyraflufen-ethyl) | 0.1* |
| Pyrasulfotole | 0.02* |
| Pyrazophos (F) | 0.05* |
| Pyrethrins | 0.5 |
| Pyridaben (F) | 0.05* |
| Pyridalyl | 0.02* |
| Pyridate (sum of pyridate, its hydrolysis product CL 9673 (6-chloro-4-hydroxy-3-phenylpyridazin) and hydrolysable conjugates of CL 9673 expressed as pyridate) | 0.05* |
| Pyrimethanil (R) | 0.05* |
| Pyriproxyfen (F) | 0.05* |
| Pyroxsulam | 0.02* |
| Quinalphos (F) | 0.05* |
| Quinclorac | 0.05* |
| Quinmerac | 0.1* |
| Quinoclamine | 0.05* |
| Quinoxyfen (F) | 0.05* |
| Quintozene (sum of quintozene and pentachloro-aniline expressed as quintozene) (F) | 2 |
| Quizalofop, incl. quizalfop-P | 0.05* |
| Resmethrin (resmethrin including other mixtures of consituent isomers (sum of isomers)) (F) | 0.05* |
| Rimsulfuron | 0.05* |
| Rotenone | 0.02* |
| Saflufenacil (sum of saflufenacil, M800H11 and M800H35, expressed as saflufenacil) (R) | 0.03* |
| Silthiofam | 0.05* |
| Simazine | 0.05* |
| Spinetoram (XDE-175) | 0.1* |
| Spinosad (spinosad, sum of spinosyn A and spinosyn D) (F) | 0.1* |
| Spirodiclofen (F) | 0.05* |
| Spiromesifen | 0.02* |
| Spirotetramat and its 4 metabolites BYI08330-enol, BYI08330-ketohydroxy, BYI08330-monohydroxy, and BYI08330 enol-glucoside, expressed as spirotetramat (R) | 0.1* |
| Spiroxamine (R) | 0.1* |
| Sulfosulfuron | 0.05* |
| Sulfoxaflor (sum of isomers) | 0.05* |
| Sulfuryl fluoride | 0.02* |
| Tau-Fluvalinate (F) | 0.01* |

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Tebuconazole (R) | 0.05* |
| Tebufenozide (F) | 1 |
| Tebufenpyrad (F) | 0.1 |
| Tecnazene (F) | 0.05* |
| Teflubenzuron | 0.05* |
| Tefluthrin (F) | 0.05 |
| Tembotrione (R) | 0.05* |
| TEPP | 0.02* |
| Tepraloxydim (sum of tepraloxydim and its metabolites that can be hydrolysed either to the moiety 3-(tetrahydro-pyran-4-yl)-glutaric acid or to the moiety 3-hydroxy-(tetrahydro-pyran-4-yl)-glutaric acid, expressed as tepraloxydim) | 0.1* |
| Terbufos | 0.01* |
| Terbuthylazine | 0.05* |
| Tetraconazole (F) | 0.02* |
| Tetradifon | 0.05* |
| Thiabendazole (R) | 0.1* |
| Thiacloprid | 0.05* |
| Thiamethoxam (sum of thiamethoxam and clothianidin expressed as thiamethoxam) | 0.05* |
| Thifensulfuron-methyl | 0.05* |
| Thiobencarb (4-chlorobenzyl methyl sulfone) (A) | 0.05* |
| Thiophanate-methyl (R) | 0.1* |
| Thiram (expressed as thiram) | 0.2* |
| Tolclofos-methyl | 0.1* |
| Tolylfluanid (Sum of tolylfluanid and dimethylaminosulfotoluidide expressed as tolylfluanid) (F) (R) | 0.05* |
| Topramezone (BAS 670H) | 0.02* |
| Tralkoxydim | 0.05* |
| Triadimefon and triadimenol (sum of triadimefon and triadimenol) (F) | 0.2* |
| Tri-allate | 0.1* |
| Triasulfuron | 0.1* |
| Triazophos (F) | 0.1 |
| Tribenuron-methyl | 0.05* |
| Trichlorfon | 0.05* |
| Triclopyr | 0.1* |
| Tricyclazole | 0.05* |
| Tridemorph (F) | 0.05* |
| Trifloxystrobin (A) (F) (R) | 0.05* |
| Triflumizole: Triflumizole and metabolite FM-6-1(N-(4-chloro-2-trifluoromethylphenyl)-n-propoxyacetamidine), expressed as Triflumizole (F) | 0.1* |
| Triflumuron (F) | 0.05* |
| Trifluralin | 0.05* |
| Triflusulfuron | 0.05* |
| Triforine | 0.05* |
| Trimethyl-sulfonium cation, resulting from the use of glyphosate (F) | 0.05* |
| Trinexapac (sum of trinexapac (acid) and its salts, expressed as trinexapac) | 0.05* |

*(continues)*

*(continued)*

| *Pesticide* | *MRL (parts per million-ppm)* |
|---|---|
| Triticonazole | 0.02* |
| Tritosulfuron | 0.02* |
| Valifenalate | 0.02* |
| Vinclozolin | 0.05* |
| Warfarin | 0.01* |
| Ziram | 0.2* |
| Zoxamide | 0.05* |

*(*) Indicates lower limit of analytical determination*

## Annex 4.2: Codex Standard for Ginger (CODEX STAN218-1999)

1. **Definition of Produce**
   This Standard applies to the rhizome of commercial varieties of ginger grown zingiber from Zingiber officinale Roseoe, of the Zingiberaceae family to be supplied fresh to the consumer after preparation and packaging. Ginger for industrial processing is excluded.

2. **Provisions Concerning Quality**
   2.1 Minimum Requirement
   In all classes, subject to the special provisions for each class and the tolerances the ginger must be:
   - Whole
   - Sound, produce affected by rotting or deterioration such as to make it unfit for consumption is excluded.
   - Clean, practically free of any visible foreign matter
   - Practically free of damage caused by pests affecting the general appearance of the produce
   - Free of abnormal external moisture, and if washed- dried properly, excluding condensation following removal from cold storage
   - Free of any foreign smell and/or taste
   - Firm
   - Free of abrasions, provided light abrasions which have been dried properly are not regarded as a defect
   - Sufficiently dry for the intended use: skin, stems and cuts due to harvesting must be fully dried.

   2.1.1 The development and condition of the ginger must be such as to enable it:
   - To withstand transport and handling and;
   - To arrive in satisfactory conditions at the place of destination.

2.2 Classification

Ginger is classified in three classes defined below:

2.2.1 "Extra" Class

Ginger in this class must be of superior quality. It must be characteristic of the variety and/or commercial type. The roots must be cleaned, well shaped and free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package.

2.2.2 Class I

Ginger in this class must be of good quality. It must be characteristic of the variety and/or commercial type. The roots must be firm without evidence of shrivelling or dehydration and without evidence of sprouting. The following slight defects however may be allowed provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package:

- Slight skin defects due to rubbing provided they are healed and dry and the total surface area affected not exceeding 10 percent

2.2.3 Class II

This class includes ginger that does not qualify for inclusion in the higher classes, but satisfies the minimum requirements specified in section 2.1. The roots should be reasonably firm. The following defects however, may be allowed provided the ginger retains its essential characteristics as regards the quality, the keeping quality and presentation:

- Skin defects due to rubbing, provided they are healed and dry and the total surface area affected not exceeding 15 percent
- Early signs of sprouting (not more than 10 percent by weight by unit of presentation)
- Slight markings caused by pests
- Healed suberized cracks, provided they are completely dry
- Slight traces of soil
- Bruises

**3. Provisions Concerning Sizing**

Size is determined by the weight of the ginger.

| *Size code* | *Weight (grams)* |
|---|---|
| A | 300 |
| B | 200 |
| C | 150 |

**4. Provisions Concerning Tolerances**

Tolerances in respect of quality and size shall be allowed in each package for produce not satisfying the requirements of the class indicated.

4.1 Quality Tolerances

4.1.1 "Extra" Class

Five percent by number or weight of ginger not satisfying the requirements of the class, but meeting those of class 1 or, exceptionally, coming within the tolerances of that class.

4.1.2 Class I

Ten percent by number or weight of ginger not satisfying the requirements of the class but meeting those of Class II or, exceptionally, coming within the tolerances of that class.

4.1.3 Class II

Ten percent by number or weight of ginger satisfying neither the requirements of the class not the minimum requirements, with the exception of produce affected by rotting or any other deterioration rendering it unfit for consumption.

4.2 Size Tolerances

For the "Extra" Class 5 percent and for class I and class II. 10 percent by number or by weight of ginger not satisfying the requirements in regards to sizing.

**5. Provisions Concerning Presentation**

5.1 Uniformity

The contents of each package must be uniform and contain any ginger of the same origin, variety and/or commercial type, quality and size. The visible part of the package must be representative of the entire contents.

The weight of the heaviest hand (rhizome) may not be more than twice the weight of the lightest hand (rhizome) in the same package.

5.2 Packaging

Ginger must be packed in such a way as to protect the produce. The materials used inside the package must be new one, clean and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly of paper or stamps bearing trade specifications is allowed provided the printing or labelling has been done with non-toxic ink or glue.

Ginger shall be packed in each container in compliance with the Recommended International Code of practice for packaging and Transport of Fresh Fruits and Vegetable (CAC/RCP44-1995)

5.2.1 Description of Containers

The containers shall meet the quality, hygiene, ventilation and resistance characteristics to ensure suitable handling, shipping and preserving of the ginger, packages must be free of all foreign matter and smell.

**6. Marking or Labelling**

6.1 Consumer Packages

In addition to the requirements of the Codex General Standard for the Labelling of Pre-packaged Foods (CODEX STAN 1-1995). The following specific provisions apply:

6.1.1 Nature of Produce

If the produce is not visible from the outside, each package shall be labelled as to name of the variety and/or commercial type.

6.2 Non-Retail Containers

Each package must bear the following particulars, in letters grouped on the same side, legibly and indelibly marked and visible from the outside, or in the documents accompanying the shipment.

6.2.1 Identification

Name and address of exporter, packer and/or dispatcher. Identification code (optional) 2.

6.2.2 Nature of Produce

Name of the produce if the contents are not visible from the outside. Name of the variety and/or commercial type (optional).

6.2.3 Origin of Produce

Country of origin and optionally, district where grown or national regional or local place name.

1 For the purposes of this Standard this includes recycled material of food—grade quality.

2 The national legislation of a number of countries requires the explicit declaration of the name and address.

6.2.4 Commercial Identification

- Class:
- Size (size code or minimum and maximum weight in grams):
- Number of units (optional):
- Net weight (optional):

6.2.5 Official Inspection Mark (optional)

**7. Contaminants**

7.1 The produce covered by this standard shall comply with the maximum levels of the Codex General Standard for Contaminants and Toxins in Food and Feed (CODEX STAN 193-1995).

7.2 The produce covered by the Standard shall comply with the maximum residue Limits for pesticides established by the Codex Alimentarius Commission.

**8. Hygiene**

8.1 It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice-General Principles of Food Hygiene (CAC/RCP 1-1969). Code of Hygiene

Practice for Fresh Fruits and Vegetables (CAC/RCP 53-2003), and other relevant Codex texts such as Codex of Hygienic Practice and Codex of Practice.

8.2 The produce should comply with any microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria for Foods (CAC/GL 21-1997).

## Annex 4.3: International Standards for Phytosanitary Measures

| *ISPM* | *Title* | *Year* |
|---|---|---|
| ISPM 1 | Phytosanitary principles for the protection of plants and the application of phytosanitary measures in international trade (originally adopted in 1993, revised in 2006) | 2006 |
| ISPM 2 | Framework for pest risk analysis (originally adopted in 1995, revised in 2007) | 2007 |
| ISPM 3 | Guidelines for the export, shipment, import and release of biological control agents and other beneficial organisms (originally adopted in 1996, revised in 2005) | 2005 |
| ISPM 4 | Requirements for the establishment of pest free areas | 1995 |
| ISPM 5 | Glossary of phytosanitary terms (updated as needed)<br>• Supplement 1 (2012)—Guidelines on the interpretation and application of the concept of official control for regulated pests<br>• Supplement 2 (2003)—Guidelines on the understanding of potential economic importance and related terms including reference to environmental considerations<br>• Appendix 1 (2009)—Terminology of the Convention on Biological Diversity in relation to the Glossary of phytosanitary terms | |
| ISPM 6 | Guidelines for surveillance | 1997 |
| ISPM 7 | Phytosanitary certification system (originally adopted in 1997, revised in 2011) | 2011 |
| ISPM 8 | Determination of pest status in an area | 1998 |
| ISPM 9 | Guidelines for pest eradication programmes | 1998 |
| ISPM 10 | Requirements for the establishment of pest free places of production and pest free production sites | 1999 |
| ISPM 11 | Pest risk analysis for quarantine pests (originally adopted in 2001, revised in 2004 and 2013) | 2013 |
| ISPM 12 | Phytosanitary certificates (originally adopted in 2001, revised in 2011) | 2011 |
| ISPM 13 | Guidelines for the notification of non-compliance and emergency action | 2001 |
| ISPM 14 | The use of integrated measures in a systems approach for pest risk management | 2002 |
| ISPM 15 | Regulation of wood packaging material in international trade (originally adopted in 2002, revised in 2009, Annex 1 and 2 revised in 2013) | 2009 |
| ISPM 16 | Regulated non-quarantine pests: Concept and application | 2002 |
| ISPM 17 | Pest reporting | 2002 |
| ISPM 18 | Guidelines for the use of irradiation as a phytosanitary measure | 2003 |
| ISPM 19 | Guidelines on lists of regulated pests | 2003 |
| ISPM 20 | Guidelines for a phytosanitary import regulatory system | 2004 |
| ISPM 21 | Pest risk analysis for regulated non-quarantine pests | 2004 |
| ISPM 22 | Requirements for the establishment of areas of low pest prevalence | 2005 |
| ISPM 23 | Guidelines for inspection | 2005 |
| ISPM 24 | Guidelines for the determination and recognition of equivalence of phytosanitary measures | 2005 |

| ISPM | Title | Year |
|---|---|---|
| ISPM 25 | Consignments in transit | 2006 |
| ISPM 26 | Establishment of pest free areas for fruit flies (Tephritidae) | 2006 |
| ISPM 27 | Diagnostic protocols for regulated pests | 2006 |
| | DP 1: Diagnostic protocol for Thrips palmi Karny | 2010 |
| | DP 2: Diagnostic protocol for Plum pox virus | 2012 |
| | DP 3: Diagnostic protocol for Trogoderma granarium Everts | 2012 |
| ISPM 28 | Phytosanitary treatments for regulated pests | 2007 |
| | PT 1: Irradiation treatment for Anastrepha ludens | 2009 |
| | PT 2: Irradiation treatment for Anastrepha oblique | 2009 |
| | PT 3: Irradiation treatment for Anastrepha serpentine | 2009 |
| | PT 4: Irradiation treatment for Bactrocera jarvisi | 2009 |
| | PT 5: Irradiation treatment for Bactrocera tryoni | 2009 |
| | PT 6: Irradiation treatment for Cydia pomonella | 2009 |
| | PT 7: Irradiation treatment for fruit flies of the family Tephritidae (generic) | 2009 |
| | PT 8: Irradiation treatment for Rhagoletis pomonella | 2009 |
| | PT 9: Irradiation treatment for Conotrachelus nenuphar | 2010 |
| | PT 10: Irradiation treatment for Grapholita molesta | 2010 |
| | PT 11: Irradiation treatment for Grapholita molesta under hypoxia | 2010 |
| | PT 12: Irradiation Treatment for Cylas formicarius elegantulus | 2011 |
| | PT 13: Irradiation Treatment for Euscepes postfasciatus | 2011 |
| | PT 14: Irradiation Treatment for Ceratitis capitata | 2011 |
| | PT 15: Vapour heat treatment for Bactocera cucurbitae on Cucumis melo var. reticulatus | 2014 |
| ISPM 29 | Recognition of pest free areas and areas of low pest prevalence | 2007 |
| ISPM 30 | Establishment of areas of low pest prevalence for fruit flies (Tephritidae) | 2008 |
| ISPM 31 | Methodologies for sampling of consignments | 2008 |
| ISPM 32 | Categorization of commodities according to their pest risk | 2009 |
| ISPM 33 | Pest free potato (Solanum spp.) micropropagative material and minitubers for international trade | 2010 |
| ISPM 34 | Design and operation of post-entry quarantine stations for plants | 2010 |
| ISPM 35 | Systems approach for pest risk management of fruit flies (Tephritidae) | 2012 |
| ISPM 36 | Integrated measures for plants for planting | 2012 |

## Annex 5.1: Detailed Description of Cut-Flower Value Chain

### *Input Suppliers*

*Suppliers of variable inputs:* The variable inputs in the production of cut-flowers include planting materials (seeds, bulbs, saplings) and agrochemicals (fertilizers, pesticides, herbicides, fungicides, etc.). Most of the planting materials for gerbera, gladiolus, carnation and rose are imported. The main suppliers of inputs are SIAM Floritech, Crop Pro-Tech, Flora Nepal and Floriculture Cooperative. The first three companies mostly import planting materials from the Netherlands (Gerbera, Carnation, Rose, Limonium), Germany (Rose), Poland (Gerbera), Israel (Carnation, Gypsophila, Chrysanthemum and Asters) and India (Gerbera, Carnation). These companies are sole authorized importers in Nepal for the breeding companies they import from. In the past, mother plants for roses used to be imported directly from the Netherlands, Spain, Israel and other destinations. But this has changed as most of these global suppliers now have plant propagation centers in India, China, and Kenya. The orders for planting materials may be placed with companies based in European countries, but deliveries are made from their Asian plant prorogation sites. Input suppliers believe that planting materials sourced directly from European breeders are consistent and superior in quality than those sourced from propagation sites. However, the main advantages of importing through India-based propagation sites are: (i) price advantage to the importer due to transportation and currency conversion, and (ii) the input supplier companies also provide technical support. Another key input supplier is the Floriculture Cooperative, which mostly imports planting materials through other importers and then supplies to producers. The Cooperative also imports directly when planting materials are required in large quantities.

*Suppliers of fixed assets:* Small producers either buy the greenhouse system from importers such as Crop Pro-Tech or buy greenhouse materials by parts. For example, importers bring in ultraviolet (UV) plastic sheets and insect nets. However, small growers largely use silpaulin covering sheet that is easily available in local markets. Silpaulin is a cheaper option to the UV plastic film but does not have the same protective effect on plants. Most small growers locally build greenhouse structures using bamboo. Bamboo is an easily available alternative to GI or aluminum structures and it is attractive because of the low investment cost. However, in the long run bamboo could be more expensive due to the high maintenance costs. Although most producers currently use bamboo structures, they are eager to shift to the GI or aluminum structures. The greenhouses locally built by producers often work as mere shades and have little or no environment control mechanisms that are essential to grow cut-flowers. There are also input supply companies such as SIAM Floritech that design and fabricate manually operated greenhouses using aluminum or galvanized iron structures and offer option of silpaulin or UV plastic sheet covering depending on demand. Locally designed and fabricated greenhouses are not temperature or humidity controlled, and therefore come with manually operated ventilation. Drip irrigation has gained popularity among commercial cut-flower producers in recent times and in some cases it has replaced canal irrigation. Suppliers for drip irrigation system import from India. The main suppliers are Nepal Thopa Sichai (translated as Drip Irrigation) and Crop Protect.

### Producers

In total, there are about 544 entrepreneurs who are involved in floriculture, of which 63 producers are involved in commercial production of cut-flowers. Among the 63, about 43 producers use greenhouses or plastic covered shades while the remaining 20 produce in open areas. Even among the 43 using greenhouses, only about 5 of them use high-tech or semi high-tech greenhouses. The main reason behind low technology is that the investment costs for imported high tech greenhouses are high for an average producer. However, there are many benefits associated with such technologies, including (i) metal structure that is more durable than the locally made bamboo, (ii) temperature and humidity control features, (iii) pest control nets that offers benefits of reduced use of pesticides. Cut-flower producers could be categorized into two kinds—those who produce year-round of which there are less than 50, and those who produce seasonal cut-flowers for specific seasons only. Production of cut-flowers is dominated by small scale entrepreneurs. A handful of migrants who have returned home have also made investments in the cut-flower production. Producers also fulfill the role of transporters up to the wholesale point. There is no dedicated mode of transport for cut-flowers. Producers use any vehicle available such as local busses, vans, taxis and motorbikes.

### *Wholesalers*

Among, these is Flora Nepal, which is a subsidiary of Golchha Organization. The firm produces cut-flowers and runs a wholesale unit which is also supplied by a number of other small farmers. Other major wholesaler include United Flora and Global Flora. These wholesale units are jointly owned by a number of different value chain actors through a structure that resembles a cooperative model. United Flora has 15 investors of which 7 are producers and others are retailers. This model has proven successful in vertical coordination as producers are guaranteed a secure market for their cut-flowers and retailers can get their supplies on a regular basis. The wholesale point also serves as an important platform for the flow of market information and minimization of ex-ante and ex-post transaction costs. The success of the United Flora model inspired other industry players (34 investors) to form Global Flora. Of the 34 investors, one is an input supplier, 20 are producers, 7 are retailers and the rest are entrepreneurs. Both United Flora and Global Flora source all of their producer from member that are producers and then sell to their retail members and others in the market. Each wholesale units provide employment to 4–6 unskilled/semi-skilled persons all year round and another 4–5 unskilled persons during peak seasons. The employees are largely male. In addition, there are other two privately owned wholesale units—Sri Suppliers and Oasis Continental.

### *Retailers*

There are 35 cut-flowers retailers in the country that are listed with (FAN), of which 3 are in Pokhara and the rest are in Kathmandu and Lalitpur. Another group of retailers is found in Biratnagar, Bhirahava, Birgunj, Narayanghad—but they are mostly not listed with FAN, and therefore their exact numbers is not known. It is estimated that this group purchase about 5 percent of domestic production.

### *Exporters*

The TEPC data shows that exports of floriculture products are decreasing steadily over the past decade. Furthermore, the share of cut-flowers in exports is very low. Everest Floriculture, a production farm established with the intent to export roses from Nepal to Japan, has successfully exported for a few years. However, due to various reasons, the company shut down a few years ago. According to the industry, what is regarded as exports of cut-flowers are really samples and not commercial volumes. This reflects occasional attempts by wholesalers to send samples for cut-flowers in small quantities to India. United Flora exports to India and Qatar periodically. Global Flora and Flora Nepal have also tried exporting to India a few times in the past but are not regularly.

### *Importers*

Imports from India are growing due to increasing domestic demand, most of which is coming from Kathmandu. Sri Suppliers, a wholesale unit and many other retailers import cut-flowers from India and Thailand. The flowers imported from India are mainly Rose, Carnation, Gerbera, Tuberose, Lily and Marigold. Orchids are mainly imported from Thailand. The importers from India use local agents who buy products on their behalf from the wholesale markets or "mandis" in key Indian cities such as Delhi, Calcutta and Silguri. The local agents are responsible for packaging the cut-flowers which are then transported by road for up to 36–48 hours. The means of transport includes buses headed to Kathmandu. Cut-flowers from India are brought in through the Raxaul, Birgunj, Bhirahava, Kakadbhitta border points. From there it takes from 12 to 48 hours to reach Kathmandu.

### *Consumers*

Approximately 90 percent of end consumers for cut-flowers are in Kathmandu, 5 percent in Pokhara and the remaining percent in cities such as Biratnagar, Bhirahava, Birgunj and Narayanghad. The consumption of cut-flowers in these cities has been increasing trend over the past decade, especially for weddings and other occasions. Retailers believe that 90 percent of consumers buy cut-flowers as gift for others. Consumers are quite satisfied with the current quality of production, but demand more variety and color. They are not socially or environmentally conscious to demand standards or labels that are sought after internationally.

## Notes

1. The classification of agro-ecological zone is implied by the numbering system for stratum in sampling design.
2. District is used as a stratification to draw random samples from the 2010 data. For each district, we draw data points of 2003-sample-size within that district. Districts that do not have enough observations to do so are assigned substitutes: Jumla and

Mugu are used for substituting Dolpa; Bejura and Bajhang for Humla; Lalitpur, Bhaktapur, Nuwakot for an insufficient portion of Kathmandu; and Parsa for an insufficient portion of Chitwan.

3. The process involves "out-of-sample" efficiency estimations, for which we impose the theoretical maximum value of one at the full efficiency level. Another way to put it is that we use the observation in question and a random sample of 2003-sample-size-minus-one data points from the 2010 data in estimating the DEA frontier for 2010.
4. By inspection, we excludes outliers, most of which have substantially higher revenues or expenses than the runner-ups in the distributions for the sample. This includes; Rice revenue exceeding 100,000 Rs: Wheat revenue exceeding 20,000 Rs: Other Cereal revenue exceeding 50,000 Rs: Pulse revenue exceeding 10,000 Rs: Tuber revenue exceeding 20,000 Rs: Oilseed revenue exceeding 50,000 Rs: Cash Crop revenue exceeding 100,000 Rs: Vegetable revenue exceeding 100,000 Rs: Fruits revenue exceeding 20,000 Rs: every output revenue-equivalent smaller than 1 Rs: Seed expense exceeding 80,000 Rs for 2003: Chemical Fertilizer expense exceeding 10,000 Rs: and Permanent Labor exceeding 100,000 hours for 2010. Each of these items drop up to a few observations.
5. This leads to a quantity index in the form of a weighted harmonic mean, where weights are the expenditures and variables are the pseudo-quantities repenting the total expenditure divided by component-specific prices.

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