INCLUSIVE AGRIBUSINESS GROWTH IN THE PHILIPPINES

THE ROLE OF DIRECT AND INDIRECT CHANNELS WITH A FOCUS ON THE LABOR MARKET

ASIA-PACIFIC POLICY CENTER

Inclusive Agribusiness Growth in the Philippines

The Role of Direct and Indirect Channels with a Focus on the Labor Market

FINAL REPORT

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ACRONYMS

A&D	alienable and disposable
AARNR	agriculture, agrarian reform and natural resources
ADF	Augmented Dickey Fuller
AFF	Agriculture, Fishery and Forestry
AFMA	Agriculture and Fisheries Modernization Act
AFTA	ASEAN Free Trade Area
Agrikulturang MakaMASA	Agrikulturang Makapagpabagong Programa Tungo sa MASAgana at Maunlad na Pagsasaka at Pangisdaan
AO	Administrative Order
ARBs	agrarian reform beneficiaries
ARMM	Autonomous Region in Muslim Mindanao
ASEAN	Association of Southeast Asian Nations
ASPBI	Annual Survey of Philippine Business and Industry
AVAs	agribusiness venture arrangements
BMBEs	Barangay Micro Business Enterprises
BSP	Bangko Sentral ng Pilipinas
CAR	Cordillera Administrative Region
CARP	Comprehensive Agrarian Reform Program
CEPT	Common Effective Preferential Tariff
CGE	computable general equilibrium
CLOA	Certificate of Land Ownership Award
CPI	consumer price index
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DENR	Department of Environment and Natural Resources
ECM	error-correction model
EO	Executive Order
FIES	Family Income and Expenditure Survey
GATT-WTO	General Agreement on Tariffs and Trade-World Trade Organization
GDP	gross domestic product
GMA-CARES	Ginintuang Masaganang Ani Countrywide Assistance for Rural Employment and Services
GVA	gross value added
HVCC	High Value Commercial Crops
IPP	Investment Priorities Plan

LFS	Labor Force Survey
LN	natural logarithm
MSMEs	Micro, Small and Medium Enterprises
MTPDP	Medium-Term Philippine Development Plan
NCR	National Capital Region
NIA	National Income Accounts
NLRC	National Labor Relations Commission
NSCB	National Statistics Coordination Board
NSO	National Statistics Office
PINF	real non-food price index
PPP	public-private partnership
RER	real exchange rate
RGDP	regional gross domestic product
SAM	social accounting matrix

EXECUTIVE SUMMARY

As would be expected in a growing economy, the relative importance of Philippine agriculture in total output and employment has dwindled over time. At the turn of the present decade, agriculture accounted for only about 18 percent of GDP and 33 percent of employment. Visibly, poverty reduction in the large majority of provinces has been accompanied by higher growth rates in non-agricultural incomes than in agricultural incomes. These patterns thus seem to suggest that the key driver to poverty reduction in the years ahead would be the growth of the non-agricultural sector.

This study shows, however, that not recognizing agriculture's crucial linkages with the other sectors of the economy can seriously understate the relative importance of agriculture in output, employment, and poverty reduction. The full range of economic activities in the agri-supply chains—from primary agriculture to agri-processing and trading—account for about a third of GDP and one-half of total employment. Firms directly related to agriculture compose the agribusiness sector, including agro-processors and farm input providers. Agribusiness has been growing at a higher rate (4%) than agriculture (2.5%). Moreover, employment share in agribusiness has been increasing; the proportion to total employment increased from 14% in 1988 to 18% in 2009.

In terms of the policy framework affecting agribusiness, the over-arching sectoral [agriculture, agrarian reform and natural resources (AARNR)] strategy in the 2004-2010 Medium-Term Philippine Development Plan (MTPDP) is supportive of agribusiness development as it seeks to establish the framework and mechanisms that will facilitate the transformation of farmlands into agribusiness enterprises. It likewise promotes non-farm enterprises including agri-processing. Agribusiness development is likewise highlighted in the so-called "banner programs" of the Department of Agriculture (DA). With regard to the promotion of agri-business development, the new administration is using the Convergence Strategy as its platform to develop lands for agribusiness.

As the agriculture sector has shown signs of staging a more rapid growth in the years to come, an interesting question to probe would be related to the movement of labor between primary/basic agriculture and agro-processing especially under various economic and policy scenarios that are aimed to facilitate development. A static Computable General Equilibrium (CGE) model of the Philippine economy is used to simulate the effects of various policy scenarios and evaluate their employment impacts across various economic sectors. Two scenarios were explored using the model. Scenario 1 (agriculture productivity enhancement scenario) imposes a one percent

productivity improvement for all agricultural commodities. It is designed to capture improvements in technology and/or farm practices. Scenario was implemented through a one percent increase in the use of primary inputs for all agricultural commodities. It is designed to capture higher investments in agriculture.

Results for Scenario 1 indicate that real GDP is projected to be 0.20% higher than its baseline value. Moreover, the value added of all the major sectors also increase, with a larger expansion for the non-agricultural sectors. The productivity improvements lead to an increase in aggregate and sectoral employment. The simulation results also suggest that the productivity changes lead to higher household income and international trade. Scenario 2 simulation results suggest that higher investments in agriculture are likely to cause an increase in the value added of all major sectors in the economy. This consequently leads to a 0.3% expansion in real GDP. Higher investments in agriculture lead to an across the board increase in the outputs of all the industries in the model. Higher value added for agricultural industries also causes the increase in employment for all industries.

In the aggregate, both scenarios are likely to cause an increase in aggregate output, employment and household income. The increases in value added and employment go beyond the Agriculture sector as similar results are found for the Industry and Services sectors. This finding may be explained by two factors. First, the decline in prices of agricultural commodities lowers the costs of industries that use these commodities as inputs in the production process. Second, the increase in household income, strengthened in some cases by lower commodity prices, increases domestic demand.

Growth of agricultural output is thus expected to have potentially large employment multiplier effects throughout the supply chains. These effects are particularly beneficial for the unskilled segments of the labor market, where poverty is typically intense and concentrated. That is, the growth is expected to increase the demand for unskilled labor (and possibly raise wages), thereby raising labor income and hence reducing poverty. Moreover, to the extent that agricultural growth exerts downward effects on food prices, households' real incomes are expected to rise, particularly for low-income households whose food expenditures usually take a high proportion of their total income.

The positive effects of agricultural growth on labor income through the labor-market channel were not quite evident in the regression results based on regional panel data, although confirmed by the simulation results based on the CGE model of the Philippine economy. The Anríquez and López model is used to identify the specific mechanisms or routes through which sectoral (agriculture or non-agriculture) income growth leads to poverty reduction and to quantify the relative magnitudes of such alternative routes. Results showing that labor demand elasticities are not statistically significantly

different from zero suggest that, unlike Chile, the pro-poor (pro-unskilled labor) impact of agricultural growth through the labor market channel in the Philippines is negligible, and the poverty reduction impact of agricultural as well as non-agricultural growth works through other mechanisms.

In contrast, the poverty-reducing effects of agricultural growth through the food-price channel are quite strong and robust. The regression results based on quarterly national data suggest that food prices respond negatively to growth of agricultural output: the elasticity of food prices with respect to agricultural output is about -0.07 in the short run and -0.44 in the long run. Simulation results further show that a 3% increase in agricultural output, which is quite close to the country's national average in the past decade, raises average real household income by 0.62% to 0.87%. This translates to a reduction of poverty incidence by around 0.30 to 0.40 percentage point, or (using the 2009 official poverty incidence as baseline) a decrease in the number of poor Filipinos anywhere from 264,000 to 352,000. A higher agricultural growth of 5%, which is quite feasible given the development experiences of the country's dynamically growing neighbors, leads to an increase of average real income by 1.04% to 1.46%, thereby reducing poverty incidence by 0.5 to 0.7 percentage point (i.e., a decrease in the number of poor persons by 440,000 to 616,000). Still, the effects of such growth on the poor are likely to be even higher than what these estimates suggest since the estimation ignores the fact that the proportion of food expenditures in total household budget is substantially higher for the poor than for the average household (particularly for the non-poor).

In addition to the effect of expansion of agricultural output to poverty via the food price channel, the direct effect of agricultural expansion, through the income of poor farmers, was also estimated. The results show that expanding the agricultural/agribusiness output by 1% increases the average income of poor farmers by about 0.1%, controlling for the farmer's off-farm income.

Evidently, developments in agriculture have potentially far-reaching effects on the economy, with the possibility that the income and employment benefits to non-agricultural sectors may even exceed those in agriculture. The CGE simulation results show, for example, that a sector-wide improvement in agricultural productivity (or, alternatively, an increase in agricultural investment) leads to a smaller proportionate increase in employment in agriculture than in non-agricultural sectors. The impact is particularly strong in agri-using industries as well as in sectors providing services to agriculture. Moreover, because aggregate food prices fall relative to nonfood prices, the real incomes of poor households rise, amplifying the poverty-reducing effects of agricultural productivity improvement on the demand for unskilled labor.

That agricultural growth should be seen as a complementary component of a poverty reduction strategy, even as primary agriculture now constitutes only a relatively small component of GDP, is evident in this study. To harness the potential of the sector in contributing to faster poverty reduction and inclusive growth, sustained improvement in agricultural productivity has to be high in the development agenda. Government has to substantially improve the investment climate in agriculture and rural areas. This would require moving away from the "business as usual" approach to governing the sector. In particular, the binding constraints to productivity and income growth in agriculture and rural areas need to be addressed.

Foremost among these constraints is the high "cost of doing business" in rural areas. Addressing this would require investing in basic infrastructure (transport, power, communication, and irrigation), improving governance, and, in many places, maintaining peace and order. Efficiency-inhibiting regulatory measures in all segments of the supply chains (e.g., Cabotage Law in shipping) also have to be removed. Such measures create high transactions costs, reducing the earnings of poor farmers and landless workers, and making food more expensive and less accessible to poor urban consumers and even small farmers who are net buyers of food. A related issue is the inefficient allocation particularly the emphasis on rice at the expense of other commodities that have greater market and output potential.

Access to credit is another critical constraint to productivity growth. The CARP (and its replacement, CARPer) has muted the efficient functioning of agricultural land markets. Efforts to get credit flowing to agriculture should involve making the CLOAs (Certificate of Land Ownership Award) bankable. This would require the elimination of restrictions on land transferability, land use, and contractual arrangements.

I. INTRODUCTION

Poverty in the Philippines continues to be a major concern in development as the trend in poverty reduction over the past two decades has been quite dismal—from 38% in 1988 to 26% in 2009 or less than one percent reduction per year. Latest poverty estimates (2009) indicate that poverty continues to be concentrated in the rural areas where 40% of the population is considered poor, while the figure is only 12% in the urban areas. Hence, the rural sector contributes to about three-fourths of the total poor in the country. The sectoral disaggregation would show that the poverty incidence in the agriculture sector is about 48% and contributes to about two-thirds of the country's poor. Given this picture of poverty in the country, the general thinking is that the main avenue to reduce poverty in the country is by raising farm incomes. As such, substantial resources have been channeled to assist small farmers, particularly those into rice and corn farming. This has been in the form of price support, fertilizer, credit and infrastructure subsidies.

However, a recent study by World Bank (2009) indicates that there is a rather weak linkage between agricultural growth and poverty reduction. The study demonstrates that agricultural growth does not dominate the process of poverty reduction, since the nonfarm sector plays an equally important role. The growth elasticity of the non-agricultural sector growth is found to be significantly larger than that of agricultural income growth. This puts into question the entire notion of raising farm incomes as a pathway out of poverty. Given this, should we concentrate on alternative pathways out of poverty? Or should we re-examine the analytical framework in assessing the contribution of agriculture to rural growth and poverty reduction? The analysis of sector elasticities to poverty reduction may have underestimated the contribution of agriculture to poverty reduction.

Focusing on farm income provides only a partial view of the broader role of agriculture in poverty reduction. Without taking into account the broader linkages that agriculture has with the rest of the economy the sector's contribution may be substantially underestimated. Hence, there is a need to expand the analysis to cover agribusiness, particularly the components of agriculture that may have been counted under other sectors. In addition to expanding the scope of the agricultural sector in assessing its impact on growth and poverty reduction, there is the need to examine the structure of the sector, particularly what is prioritized in terms of program support and protection. Poverty profiles, for instance, suggest that poverty is more prevalent among coconut farmers than rice and corn farmers, but substantial resources are poured into the latter crops. In addition, other exportable crops like pineapple, mango, bananas are given

much less support, or even none at all. This has resulted in limited diversification in the agricultural sector, impeding the growth of the non-farm economy thus limiting the creation of new jobs that would mostly be available to unskilled labor.

In this light, the World Bank has commissioned the Asia-Pacific Policy Center to look into the agribusiness sector of the country. The study aims to verify the following hypotheses:

1) the agricultural policy framework has had a negative impact on the capacity of the agribusiness sector to create nonfarm job opportunities;
2) these job opportunities represent an important channel through which poverty in the Philippines can be reduced; and
3) taking into account the linkages between agriculture and the rest of the economy would increase the contribution of agriculture in poverty reduction.

The study looked into four different areas to address the key objectives, each of which is covered in the following chapters of this report. Chapter 2 characterizes the agribusiness sector. Likewise, it isolates the income and poverty implications of the current structure of the sector particularly to rural households. Chapter 3 is devoted to reviewing key policies that have been implemented in the past as well as those that are still in effect. Chapter 4 measures the size of the sector and linkages between agriculture and the other sectors of the economy. In Chapter 5, the channels linking agricultural growth and poverty reduction are tackled. The report concludes with the key findings and policy implications in Chapter 6.

II. THE AGRIBUSINESS SECTOR

Definition

There are a number of ways of defining the agribusiness sector. One definition of the sector would be to include all industries that are linked to agriculture directly, such as the industries that provide inputs directly to agriculture (e.g. agrochemicals, seeds and farm machineries) and industries that make use of farm output as inputs into production processes to deliver goods such as food products, beverages, textiles, cigarettes, etc. The other definition of agribusiness is based on "the contribution to all economic activity required to support the delivery of food, clothing and shoes, and tobacco to domestic consumers and to support agricultural exports". This latter definition from Davis and Goldberg (1957) and Holt and Pryor (1999) takes into account all forward and backward linkages across all industries involved in the production either of the final inputs that are consumed by agriculture or of the final food products that are purchased by households for consumption or for exports.

Table 1. Agribusiness sub-sectors

Rice and corn milling	Production of crude vegetable oils, fish and other marine oils and fats
Flour, cassava and other grains	Manufacture of animal feeds
Sugar milling and refining	Manufacture of miscellaneous wood, cork, and cane products
Coffee roasting and processing	Tobacco leaf flue-curing and drying
Canning and preserving of fruits and vegetables	Manufacture of hardboard and particle board
Miscellaneous food products	Sawmills and planning of wood
Slaughtering and meat packing	Manufacture of veneer plywood
Fish canning	Manufacture of other rubber products
Fish drying, smoking and manufacturing of other seafood	Manufacture of jewelry and related articles
Manufacture of starch and starch products	Manufacture of wood carvings
Production of crude coconut oil, copra cake and meal	Restaurants, bars, canteens and other eating and drinking places
Manufacture of desiccated coconut	Wholesale and retail trade

For the purposes of this study, an operational definition is adopted using available data. An initial listing of the subsectors directly linked to agriculture was obtained from the input-output table produced by the National Statistics Office[1]. All sub-sectors with non-zero input coefficients were included in the initial list. This initial cut-off includes 84

[1] The only available IO table is as of 2000. This particular table has 240 lines.

sub-sectors. To isolate the relevant sub-sectors, two other indicators were used. Indicative output and employment size were estimated from the latest Annual Survey of Philippine Business and Industry (ASPBI). Using these indicators, a composite score was computed for each of the sub-sectors included in the initial cut-off. Table 1 lists the sub-sectors composing the agribusiness sector as defined in this study[2].

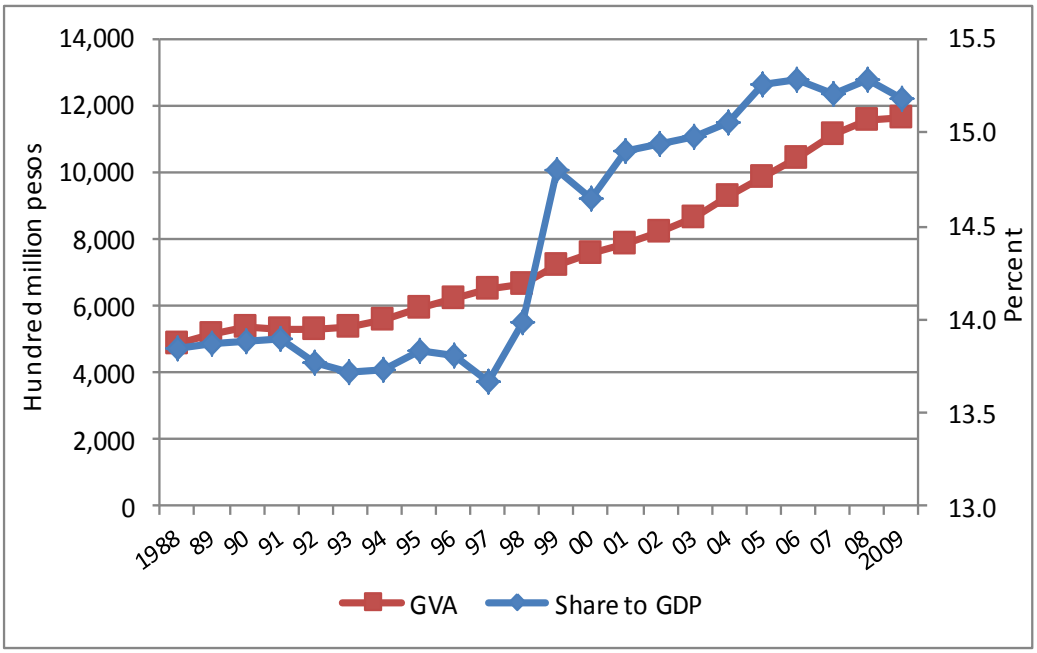
Output and employment estimates of the sector were computed using weights from the Census of Philippine Business and Industry and the ASPBI. Respective regional GVA were derived using these weights from the Regional Gross Domestic Products published by the National Statistics Coordination Board. Consequently, the data compiled for the analysis in the following chapters are regional aggregates.

Agribusiness trend

Output

Over the past two decades, agribusiness has been growing. Its average growth rate over the period is about 4%. This is higher than the average growth rate of the agricultural sector (2.5%). Despite this growth, its share to GDP has only increased by 1.3 percentage points.

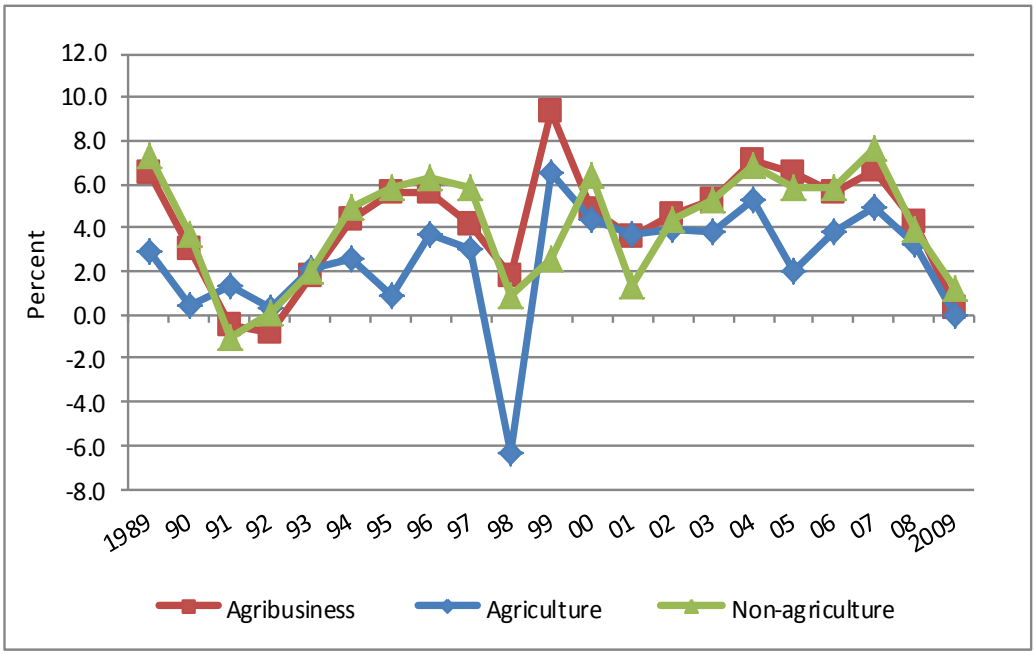
Figure 1. Agribusiness GVA and GDP Share



Source: Authors' estimates based on the National Income Accounts.

[2] See Annex A for the complete listing and estimates.

Figure 2. Growth in agribusiness, agriculture and non-agriculture



Source: Authors' estimates based on the National Income Accounts.

The growth pattern of agribusiness is similar to that of the non-agricultural sector. Intuitively, the sector is expected to mimic that of the agricultural sector, however, what is observed is the opposite.

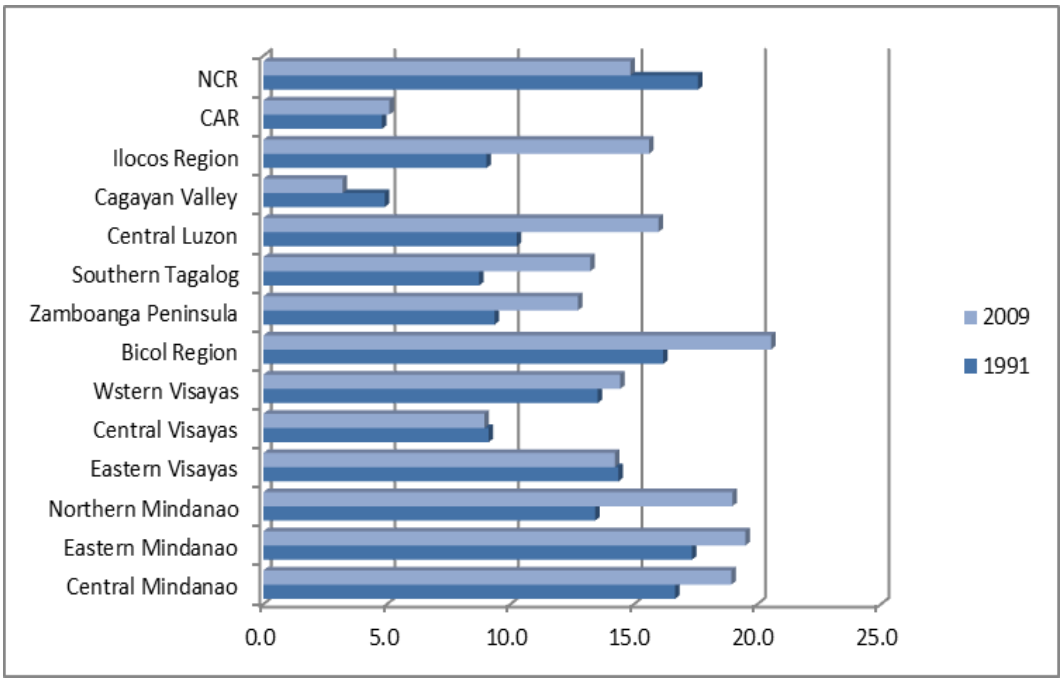
Table 2. Regional shares of agribusiness GVA (%)

Region	1991	2009
NCR	44.1	35.9
CAR	0.6	0.7
Ilocos Region	1.9	2.9
Cagayan Valley	0.7	0.4
Central Luzon	6.4	7.8
Southern Luzon	8.5	11.0
Bicol Region	1.9	2.3
Western Visayas	7.6	9.6
Central Visayas	6.1	6.4
Eastern Visayas	1.7	1.3
Western Mindanao	2.8	2.6
Northern Mindanao	5.0	6.3
Eastern Mindanao	8.8	8.8
Central Mindanao	4.0	4.0

Source: Authors' estimates based on the National Income Accounts.

The National Capital Region still holds the largest share of the sector. As seen in Table 2, about 36% of the sector's GVA is in NCR though this has gone down compared to its 44% share in 1991. The neighboring region of Southern Luzon holds about 11% followed by Western Visayas with 10% and Eastern Mindanao with 9%. Most of the manufacturing firms, food in particular, are concentrated in NCR and Southern Luzon while the relatively high share in Western Visayas is expected as most of the sugar mills and refineries are in this region (i.e., Iloilo and Negros Occidental). The booming production of banana and pineapple in Eastern Mindanao (Davao provinces) is driving the agribusiness sector in the region.

Figure 3. Agribusiness GVA shares by region (%)



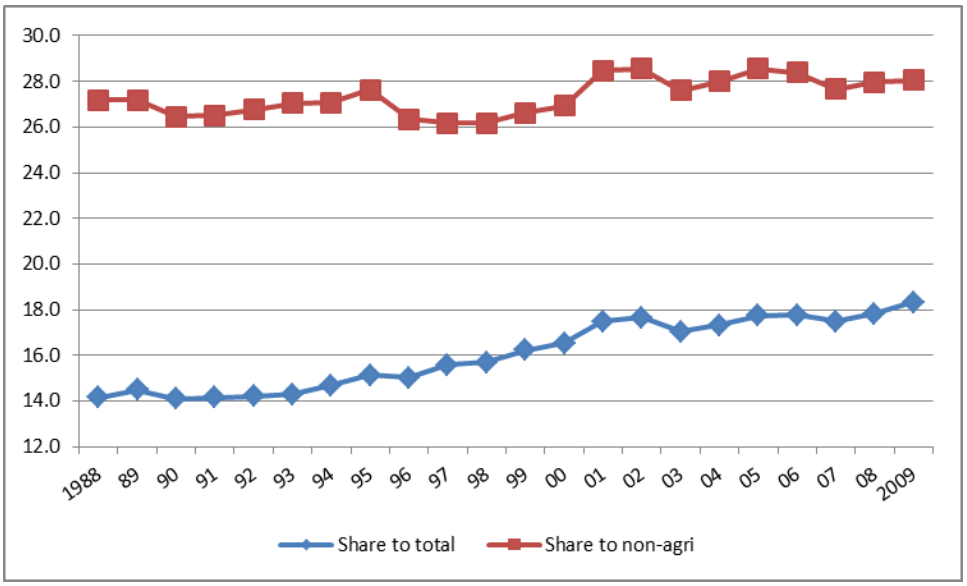
Source: Authors' estimates based on the National Income Accounts.

Looking at regional economies, the 2009 data shows that agribusiness in Western Visayas, Eastern Mindanao, Northern Mindanao and Central Mindanao is relatively higher compared to the other regions. Measured as the ratio of the agribusiness output over the region's GDP, the proportion in these regions is at least 19%. In contrast, Cagayan Valley and CAR have the lowest shares. Note though the expansion of the sector in Ilocos Region as well as in Central Luzon and Northern Mindanao where the increase in share to RGDP is at least 6 percentage points. NCR, Cagayan and, to a small extent, Central and Eastern Visayas and Western Mindanao saw a decrease in their respective shares. Maps of these estimates are seen in Annex B.

Employment

The Labor Force Survey of the National Statistics Office includes the two digit industry code of the respondent's employment. This information is sufficient to classify whether workers belong to an agribusiness firm as defined in the previous section. Following the full series of the LFS, we estimate the employment shares by region to total employment and to non-agricultural employment only.

Figure 4. Employment shares of agribusiness (%)



Source: Authors' estimates based on the Labor Force Surveys.

As seen in the figure above, employment share in agribusiness has been increasing. However, when it is taken as a proportion to total non-agriculture employment, the ratio has stagnated at about 28% over the recent decade. On the other hand, the proportion to total employment has increased from 14% in 1988 to 18% in 2009.

The spread of agribusiness workers across regions is shown in Table 3. Unlike what was observed with the sector's GVA, employment in agribusiness seems to be spread evenly across regions. As of 2009, Western Mindanao region has the highest share with almost 10%. This is followed by the rest of the regions in Mindanao with at least 8% ratio to total employment. This is not the same scenario observed in 1991 when the distribution was skewed to NCR and its neighboring regions. The only exception then was Western Visayas.

Looking at the distribution of employment within regions (Figure 5), NCR still has the highest proportion of those employed in agribusiness with about 24%. This is followed by the regions of Northern Mindanao (where most of the medium enterprises are located), Southern Mindanao, Ilocos and Central Luzon. The Cordillera Administrative Region remains to have the least proportion of agribusiness workers.

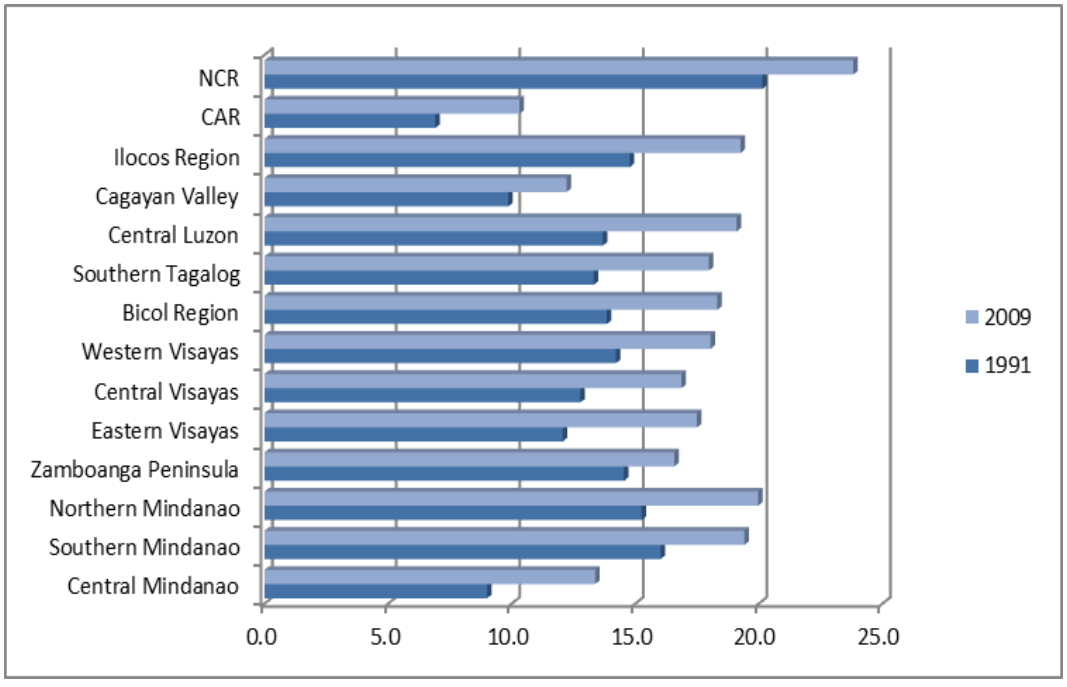
Table 3. Regional shares of agribusiness employment (%)

Region	1991	2009
NCR	17.2	5.7
CAR	1.0	5.3
Ilocos Region	5.8	7.9
Cagayan Valley	2.9	7.3
Central Luzon	9.1	5.9
Southern Luzon	11.9	5.7
Bicol Region	7.3	7.6
Western Visayas	9.3	7.1
Central Visayas	7.1	5.9
Eastern Visayas	5.1	7.5
Western Mindanao	4.9	9.6
Northern Mindanao	6.9	8.4
Southern Mindanao	8.3	8.1
Central Mindanao	3.3	8.0

Source: Authors' estimates based on the Labor Force Surveys.

The proportion has increased in all regions with Central Luzon and Eastern Visayas leading the roster. These regions posted 5 percentage point increases between 1991 and 2009. Corresponding maps are in Annex C.

Figure 5. Agribusiness employment shares, by region (%)

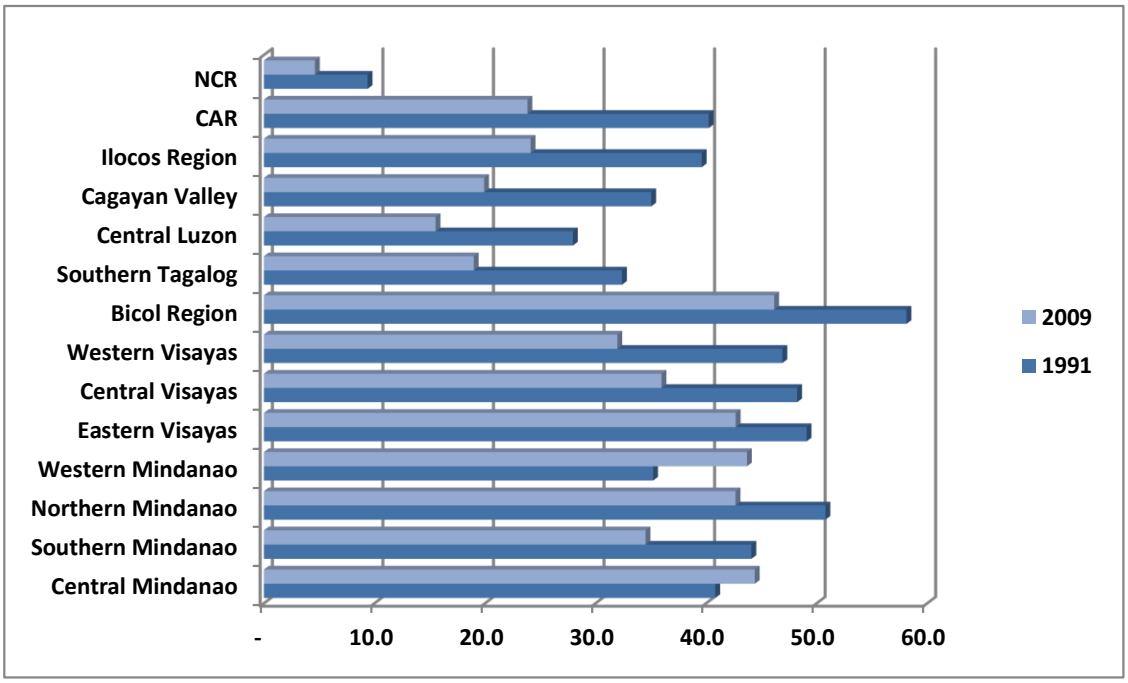


Source: Authors' estimates based on the Labor Force Surveys

Implications on poverty

Poverty reduction in the country has been middling over the past two decades. Estimates show that on the average, poverty has been decreasing by only 0.6%. The national average masks the varying performances of regions. Recent estimates show that only the capital region has the lowest incidence with 5%. Controlling for the initial level in 1991, it also has the highest percentage reduction among the regions. Poverty has decreased by 51% over the said period. With the exception of the Bicol region, all the other regions experienced a reduction in poverty by at least 40%. Lagging are the conflict ridden regions in Mindanao. In fact poverty increased in the regions of Western and Central Mindanao.

Figure 6. Poverty incidence by region, 1991 and 2009 (%)

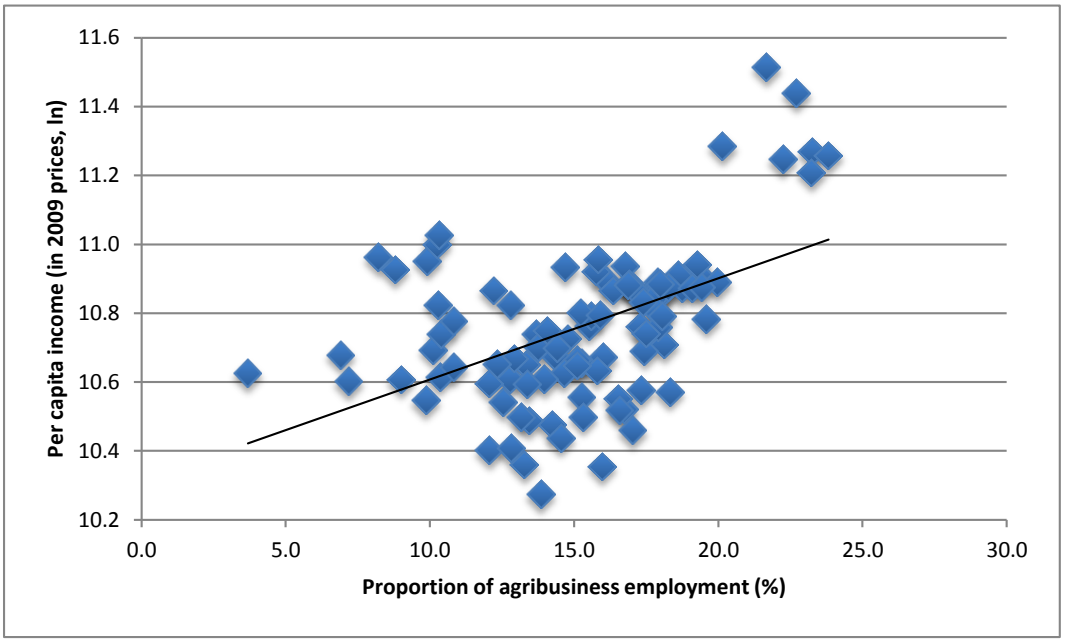


Source: Authors' estimates based on the Family Income and Expenditure Survey (various years)

Given these varying rates of poverty across regions, the study aims to link these to the relative performance of the regions in non-agricultural sector. Before proceeding to the more rigorous exercises the following chapters, a two dimensional presentation of these relationships are shown in the following figures. Note that these graphs provide indicative direction of the relationships being established.

Regions with higher proportion of non-agricultural employment (agribusiness employment in particular), have higher incomes. This positive correlation is shown in the scatterplot of regions over the period 1991-2009 (Figure 7).

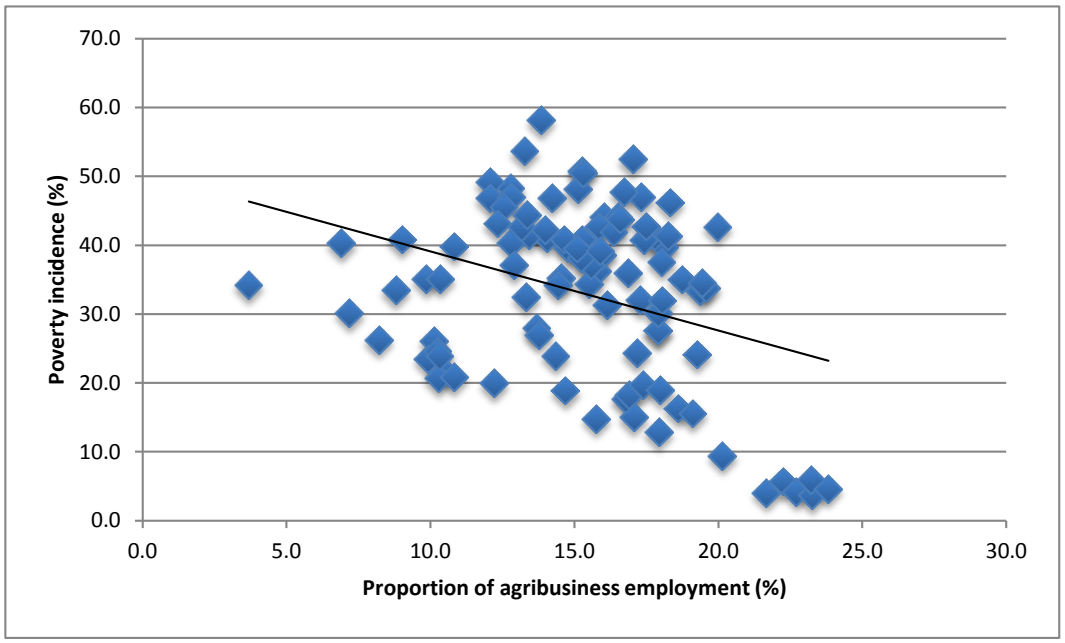
Figure 7. Agribusiness employment and incomes, 1991-2009



Source: Authors' estimates based on the Labor Force Survey and Family Income and Expenditure Survey

The inverse relation is observed when agribusiness employment is plot against the poverty incidence of the region. Employment opportunities outside agriculture entail higher incomes and thus the observed reduction in the number of poor.

Figure 8. Agribusiness employment and poverty (1991-2009)



Source: Authors' estimates based on the Labor Force Survey and Family Income and Expenditure Survey

III. POLICY FRAMEWORK AFFECTING AGRIBUSINESS

Background

Agribusiness development works within an extensive policy environment given its linkages between and among the key sectors of the economy: agriculture, industry, and services. Hence, the development of the agribusiness sub-sector is affected by a large range of policies across different sectors.

Here, we present a review of policies that affect agribusiness development in the Philippines. It will look into both sector-specific policies and the larger policy framework affecting the nature of doing business in the country. The sector-specific policies look at the agribusiness development framework within the over-all agricultural development framework and policies directly related to the promotion of agribusiness. On the other hand, other related policy areas that affect agribusiness include the labor market, land market and capital markets and these are also discussed.

Sector specific policies

For the past two decades, the country's agriculture development framework has consistently highlighted the importance of agribusiness development; however, there have been issues in operationalization and implementation of programs and projects related to agribusiness development. The support system has been rather weak and the focus is disproportionately skewed to rice, particularly towards attainment of rice self-sufficiency.

The over-arching sectoral [agriculture, agrarian reform and natural resources (AARNR)] strategy in the 2004-2010 Medium-Term Philippine Development Plan (MTPDP) highlighted the agribusiness approach to agricultural and rural development. The two main goals for the plan period was to develop at least two million hectares of new agribusiness lands in order to create at least two million jobs, or one job per hectare, and make food plentiful at competitive prices where the cost of priority "wage goods" such as rice, sugar, vegetables, poultry, pork and fish, and other important non-wage goods like corn must be reduced. Goal 1 is supportive of agribusiness development as it seeks to establish the framework and mechanisms that will facilitate the transformation of farmlands into agribusiness enterprises. It likewise promotes non-farm enterprises including agri-processing.

Agribusiness development is likewise highlighted in the so-called "banner programs" of the Department of Agriculture. Under the Estrada Administration, the banner policy

was called the Agrikulturang MakaMASA (Makapagpabagong Programa Tungo sa MASAgana at Maunlad na Pagsasaka at Pangisdaan). It had five operational components namely rice, feed crops, diversified farming systems, livestock, and fisheries through development of the following four areas of concern: irrigation development, research and technology commercialization, postharvest and processing modernization, and close partnership with investors and industry groups. Under the Arroyo administration, it was recast as the Ginintuang Masaganang Ani Countrywide Assistance for Rural Employment and Services (GMA-CARES) Banner Programs. It likewise consists of five sub-programs: GMA Rice, GMA Corn, GMA High Value Commercial Crops (HVCC), GMA Livestock, and GMA Fisheries. In 2009, the government consolidated all DA interventions to launch the F.I.E.L.D.S program. FIELDS stands for the six areas of support for the sector: Fertilizer, Irrigation, Education and training of farmers and fisherfolk, Loans, Dryers and post-harvest facilities, and Seeds of high–yielding and hybrid varieties. Cross-cutting programs include farm-to-market roads and irrigation development.

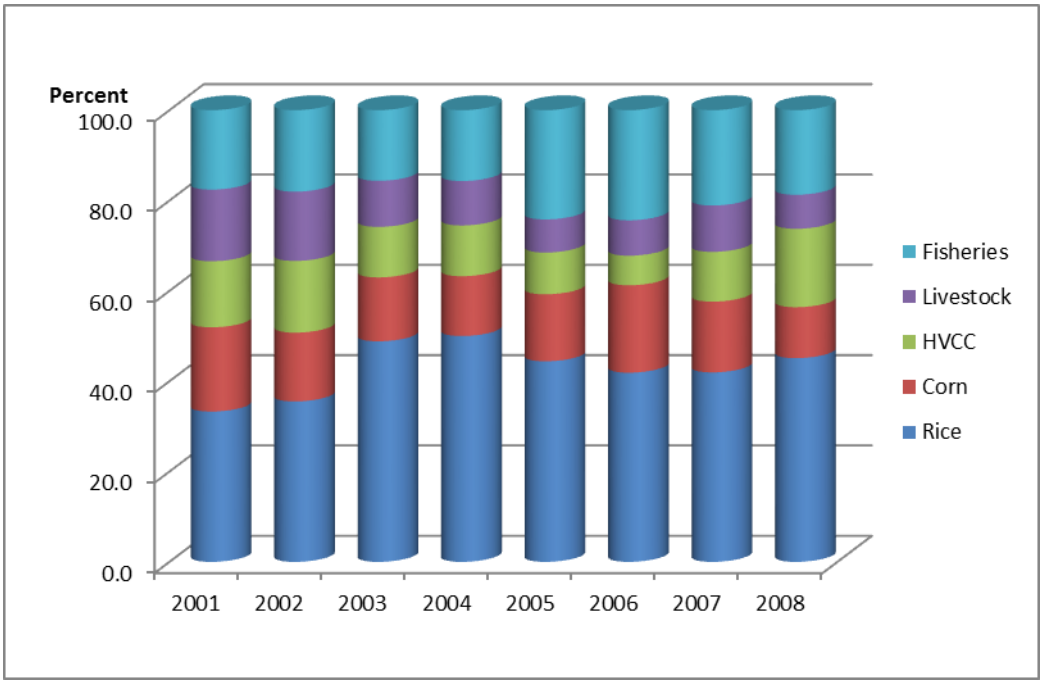
Among the sub-programs, it is the HVCC that has direct links to agribusiness development as it is the "high value" crops that have high export potentials, can generate relatively higher returns and have forward linkages in processing. In fact the sub-program was meant to implement RA 7900 or the *High-Value Crops Development Act of 1995*. The law provided the framework and coordinative mechanisms to develop large tracts of lands for high-value and commercial crops among the Department of Agriculture, Department of Agrarian Reform and Department or Environment and Natural Resources.

Despite the agricultural policy and program framework supportive of agribusiness development, there are gaps and related issues that hinder the full potential of agribusiness development in the country. Some of these are within the ambit of the agriculture sector, while others are part of the larger macro-economic policy environment like trade policy distortions, land market policies and regulatory burdens. These shall be discussed in the subsequent section.

Within the agricultural sector, the key gap identified is the inadequate public sector support for core services that would underpin and complement private enterprise in agriculture, such as market information, market development services, R&D, extension services and access infrastructure (WB, 2005). While this is partly due to inadequate funding in the agricultural sector, a more important and related issue relates to inefficient allocation particularly the emphasis on rice at the expense of other commodities that have greater market and output potential.

Data from the DA Budget Division and National Irrigation Administration shows that from 2001 to 2008, over P95.6 billion was disbursed to fund regular programs in agriculture. Two-thirds of this was spent for infrastructure (P50.7 billion for irrigation and P13.2 billion for farm-to-market roads) while the balance of P31.6 billion for the GMA program was spent significantly on rice. In 2008, 45.1 percent of the funds allocated to DA's regular programs was allocated to rice (Figure 9).

Figure 9. Allocation of DA program expenses (GMA-CARES)



Source: Budget Division, Department of Agriculture

In addition to a disproportionate focus on rice, a large share of public expenditure in agriculture is redistributive in nature and goes towards what are essentially private goods and services such as provision of seeds and planting materials, animals, agro-processing factories, tubewells etc., rather than genuine public goods (WB, 2005).

This emphasis on rice, particularly the objective of attaining rice self-sufficiency is a major policy focus of the Aquino Administration. Under the Aquino administration, the banner program is called the Agrikulturang Pilipino or Agri-Pinoy. Agri-Pinoy was recently launched and its guiding principles are (1) food security and self-sufficiency; (2) sustainable agriculture and fisheries; (3) natural resource management; and (4) local development. The President has committed to the Philippines' attaining rice self-sufficiency by 2013. Given this commitment, it is very likely that the DA's focus and funding on rice will continue. The fixation on rice self-sufficiency results in relatively higher price of rice in the domestic market compared to the world market price. The

effect is two-fold. Consumers pay more for their rice and rice land becomes more expensive.

With regard to the promotion of agri-business development, the new administration is using the Convergence Strategy as its platform to develop lands for agribusiness. The three agencies recently issued DA-DAR-DENR Joint Memorandum Circular No. 1, series of 2010 (Policy and Implementation Framework for the Enhanced National Convergence Initiative (NCI) among DA, DAR and DENR). The convergence strategy adopts the watershed and ecosystem management approach as the intervention framework in the convergence areas. The strategy will facilitate governance of sustainable rural development in an institutionally horizontal manner while adopting the watershed and ecosystem management approach. This will be done through: a) enhancing institutional efficiencies, b) expanding opportunities for agro-enterprise and agribusiness development, and c) achieving spatial integration. The Agro-Enterprise Cluster and Agribusiness Development under the NCI shall facilitate enterprise development and agribusiness within the convergence sites through the establishment of agro-enterprise clusters in all provinces. These clusters will be the locus of agribusiness initiatives based on the potential of the areas. DA, DAR and DENR are currently in the planning stage particularly in engaging the local government units to delineate focus areas and formulate convergence plans.

Land Market Policies

The institution of an agrarian reform program covering both redistributive and tenure improvement policies has substantially distorted the land markets particularly for agricultural land. Republic Act (RA) 6657 or the *Comprehensive Agrarian Reform Law* was signed into law on June 10, 1988 by President Corazon C. Aquino. The law covers all public and private agricultural lands regardless of tenurial arrangements and crops planted, including other lands of the public domain suitable for agriculture. Program beneficiaries include all agricultural lessees and share tenants regardless of crops grown as well as regular, seasonal and other farm workers, and farmers' organizations or cooperatives. Landowners covered under the program are generally allowed to have five hectares retention limit. This retention limit is the de facto agricultural land ownership ceiling. Program beneficiaries have an award ceiling of three hectares.

The restrictions imposed by the CARP on transferability and disposition of awarded lands have affected land markets. In particular, Section 27 provides that lands acquired by beneficiaries under CARP may not be sold, transferred, and conveyed except through hereditary succession, or to the government, or the Land Bank of the Philippines, or to other qualified beneficiaries for a period of ten (10) years. The protracted implementation of the CARP, which has twice been extended by subsequent laws, has

resulted in uncertainties over property rights. Landowners pending CARP coverage and implementation tend to under-invest in their agricultural lands. The ownership ceiling of five hectares limits the potentials for agribusiness development particularly for crops and commodities requiring large cropping areas to be profitable. While this could have been addressed by the land rental markets, the restrictions imposed by Section 27 of the CARP law, likewise restricts the rental markets. The ownership ceiling also constrains the credit market. Agribusiness firms may find it difficult to use their agricultural lands as collateral or security for loans as banks (as juridical persons) may only own a maximum of five hectares of land. Hence, technically any agricultural land beyond five hectares will be subjected to CARP coverage. This makes banks wary of accepting agricultural lands as collateral.

Within the context and limitations imposed by the CARP, the DAR recognizes the importance of agribusiness development and the opportunities for farmer-beneficiaries to increase their incomes through agribusiness. The strategy is through agribusiness venture arrangements (AVAs) between agrarian reform beneficiaries (ARBs) and investors/private sector. DAR A.O. No. 9, series of 2006, defines the rules and regulations related to the use of CARP lands for agribusiness venture arrangements, particularly when private investors and agrarian reform beneficiaries join together to develop and manage agricultural lands distributed under the CARP. Under the AO, there are different types of agribusiness partnership or arrangement that may be mutually entered between ARBs and investors. These are:

1. Joint-Venture Agreement – the ARBs and investors shall form a joint venture corporation (JVC) to manage farm operations, with the ARBs contributing the use of their land and investors contributing capital and technology for production, processing and marketing of agricultural goods, or construction, rehabilitation, upgrading and operation of agricultural capital assets, infrastructure and facilities.
2. Production/Contract Growing/Growership Contract – the ARBs shall commit to produce certain crops which the investor buys at pre-agreed terms
3. Marketing Contract – the ARBs shall engage the services of an investor who will explore markets and buyers for the produce of the ARBs.
4. Lease Agreement – the ARBs shall bind themselves to give the former landowner or any other investor general control over the use and management of the land for a definite period of time.
5. Management Contract – the ARBs shall hire the services of a contractor to assist in the management and operation of the farm for the purpose of producing high

value crops or other agricultural crops in exchange for a fixed wage and/or commission.

6. Service Contract – the ARBs shall engage the services of a contractor for mechanized land preparation, cultivation, harvesting, processing, post harvest operations and /or other farm activities for a fee.
7. Build-Operate-Transfer – the investor may build, rehabilitate or upgrade capital assets, infrastructure and facilities applied to the production, processing and marketing of agricultural products, which he/she shall operate for an agreed period after which the ownership thereof is conveyed to the ARBs who own the land where such improvements and facilities are located.

As the AVA policy and operating guidelines are formulated within the context of the CARP, the approval process for AVAs particularly those that require transfer of or allow the use and possession of the land in favor of the investor such as lease agreement, joint venture agreement or similar schemes require the review and evaluation by the field and central office units and approval by the Presidential Agrarian Reform Council. This bureaucratic process discourages potential investors or agribusiness firms to engage ARB groups in the venture arrangements.

Aside from distortions in the land market related to the CARP, there are also difficulties related to the acquisition and disposition of residential, industrial, commercial and public lands. The current land administration and management system in the country is based on the Public Land Act of 1936. Since then, a succession of laws, policies, and issuances have been passed relating to the administration of land, particularly A&D land. The laws, policies and issuances are being implemented by a multitude of government agencies. Many of the substantive and procedural laws were written without consideration of consequential amendments that their introduction will have on existing legislation.

This has resulted in an inefficient land administration and management system that is characterized by difficult and complicated procedures resulting in delays in the registration of land rights and adjudication of disputes. As the laws are being implemented by different agencies, there are overlaps in jurisdiction and mandates as well as duplication of functions and responsibilities. This situation likewise makes the land market inefficient as there are costs (both financial and opportunity costs) related to land market transactions. The current laws and system either does not allow re-classification of lands or makes the process of registering claims and acquiring titles expensive and difficult.

Labor market policies that increase the cost of doing business and those that restrict flexibility of companies and firms directly impact on agribusiness development as they

impact on the viability or profitability of agribusiness enterprises, particularly those in the formal sector. Labor market policies in the Philippines have come from a long train of welfare legislation put in the legal framework to protect labor's welfare, improve their incomes and job security as well as help developed a caring and prosperous society (Sicat, 2009). This is evident in labor policies related to mandatory minimum wage, worker dismissal and restrictions on fixed contract employment.

The minimum wage policy under the *Wage Rationalization Act* (R.A. 6727) provides for the setting of minimum wages through regional wage boards. Minimum wage rates are mandatory. The setting of the minimum wage rates is done at the regional level through the regional tripartite Wages and Productivity Boards. There are differential rates across regions by sectors (and sub-sectors). Registered agribusiness firms should comply with the minimum wage. Depending on the type of firm or agribusiness activity, the minimum wage may fall under any of the following major category:

1. Agriculture – plantation/non-plantation, by crop
2. Retail/Services
3. Manufacturing
4. Cottage/Handicraft/Micro-enterprise

As minimum wage is mandatory, it may discourage the development of agribusiness enterprises, or expanding existing informal enterprises.

Philippine labor laws provide strict requirements in dismissal of workers. The key provisions related to worker dismissal are contained in Article 283 of the Labor Code. The basic requirements for the lawful dismissal of a worker are just cause and due process. The just causes for dismissal are:

1. Serious misconduct or willful disobedience by the employee of the lawful orders of his employer or representative in connection with his work.
2. Gross and habitual neglect by the employee of his duties.
3. Fraud or willful breach by the employee of the trust reposed in him by his employer or duly authorized representative.
4. Commission of a crime or offense by the employee against the person of his employer organize immediate member of his family or his duly authorized representative.

The due process entails the following:

1. Written notice

2. Hearings
3. Decision by the employer (without prejudice to the right of the worker to contest the decision with the NLRC)
4. Quasi-judicial proceedings with NLRC

These restrictions make it difficult and costly for employers to dismiss workers, even when there is just cause for termination. The burden to prove just cause is with the employer and the administrative, quasi-judicial, and judicial process makes the process costly.

In a related vein, the termination or severance of an employee requires the employer give separation pay. This is prescribed by Articles 283 and 284 of the Labor Code. Separation pay is requisite payment to the employee when there is termination of employment by the employer for an authorized cause, the amount of which depends on the cause. If the termination is due to the installation of labor-saving devices or redundancy, the separation pay is one month's pay for every year of service or one month pay, whichever is higher. If the termination is due to retrenchment to prevent losses, or closure or cessation of operation of the establishment not due to serious business losses, or due to disease, the separation pay is one-half month's pay for every year of service or one month pay, whichever is higher. However, there is no requirement for separation pay if the closure is due to serious business losses. An employee who voluntarily resigns from his work is not entitled to separation pay. There is no provision in the Labor Code which grants separation pay to voluntarily resigning employees.

Article 281 of the Labor Code provides that probationary employment shall not exceed six months. An employee who is allowed to work after six months shall be considered a regular employee. This makes the employee entitled to security of tenure, which means that he/she cannot be dismissed without legal ground and will be entitled to employment benefits like vacation and sick leaves, as well as social security and health insurance coverage. This increases the cost of labor for the agribusiness firm. Fixed-term contracting as an alternative is not a readily available option as there are many restrictions revolving fixed term contracts.

Economy-wide and Other Related Policies

Tariff Reform and Trade Liberalization

The Tariff Reform Program was initiated in 1981 to review/restructure the Philippine tariff system to make the tariff structure responsive to the needs of the economy taking

into account changing patterns in trade and advancements in technology. So far, four (4) tariff reform programs have been undertaken since the 1980s.

Government's intent to reform the tariff structure was realized with the issuance of E.O. 334 which provides the tariff schedule from 2001 to 2004 for all products (excluding certain meat products falling under HS Chapter 2, rice, corn and sugar whose individual tariff schedules have yet to be determined). Under this E.O., a tariff band of 0% - 5% was to be implemented by 2004 (except for a limited range of sensitive agricultural products with a 2004 tariff rate of 30%).

With the effectivity of E.O. 334 on January 1, 2001, the average nominal tariff declined from approximately 10% in 1999 to 5% in 2004. Average tariffs for the agricultural, fishery and forestry sectors are higher due mainly to the greater tariff protection accorded sensitive agricultural products. From 2001 to 2003, more than half of total tariff lines will be dutiable at 3% and below. In 2004, nearly 97% of all tariff lines will have duties falling within the target tariff range.

Trade liberalization initiatives include the country's accession to the General Agreement on Tariffs and Trade-World Trade Organization (GATT-WTO), and the ASEAN Free Trade Area (AFTA) with its accompanying Common Effective Preferential Tariff (CEPT) scheme.

Trade reform policy of the government had its beginnings in the early 1980s with the objective of correcting the imbalances caused by the country's import substitution policies. The average nominal tariff rates fell from 41.4 percent in 1980 to 27.6 percent in 1985. The agriculture sector however was the most protected sector with average nominal tariff rate of 35.9 percent. The second phase of the trade reform policy saw large reductions in nominal tariff rates, from 28 percent in 1990 to 16 percent in 1995. Agriculture still maintained a higher rate at 28 percent. By 2004, the nominal tariffs for the manufacturing and mining sector began to cluster around the 3 percent mark. The agriculture sector still had a relatively higher protection rate with nominal tariffs at 9.3 percent (Tecson, 2007).

The liberalization of Philippine agriculture under the WTO saw the conversion of non-tariff barriers like quantitative restrictions to tariffs. The country was able to negotiate concessions for some commodities, particularly rice and sugar, but practically all agricultural products were subject to tariff schedules that will eventually lead to zero-tariff.

The AFTA involves the removal of obstacles to freer trade among member states. This includes the abolition of high tariffs or taxes on traded goods and the scrapping of quantitative restrictions (QRs) and other non-tariff barriers (NTBs) that limit the entry

of imports. The main implementing mechanism of AFTA is the Common Effective Preferential Tariff (CEPT) Scheme.

The ultimate objective of AFTA is to increase ASEAN's competitive edge as a production base geared for the world market. A critical step in this direction is the liberalization of trade in the region through the elimination of intra-regional tariffs and non-tariff barriers. This will have the effect of making ASEAN's manufacturing sectors more efficient and competitive in the global market. At the same time, consumers will source goods from the more efficient producers in ASEAN thus expanding intra-ASEAN trade.

CEPT is a cooperative arrangement among ASEAN Member States that will reduce intra-regional tariffs and remove non-tariff barriers over a 10-year period commencing January 1, 1993. The goal of the Scheme is to reduce tariffs on all manufactured goods to 0-5% by the year 2003. This will benefit Philippine exporters to ASEAN. The lower CEPT rates make the country's products cheaper in these markets, thus stimulating greater demand. The increase in exports to ASEAN would depend on the price elasticity of demand.

All manufactured products, including capital goods and processed agricultural products, and those falling outside the definition of "unprocessed agricultural products" are covered by the CEPT Scheme.

Fiscal Incentives

The Investment Priorities Plan (IPP) outlines the priority investment areas that are subject to fiscal incentives like tax incentives, income tax holiday, tax credits, and special non-fiscal incentives, such as preferential treatment when applying for Alien Employment Permit and Work Visas for foreign staff. These areas include the production and processing of agricultural and fishery products (including their by-products and wastes), biofuels, feeds, and fertilizers. This also covers biotechnological products and services and manufactured products related to herbal and/or traditional drugs. The incentive to invest in the Autonomous Region in Muslim Mindanao (ARMM) is given a high priority as the list of investment areas under agriculture, agribusiness/aquaculture and fishery is quite comprehensive. On the other hand, the *Foreign Investments Act* of 1991 (RA 7042, as amended by RA 8179) has liberalized the entry of foreign investments in the country.

Fiscal Incentives for Agriculture and Agribusiness is likewise provided under RA 9501 or the *Magna Carta for Micro, Small and Medium Enterprises* (MSMEs). Incentives for agribusiness-based MSMEs include productivity enhancement services and access to tax credits and other tax and duty incentives.

In the area of enterprise promotion and development, R.A. 9178 or *Barangay Micro Business Enterprises* (BMBE's) Act of 2002 encourages the formation and growth of barangay micro business enterprises (BMBEs) which effectively serve as seedbeds of Filipino entrepreneurial talents, and integrating those in the informal sector with the mainstream economy, through the rationalization of bureaucratic restrictions, the active granting of incentives and benefits to generate much-needed employment and alleviate poverty.

On the other hand, under the AFMA, agricultural and fisheries enterprises, and micro-agricultural processors are provide with incentives through the grant of tariff exemptions on the importation or agricultural and fishery inputs, machinery and equipment.

Monetary Sector Reform

Monetary sector reform to support the agricultural sector through the amendment of the agri-agra law is envisioned to enhance investments in agriculture and agribusiness. RA 10000 or *An Act Providing for an Agriculture and Agrarian Reform Credit and Financing System through Banking Institutions* amended Presidential Decree 717. The new law mandates banks to lend 25% of their loanable funds to the agriculture sector – 15 % for agriculture stakeholders and 10% for agrarian reform beneficiaries. It restricted alternative modes of compliance to investments that directly benefit small farmers, fishermen, and their cooperatives. It likewise provides for stiffer penalties for banks that fail to lend to the agriculture sector.

IV. MEASURING THE SIZE OF THE AGRIBUSINESS SECTOR AND LINKAGES BETWEEN AGRICULTURE AND OTHER SECTORS

Introduction

The combined primary subsectors of Philippine agriculture seems to be recovering from its poor performance in the past decade (Table 4). It is expected to grow by at least 2.5-3.5% in 2011 as increases in the gross value of agricultural output in 2010 spill over 2011.[3]

Table 4. Sectoral growth rates and their respective shares to GDP, 1990-2010

GVA Growth rates (in %)	1990-94	1995-99	1990-99	2000-04	2005-10	2000-10
Agriculture	1.62	1.58	1.60	4.19	2.77	3.41
Manufacturing/Industry	0.90	3.41	2.29	4.70	4.15	4.26
-Agribusiness	2.47	4.02	3.66	4.41	1.83	3.63
Services	1.59	5.38	3.70	5.08	4.46	6.43
GDP	1.68	3.71	2.81	5.43	4.93	4.81
Shares to GDP (in %)						
Agriculture	22	19	20	19	15	18
Manufacturing/Industry	35	35	35	34	32	33
-Agribusiness	14	14	14	15	15	15
Services	43	45	44	47	49	48
Total GDP (2009 PhP Billion)	19.5	23.2	42.7	28.0	35.9	63.9

Notes: Agriculture includes fisheries and forestry. Growth rates computed for period 1990-2010.
Agribusiness growth rates are computed for periods 1990-2009. See Annex A for sub-sectors covered in Agribusiness.
Manufacturing and GDP growth rates are computed for the period 1990-2010.
Source: BAS

The continuance of such performance can greatly boost the country's economic standing since the sector remains very vital despite its declining contribution to the

[3] Dr. Rolando Dy as quoted in Yu (2011). Online, (http://carpolaw.com/articles/bright-prospects-ahead-for-philippine-agricbuisness).

GDP. This importance is enhanced when the sector is taken in the bigger agribusiness context that includes subsectors like agricultural inputs, agro-processing and other agro-related economic activities. As indicated in the table, the agribusiness sector has exhibited slightly stronger growth relative to primary agriculture over the period 1990-2010. The maintenance or further strengthening of the sector's growth performance can provide incentive for primary agriculture to likewise expand. The relative importance of the agribusiness sector is further enhanced when considering the potential of the sector to generate and absorb labor employment. Agribusiness is projected to emerge as a key employment generator in the next five to ten years as it boasts a number of "hard to fill demand posts"[4].

As mentioned earlier, the composition and size of the agribusiness sector is based on the national accounts data and the 2008 ASPBI. The sub-sectors covered under the primary agriculture and agribusiness sectors, respectively, are shown in Annex A.

The objective is to determine the movement of labor between primary/basic agriculture and agro-processing. Such employment effects become larger as agribusiness matures and diversifies away from basic agriculture. They are also bigger for high value crops compared to the traditional crops (e.g. grains like rice and corn). And as has been indicated earlier, there typically exists an excellent potential for rapid job growth in the affiliated agro-processing industries. A Computable General Equilibrium (CGE) model is used to validate the hypothesis in relation to the flow of labor across sectors under various economic and policy scenarios.

Primary Agriculture Sector Composition and Performance

Primary agriculture covers the crop subsector, livestock, poultry, fisheries and forestry. Table 5 seems to indicate a relatively remarkable performance of the sector (excluding forestry) in terms of its gross earnings over the period 1990 to 2010. At constant 1985 prices, gross earnings of primary agriculture grew at an average rate of 3.04% annually, increasing by 64% from PhP 202 billion in 1990 to PhP 331 billion in 2010. The sub-sectoral performance exhibited huge variations, however, as presented below.

Crops Subsector

The crops subsector continued to dominate the agriculture sector, although its share to gross earnings declined from about 56% in 1990-94 to about 47% in 2005-10 despite

[4] As expressed by Criselda Sy, Director of Local Labor based on the projection estimates of a study conducted by the Department of Labor and Employment (DOLE) entitled "Project Jobs Fit: The Dole 2020 Vision" (http://carpolaw.com/articles/bright-prospects-ahead-for-philippine-agricbuisness).

Table 5. Primary Agriculture: Value of Production (in PhP million)

Commodities	1990-94	% to Total Agriculture 1990-94	1995-1999	% to Total Agriculture 1995-99	2000-04	% to Total Agriculture 2000-04	2005-10	% to Total Agriculture 2005-10	Growth Rate (%) 1990-99	Growth Rate (%) 2000-10	Growth Rate (%) 1990-2010
Crops	116,158.1	55.7	124,811.4	53.0	129,928.4	48.8	149,111.0	46.9	1.27	1.10	1.48
Palay	31,513.9	15.1	35,000.5	14.9	43,647.7	16.4	51,998.9	16.4	2.65	2.55	3.35
Corn	13,717.9	6.6	12,402.7	5.3	13,851.8	5.2	18,959.8	6.0	-0.33	3.72	1.62
Coconut	17,586.6	8.4	18,478.5	7.8	20,967.2	7.9	23,094.5	7.3	-0.03	1.85	1.36
Sugarcane	7,033.8	3.4	6,593.9	2.8	7,576.5	2.8	7,330.9	2.3	2.74	-2.57	-0.06
Banana	5,407.5	2.6	6,669.7	2.8	9,402.5	3.5	14,134.7	4.4	5.69	7.69	10.11
Pineapple	2,239.2	1.1	2,827.5	1.2	3,048.6	1.1	3,757.1	1.2	3.17	3.84	4.13
Other crops	38,659.1	18.5	42,838.5	18.2	31,434.1	11.8	29,835.1	9.4	0.46	-2.41	-1.05
Livestock	25,030.6	12.0	31,366.3	13.3	37,282.5	14.0	40,865.4	12.9	4.25	1.76	3.58
Poultry	24,447.6	11.7	32,575.4	13.8	41,090.4	15.4	46,243.9	14.6	5.88	3.16	6.09
Fishery	42,843.3	20.6	46,807.3	19.9	57,767.6	21.7	81,606.5	25.7	1.62	7.01	5.49
Total Agriculture	208,479.6	100.0	235,560.3	100.0	266,068.9	100.0	317,826.7	100.0	2.19	2.64	3.05

Source: CountrySTAT, Philippines: Bureau of Agricultural Statistics, online accesses April 2011.

the increase in average gross earnings from PhP166 billion in 1990-94 to PhP 150 billion in 2005-2010. This decline in shares was contributed by the relatively poor performance of sugarcane and the minor crops like tobacco, garlic and coffee. The rise in gross earnings came primarily from higher commodity prices that made up the decline in the volume of outputs.

Rice and corn exhibited steady production growth except in those years affected by extreme weather condition like the drought in 1997-98 (and for about 9 months in 2008-2009) or the more frequent occurrence of super typhoons. Over the period 1990-2010, however, an average annual growth rate of 1.48% and 3.35% were estimated gross earning gains for rice and corn, respectively.

Gains from coconut and sugarcane in recent years came from a rapid surge of prices as their demand strengthened for both food use and biofuel processing. The increase in the gross receipts for banana came from both higher production (expansion in area and bearing hills) and higher commodity price. Mango production, which exhibited rapid growth in the 1990s, experienced huge decline in 2008 and 2009. There are signs of recovery with production expanding by about 7% in 2010 from the previous year's production value of PhP 5.5 billion. A key factor that contributed to this rebound was the continuous flower induction that happened during the first half of 2010. The big gainers among the minor crops are rubber, calamansi, and some vegetables like onion, cabbage and eggplant.

Livestock, Fishery and Forestry Subsectors

The livestock subsector grossed PhP 211.0 billion at current prices which represented a 7.41% gain from the 2009 record. This gain was contributed by all animal types, like carabao, cattle, hogs, and goats from both production expansion and higher prices. Production of dairy products likewise expanded and contributed to the gross earnings of the sub-sector. The poultry subsector also exhibited gains with gross earnings that amounted to P152.1 billion or a 4.8% increase from the 2009 gross earning level.

Finally, the fisheries subsector grossed PhP 221.3 billion at current prices and posted a 2.6% expansion from the 2009 level. Better prices enabled commercial fishermen to recover in 2010 with a recorded 3.6% increase in the gross value of output. A 3.0% increase in gross earnings was realized in the municipal fisheries due to increased production and farmgate prices. In the case of aquaculture, gross receipts went up by 1.7% because of output expansion during the year.

Forest is regarded as an important resource for development in the Philippines. Its vast expanse provides a vital economic base for a large portion of the population. It is also home to a wide range of flora and fauna, provides raw material for forest-based

industries and furnishes the people and the economy of the Philippines with recreation areas, eco-tourism sites and a host of other benefits. These resources, especially those used for lumber and wood production, have rapidly declined. The Philippines was once a net exporter of forest products. It now imports a huge volume of wood products. The sector's contribution to the country's GDP has gradually diminished over time. The slight improvements achieved in early 2000 came as a result of a number of conservation programs initiated by the government to revive the sector. But these improvements hardly impacted the sector's growth. Since 2005, the sector's performance again deteriorated as indicated by the decline in its gross revenue at an average of 5% per year. The forestry sector has barely made even a 1% contribution to agriculture's gross value added for so many years now.

Agribusiness: Trends and Prospects

While very much dependent on the growth of primary agriculture, the growth of agribusiness is viewed as a vital sector contributing to economic prosperity. In most Asian countries, agribusiness remains crucial in terms of labor absorption and export earnings. In the Philippines, agribusiness is dominated primarily by big plantation traditional crops, namely, pineapple, bananas, rubber, coffee and sugar. The harvesting, sale, processing and other agribusiness-related aspects are handled by multinational corporations and other business enterprises. Agribusiness related activities in livestock as well as in fish and other marine products are rapidly coming in to further boost the expansion of the sector

As can be noted in Table 4, the agribusiness sector has doubled in size in terms of its gross value added from about PhP 534.7 million in 1990 to PhP 1.2 billion in 2009. The sector's average rate of expansion has been steady at around 3.6% per annum in the last 20 years, slightly surpassing growth of the agriculture sector in both decades. Its relative share to the regional gross domestic product increased only slightly, however, from about 14% in the 1990s to about 15% in the 2000s due to the rapid expansion of the service sector as well as the mining and quarrying sub-sector.

Prospects

The promise of greater profits in the agribusiness sector in the years to come has prompted major non-agricultural corporations to explore new opportunities in agribusiness ventures. San Miguel Corp., the country's monolithic food conglomerate, is presently engaged in several agribusiness ventures. It operates three broiler chick farms and a broiler processing plant and has expanded its dairy farm in Alfonso, Cavite. Its affiliate, Filipro, established an experimental six-hectare soybean farm in Tupi, South Cotabato to identify and develop high-yielding and pest-resistant soybean varieties. San Miguel Corp. itself launched a major shrimp culture project in Calatrava, Negros

Occidental, to conduct research and help develop the nation's prawn industry into a major dollar earner.

Philippine Packing Corp., the maker of Del Monte pineapples and tomato catsup, is busy exploring the feasibility of exporting solo papayas. The Puyat-owned Mom & Pop Corp. is likewise vigorously undertaking agribusiness ventures in vegetable farming, mango fruit production, and floriculture.

Prospective growth for the agriculture industry is expected especially in the livestock, poultry, and fisheries subsectors. A number of foreign and local companies are already tapping into these industries, and opening up employment opportunities in Philippine agribusiness. For example, the Philippine-based company AgriNurture, a local producer of farm goods, recently undertook PhP 1.7 billion worth of agribusiness projects with the Chinese government of Guangxi province, and is currently negotiating the export of vegetables and other commodities to the United States.[5] Another company, the Thailand-based Charoen Pokphand (CP) Foods has also invested PhP 1 billion in a hog production facility in Concepcion, Tarlac.

The potentials of some commodities for expansion are briefly discussed below.

Invigorating the traditional export crops (sugar, coconut, pineapple and banana): The same traditional crops and their products have been exported in the last 25 years. Coconut has not advanced unlike palm oil in the ASEAN because of low productivity. However, the export of coconut fatty alcohol, used as raw materials in manufacturing detergents, has shown potential for further development and expansion. Its use (and also that of sugarcane) as feedstock for bio-fuel processing has been attracting a large number of foreign and local investors. In fact, a number of public and private sector initiatives have already been set-up to develop bio-fuels in the Philippines, including a Php 12 billion private sector investment expected to produce about 240 million liters of bio-fuel annually, and various public-private partnership (PPP) projects. The use of anhydrous alcohol or ethanol (a derivative of sugar) to replace naptha (the imported gasoline additive) could generate foreign exchange savings and additional export earnings. But moving further in this direction should be done with much care, taking into consideration the net effect not only on food security but also on the environment.

Pineapple and banana exports are dominated by multinationals. Business opportunities exist, however, in the small- and medium-scale processing of the fruit in dehydrated, dried and candied form. In fact, the value of processed pineapple was about 3 times higher than the value of fresh fruit exports. This is still not the case in banana where

[5]http://doingbusinessinthephilippines.com/general/bright-prospects-philippine-agribusiness-2/

fresh banana dominates exports and processed products exported are limited to banana chips and crackers. The persistent complaint of processors and exporters is the inadequate raw materials not only for coconut oil mills but also for dried fruits, purees and others.

Expansion of non-traditional export crops: Among the non-traditional export crop, mango seems to have some the biggest prospect in the international considering the taste and quality of the fruit which is distinct to the Philippines. The expansion of mango exports, however, still face the problem of penetration and development of markets in China, Europe, and the United States primarily from the phyto-sanitary aspect. Technology seems to be still inadequate to guarantee the pest and disease free status of the fruit. The fumigation process used by local growers is deemed unacceptable to many importing countries. Local growers also face future competition from other ASEAN countries that are rapidly expanding production by planting millions of mango trees to cash in on the bright prospects for this fruit in the Asia-Pacific region.

Solo papayas—a papaya variety that is small enough for one person to eat—have a huge export market. Although Hawaii is the current principal supplier of this product, the Philippines has a decided advantage in terms of freight cost. However, problems remain because Japanese quarantine regulations do not permit the same fumigation process allowed for Philippine mangoes to be used on solo papayas. Compounding this problem are moves in the United States to ban the application of ethylene dibromide (EDB) in the fumigation of fruits. The solo papaya market is starting to expand in other Asian countries like Hong Kong.

Expansion prospects of horticulture industry: Ornamental and cut flowers also present good market possibilities. The world market for flowers is huge—around $10 billion for cut flowers alone. Several varieties of flowers such as roses, chrysanthemums, gerbera, carnations, and orchids and grown in Baguio, can be grown under greenhouse conditions to achieve export quality. Almost any variety can be grown in the country without artificial heating or cooling, and year-round production is possible. Per hectare sales value is very high and can easily cover the cost of the labor-intensive operation.

Animal Feed business: Though raw materials for feedstuff primarily consist of oil cake, other copra residues, pet feeds, pelletized ipil-ipil leaves, and other raw materials such as soybean and pineapple pulp wastes, are in demand for feedstuff production. Potential for continued expansion is focused on the domestic market.

Hogs industry: Hog exports are currently small, but export prospects exist in the more affluent East Asian countries of Hong Kong and Singapore. Unfortunately, local producers have not been able to cash in on the rising tide of importation in these

countries because of high feed costs that make hog exports uncompetitive in price. Lower feed costs, however, would remedy the problem.

Marine Products: Aquaculture ventures such as shrimp and prawn farming are also promising areas. Exports are growing, mainly due to the aggressiveness of local producers in supplying the Japanese market. Malaysia, India, Indonesia, China, and Thailand are the country's chief competitors for this market. Domestic producers have also set their sights on the Canadian and American markets. Competition for canned tuna is keen. Thailand, the Philippines' biggest competitor, has moved ahead and is now the biggest exporter of canned tuna to the United States. Regaining the top spot in canned tuna exports to the United States may prove difficult due to the low interest rates and generous fiscal incentives granted by the Thai government to its tuna canners.

Employment Trends and Prospects

Table 6 below shows the trends of labor employment in the Philippines for the past two decades by sector. Labor employment has increased by slightly more than 150%. The figures indicate that most of this expansion took place in the service and the agribusiness sectors where labor employed almost doubled. These trends seem to validate the assertion already expressed about the potential of the agribusiness sector as a major employer in the years to come.

Table 6. Labor employment trends

Year	Total Employment	Primary Agriculture	Industry	Services	Manufacturing	Agribusiness
1988-89	21,958,658.3	10,293,751.2	3,277,608.4	8,387,298.8	2,279,721.7	3,179,948.7
1990-94	23,967,575.0	11,050,369.2	3,642,925.0	9,274,280.8	2,449,562.0	3,468,434.1
1995-99	27,435,478.3	11,033,377.9	4,448,599.1	11,953,501.4	2,759,665.2	4,327,580.2
2000-04	30,561,617.6	11,606,775.7	4,683,391.4	14,271,450.6	2,927,744.0	5,307,694.4
2005-2009	33,955,989.7	12,294,312.7	4,985,208.7	16,676,468.4	2,995,819.9	6,106,946.6

Year		% to total employment	% to total employment	% to total employment	% to total employment	% to total employment
1988-89		46.9	14.9	38.2	10.4	14.5
1990-94		46.1	15.2	38.7	10.2	14.5
1995-99		40.2	16.2	43.6	10.1	15.8
2000-04		38.0	15.3	46.7	9.6	17.4
2005-2009		36.2	14.7	49.1	8.8	18.0

As the agriculture sector has shown signs of staging a more rapid growth in the years to come, an interesting question to probe would be related to the movement of labor between primary/basic agriculture and agro-processing especially under various economic and policy scenarios that are aimed to facilitate development. A static CGE model of the Philippine economy is used to simulate the effects of various policy scenarios and evaluate their employment impacts across various economic sectors.

Description of the CGE Model

CGE is an analytical tool that is capable of analyzing the effects of policy changes and exogenous shocks on aggregate and industry outputs, consumption, input use, prices and international trade. The model and variants thereof have been used to assess policies related to international trade, forestry and biofuels (Rodriguez, 2009a, 2009b and 2008; Rodriguez and Cabanilla, 2008 and 2006; Dufournaud et al., 2003).

In its current version, the model divides the Philippine economy into four major blocks; namely, production, household, government and foreign trade. The production block is composed mainly of output supply and input demand equations. These equations are based on the assumption of an optimizing firm that is operating in perfectly competitive markets. Firm outputs are produced by combining labor, capital and intermediate goods using constant returns to scale technology.

The household block is made-up of a series of equations that describe household demands for goods and services and sources of household income. Households are assumed to own the primary factors of production; i.e., labor and capital. This means that household income is composed of the payments to these factors and net transfers. Income is then allocated between savings, taxes and consumption. The household demand for each good or service is assumed to be influenced by total consumption spending and prices of goods and services. This was specified on the assumption that the household is an optimizing agent that is price taker in product markets.

The government block is composed of equations that describe its outlays and revenues. Government outlays are made-up of expenditures on goods and services and net transfers. On the other hand, revenues are sourced from income taxes, indirect taxes, import taxes and corporate taxes. Any discrepancy between outlays and revenues are reflected in the budget deficit.

The foreign trade block is represented by equations that describe exports and imports. Since the Philippines is assumed to be a price taker in world markets, import supply and export demand equations are assumed to be perfectly elastic. On the other hand, export supply and import demand equations are based on the assumption that

domestic and foreign goods are not perfectly substitutable; i.e., the Armington assumption.

The four blocks of the model are integrated through a series of equilibrium conditions which equate supply and demand. The demand side is composed of household consumption on goods and services, government expenditures (real) on goods and services, intermediate demands and exports (foreign demand). The supply side is composed of the output of domestic firms and imports. These equilibrium conditions determine domestic prices. The model also includes a series of aggregating equations which calculate macroeconomic indicators. It is solved under a Keynesian closure wherein the wage rate is fixed and total employment is endogenous. This closure rule was adopted in order to demonstrate the potential impacts of the various scenarios on aggregate employment.

The equations of the model are shown in Annex D.

Model Disaggregation. To address the key concerns of the study, the model disaggregates the Philippine economy into 22 industries/industry groups. These are as follows:

Agriculture, Fishery and Forestry (AFF) sector. These are (i) palay, (ii) corn, (iii) sugar, (iv) coconut, (v) banana, (vi) mango, (vii) other fruits & vegetables, (viii) hogs, (ix) chicken & poultry, (x) other livestock, (xi) seaweeds, (xii) aquaculture, (xiii) other fisheries, and (xiv) other agriculture & forestry.

Industry sector: (i) rice & corn milling; (ii) sugar milling; (iii) coconut processing, (iv) other food processing, (v) other industry (agri-using), and (vi) other industry (non-agri using).

Services sector: (i) services (agri-using), and (ii) services (non-agri-using).

The activities in groups (v) and (vi) of the Industry sector, and (i) and (ii) of the Services sector were determined according to their dependence on agricultural inputs. Non-food processing activities in the Industry sector that use agricultural inputs were included in the group called Other industry (agri-using). The rest of the activities in the industry sector, i.e. those that do not use agricultural inputs, were included in Other industry (non-agri using). A similar approach was adopted for the services sector.

Data sources. The dataset for the model is composed of a social accounting matrix (SAM), extraneous parameters, and calibrated parameters. A social accounting matrix (SAM) provides a straightforward way to explore how agricultural sectors generate the direct use of non-traditional contributions to overall economy. SAMs summarize aggregate structural interrelationships among the various agents in an economy by

mapping the circular flows of income and expenditures, and supply of goods and services. SAM entries represent the payments by one agent/institution to another. An entry can also represent an income transfer for jobs. The Philippines' SAM is currently anchored on the 2000 Input-Output table of the Philippines, complemented with information from the Philippine Tariff Commission and the National Accounts of the Philippines. Extraneous parameters are composed of elasticities of substitution and transformation for the import demand and export supply equations, respectively. The elasticities are drawn from Cororaton (2000) and Inocencio et al. (2001). Finally, the calibrated parameters exploit information from the SAM and extraneous parameters. These were carefully chosen so that the baseline solution of the model replicates the values in the SAM. The baseline dataset for the model is shown in Annex C.

The Scenarios and the Simulation Results

Two scenarios were explored using the model. Scenario 1 (agriculture productivity enhancement scenario) imposes a one percent (1%) productivity improvement for all agricultural commodities. It is designed to capture improvements in technology and/or farm practices. Scenario 2 (higher investment in agriculture) was implemented through a one percent increase in the use of primary inputs for all agricultural commodities. It is designed to capture higher investments in agriculture.

Scenario 1: Agricultural Productivity Enhancement

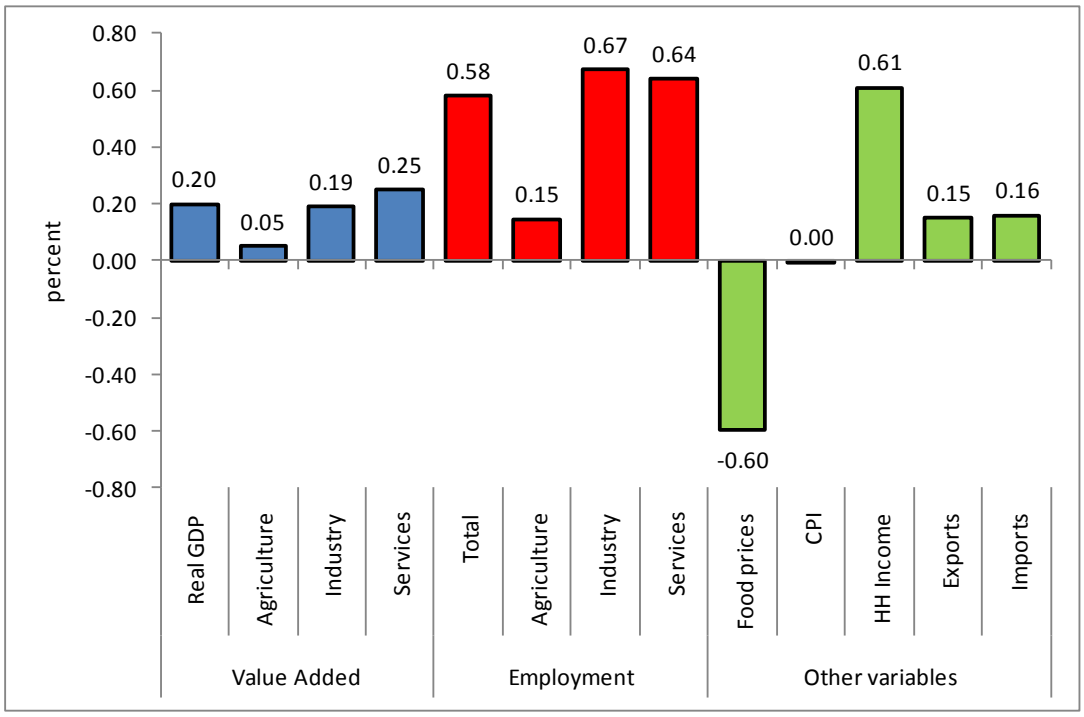
Figure 10 shows selected macroeconomic impacts from the productivity changes introduced in this scenario. It indicates that real GDP is projected to be 0.20% higher than its baseline value. Moreover, the value added of all the major sectors also increase, with a larger expansion for the non-agricultural sectors. The impacts on employment follow the pattern of changes for aggregate output. That is, the productivity improvements lead to an increase in aggregate and sectoral employment. Moreover, the increase in agricultural employment is smaller than the increase in the non-agricultural sectors. This result is not surprising because the model assumes that labor is the only mobile factor across industries and is endogenous in the aggregate. This means that increases in sectoral value added must coincide with higher employment.

The impacts on GDP and employment capture the potentially far-reaching effects of developments within the agricultural sector, with the possibility that the benefits to non-agricultural activities may be larger than the benefits to agriculture. The productivity change is also projected to cause a 0.60% decline in aggregate food prices.[6]

[6] The aggregate food price was calculated as the weighted average of the consumer prices. The weights are based on the shares of agricultural and processed food in total food consumption. The commodities in the model which are classified as food are (i) corn, (ii) sugar, (iii) coconut, (iv) banana, (v) mango, (vi)

However, the negligible change in the consumer price index (CPI) suggests that prices of non-food commodities have increased. The simulation results also suggest that the productivity changes lead to higher household income and international trade.

Figure 10. Macroeconomic impacts for scenario 1 (% deviation from baseline)



The projected increases in the agriculture value added (0.05%) and employment (0.15%) are smaller than the magnitude of the productivity improvements for the sector (1.00%). This captures an important dimension of productivity changes. Other things held constant, productivity improvements suggest that fewer primary and intermediate inputs are needed to produce a unit of output. Hence, higher outputs need not necessarily correspond to a higher input use. Value added will only increase if the consequent increase in output is larger than the productivity improvement.

Other things constant, a productivity improvement in a commodity is expected to cause a rightward shift in its supply curve and a decline in its domestic price. Table 7 shows that this result continues to hold despite the interaction across commodities and markets which is captured in a general equilibrium model. The outputs (Q) of

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other fruits & vegetables, (vii) chicken & poultry, (viii) other livestock, (ix) seaweeds, (x) aquaculture, (xi) other fisheries, (xii) other agriculture & forestry, (xiii) rice & corn milling; (xiii) sugar milling; (xiv) coconut processing, and (xv) other food processing.

agricultural commodities increased between 0.73% (Hogs) and 2.5% (Bananas). There is also a projected decline in the prices (P) of all these commodities. Value added is higher for most of the agricultural commodities. The only exceptions are Coconut (-0.22%), Hogs (-0.28%) and Other livestock (-0.10%). The decline in the value added of these three commodities may be explained by the relatively small increase (i.e., less than one percent) increase in their outputs. This suggests that the increase in their demands, which is caused by the decline in their prices, is not strong enough to overcome the pressure to reduce input use that is due to the productivity improvement.

Table 7. Disaggregated impacts from Scenario 1, % deviation from base[a]

Industry	Q	P	VA	L	C	I	X	M
Palay	1.15	-1.01	0.14	0.29	0.00	0.62	0.00	0.00
Corn	1.35	-0.99	0.34	0.59	1.51	0.51	0.00	2.07
Sugar	1.22	-0.86	0.21	0.59	1.47	0.00	0.00	1.85
Coconut	0.79	-1.28	-0.22	-0.51	1.89	0.89	0.00	1.71
Banana	2.50	-2.05	1.49	2.86	2.66	1.66	0.00	3.15
Mangoes	1.06	-0.77	0.05	0.45	1.38	0.38	0.00	1.59
Other fruits & vegetables	1.17	-0.91	0.16	0.43	1.43	0.43	0.00	1.82
Hogs	0.73	-1.35	-0.28	-0.73	0.00	0.95	0.00	0.00
Chicken and poultry	1.05	-1.03	0.04	0.11	1.64	0.64	0.00	1.80
Other livestock	0.91	-1.31	-0.10	-0.33	1.79	0.79	0.00	1.84
Seaweeds	1.59	-22.01	0.58	2.45	11.04	0.00	0.00	1.59
Aquaculture	1.24	-0.67	0.23	0.96	1.28	0.00	0.00	1.24
Other fisheries	1.10	-0.88	0.09	0.36	1.49	0.49	0.00	1.75
Other agri & forestry	0.56	-1.83	-0.45	-1.42	1.90	0.89	0.00	1.80
Rice-corn milling	1.25	-0.78	1.25	3.64	1.37	0.37	0.00	1.83
Sugar milling	1.28	-0.74	1.28	4.79	1.28	0.28	0.00	1.78
Other food manufactures	0.83	-0.41	0.83	3.61	0.97	-0.04	0.00	1.14
Coco processing	0.60	-0.18	0.60	3.74	0.78	-0.22	0.00	0.72
Other industries (agri using)	0.01	0.01	0.10	0.27	0.59	-0.41	0.00	0.15
Other Indu (non-agri using)	0.06	0.11	0.06	0.25	0.51	-0.49	0.00	0.06
Services (agri using)	0.30	0.06	0.30	0.59	0.55	-0.45	0.00	0.32
Services (non-agri using)	0.19	0.36	0.19	0.74	0.27	-0.73	0.00	0.01

Notes: n/a ... Not applicable, value is zero in the base

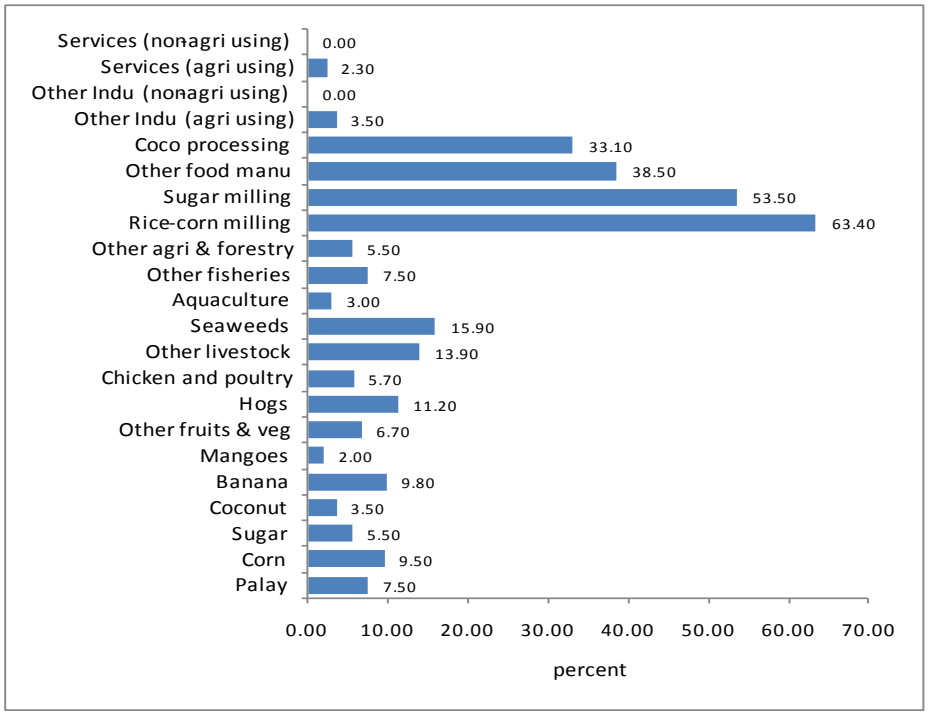
[a] Q = output, P = price of the domestic good, VA = value added, L = labor demand, C = household consumption, I = investment, X = exports, M = imports

The productivity changes also affected the markets of other industries in the economy—i.e., Rice & corn milling, Sugar milling, Other food manufacturing, Coconut processing, Other industry (agri-using), Other industry (non-agri using), Services (agri-using), Services (non-agri-using). There are two sets of impacts for these commodities that can be identified from Table 7. First, the productivity shocks caused an increase in the output and value added and lower prices of the domestic good for Rice & corn milling, Sugar milling, Other food manufacturing and Coconut processing. For these industries, lower prices of agricultural commodities led to lower production costs, and therefore lower prices of the domestic good. This translated to higher demand, particularly in consumption (C) and exports (X), and therefore higher industry outputs. Second, there was an increase in the output and price of the domestic good for Other Industry (agri-using), Other Industry (non-agri-using), Services (agri-using) and Services (non-agri-using). For these industries, higher domestic prices can be traced to higher domestic demand; which on closer inspection is due to an increase in consumption and exports. The increase in consumption can be traced to an increase in household income (0.61%) that is proportionately larger than the increase in the domestic prices of these commodities.

Two important points are worth noting also in relation to the impacts of agricultural productivity changes on non-agricultural commodities. First, the results for the non-agricultural industries can be related to their dependence on agricultural inputs. Figure 8 shows that the first set of results correspond to commodities that have a relatively strong dependence on agricultural inputs. This means that the fall in agricultural prices translate to a relatively strong decline in their production costs. The consequence is a decline in their output prices. Commodities belonging to the second set of results are not as heavily dependent on agricultural inputs. This means that the increase in demand, which tends to cause higher prices, overcomes the impacts of lower input costs. Second, the industries in the first set of results and most of the agriculture produced that are consumed as food. The decline in the prices of these commodities therefore explains the fall in the aggregate price of food.

On the other hand, the commodities in the second set of results are generally non-food commodities. The increase in their prices comes from the increased demand of non-food commodities. This implies that the decline in the aggregate price of food is due directly to the productivity increase (for agricultural commodities) and indirectly through the lower prices of agricultural commodities that are used as production inputs (food processing). On the other hand, the increase in non-food prices is due to an increase in the demand of such commodities from higher household income.

Figure 11. Share of agricultural inputs in total cost, in %



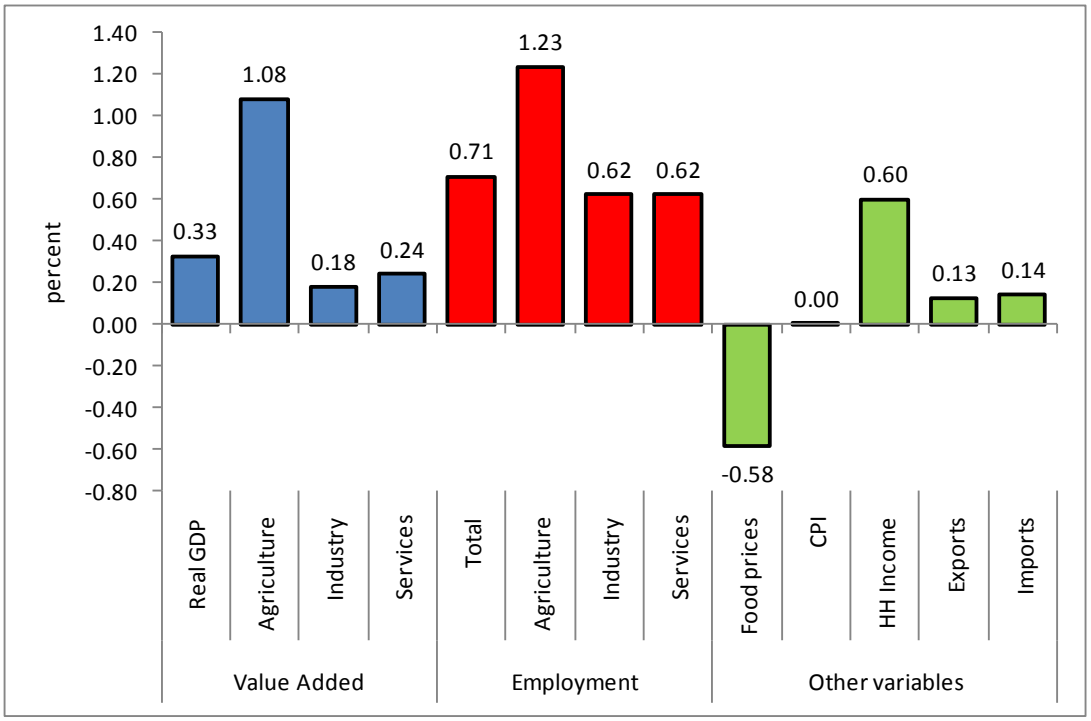
Scenario 2: Higher investments in agriculture

The simulation results suggest that higher investments in agriculture are likely to cause an increase in the value added of all major sectors in the economy (Figure 12). This consequently leads to a 0.3% expansion in real GDP. Despite having the highest projected increase in value added, agriculture only contributed about 0.14 percentage points of the increase in aggregate output because of its relatively small share in GDP. A larger proportion of the increase in output (about 0.19 percentage points) is therefore due to the increase in the value added of the non-agricultural sectors—Industry and Services. The higher value added of the different sectors explains the increase in employment (0.71%). It is also worth noting that while the largest increase in employment is in Agriculture (1.23%); higher investments in this sector are also likely to raise employment in Industry and Services. As in Scenario 1, the aggregate food price is projected to fall (-0.58%) with the increase in agricultural investments. However, the resulting increase in non-food prices is sufficiently strong to negate this impact so that the consumer price index is virtually unaffected. Higher investments are also likely to cause an increase in household incomes and international trade.

Higher investments in agriculture lead to an across the board increase in the outputs of all the industries in the model (Table 7). Higher value added for agricultural industries also causes the increase in employment for all industries. Since the positive impacts on agricultural commodities are expected given the rightward shift in their supply curves,

it is more interesting to examine the results for non-agricultural commodities. In the case of four commodities (Rice-corn milling, Sugar milling, Other food processing and Coconut processing), the expansion in output was accompanied by a decline in the price of the domestic good. For the remaining industries, the expansion in output coincided with an increase in the domestic price of the good. As with the productivity change (Scenario 1), these results can be traced to the importance of agriculture in production costs. For the first four industries, agricultural inputs account for 33.1% (Other food processing) to 63.4% (Rice-corn milling) of total production costs. However, agricultural inputs account for no more than 3.5% (Other industry: agri-using) of the production costs of the remaining industries. This means that the fall in the prices of agricultural goods had a larger impact on the production costs of the first four industries. The consequent fall in the prices of their domestic outputs in turn led to relatively large increases in the price-sensitive components of their demand (i.e. consumption and exports).

Figure 12. Macroeconomic impacts for Scenario 2 (% deviation from the baseline)



The decline in food prices as a whole may be explained along the same lines as Scenario 1. Lower food prices are due to a decline in the prices of all commodities in the agriculture and food processing sectors of the model (Table 8).

Food prices as a whole are also projected to decline. This is due to the fall in the prices of the outputs of the agricultural and food processing industries. In the case of agricultural commodities, these are a direct result of the productivity improvements

and higher investments as both scenarios are likely to causes rightward shifts in the supply curve that tend to reduce prices. On the other hand, the fall in the prices of processed food is due mostly to lower costs. Relative to other industries, food processing depends heavily on agricultural commodities as inputs. The decline in the prices of agricultural commodities therefore has a strong influence on production costs.

Table 8. Disaggregated impacts from Scenario 1, % deviation from base[a]

Industry	Q	P	VA	L	C	I	X	M
Palay	1.17	-0.97	1.17	1.34	n/a	0.34	n/a	n/a
Corn	1.41	-0.94	1.41	1.71	1.45	0.22	2.09	-2.33
Sugar	1.21	-0.84	1.21	1.61	1.43	0.00	1.82	n/a
Coconut	0.77	-1.28	0.77	0.47	1.87	0.64	1.67	n/a
Banana	2.54	-1.94	2.54	3.96	2.54	1.30	3.15	n/a
Mangoes	1.05	-0.82	1.05	1.37	1.41	0.18	1.59	n/a
Other fruits & vegetables	1.18	-0.87	1.18	1.48	1.39	0.16	1.79	0.75
Hogs	0.77	-1.30	0.77	0.39	n/a	0.66	n/a	0.77
Chicken and poultry	1.03	-1.02	1.03	1.09	1.62	0.38	1.76	-0.50
Other livestock	0.88	-1.31	0.88	0.62	1.78	0.55	1.80	-0.92
Seaweeds	1.54	-7.54	1.54	3.29	4.15	0.00	1.54	1.54
Aquaculture	1.23	-0.65	1.23	1.97	1.25	0.00	1.23	1.23
Other fisheries	1.11	-0.82	1.11	1.45	1.42	0.18	1.71	0.14
Other agri & forestry	0.70	-1.57	0.70	0.05	1.70	0.46	1.76	0.65
Rice-corn milling	1.22	-0.76	1.22	3.57	1.33	0.10	1.78	-1.85
Sugar milling	1.27	-0.72	1.27	4.76	1.26	0.02	1.76	-2.03
Other food manufactures	0.80	-0.39	0.80	3.48	0.94	-0.29	1.09	0.54
Coco processing	0.58	-0.19	0.58	3.62	0.78	-0.46	0.70	0.15
Other Industries (agri using)	0.09	0.01	0.09	0.26	0.58	-0.66	0.13	0.06
Other Industries (non-agri using)	0.05	0.08	0.05	0.19	0.52	-0.71	0.04	0.07
Services (agri using)	0.29	0.06	0.29	0.57	0.54	-0.70	0.30	0.27
Services (non-agri using)	0.19	0.36	0.19	0.73	0.26	-0.97	0.00	0.74

Notes: n/a ... Not applicable, value is zero in the base

[a] Q = output, P = price of the domestic good, VA = value added, L = labor demand, C = household consumption, I = investment, X = exports, M = imports

V. THE ROLE OF AGRICULTURE IN POVERTY REDUCTION: UNCOVERING THE CHANNELS LINKING AGRICULTURAL GROWTH AND POVERTY

Anríquez and López (2007) argue that there are three (3) mechanisms linking agricultural growth and poverty reduction, these are: *the labor market channel*, *the food price channel* and the *direct effect on poor farmers*. This chapter will look at the role by which agricultural growth affects poverty reduction and analyze each driver of poverty reduction. A regional panel data was put together for the purpose of the analysis.[7]

Labor Market Channel

The Anríquez and López approach

The main intention of Anríquez and López (2007)'s approach is to identify the specific mechanisms or routes through which sectoral (agriculture or non-agriculture) income growth leads to poverty reduction and to quantify the relative magnitudes of such alternative routes. The attempts to estimate the sectoral growth elasticity of poverty reduction (e. g., Ravallion and Datt 1996, World Bank 2009) can be seen as a reduced form approach estimating the quantitative magnitude of the net effects of agricultural and non-agricultural income growth on poverty reduction; a major limitation of such 'reduced form' approaches is that the approach cannot inform *how* sectoral growth (differentially) leads to poverty reduction. The Anríquez and López's approach intends to go beyond such reduced form approaches and to move toward more 'structural' modeling.

Anríquez and López identify, on an *a priori* basis, three possible routes: the labor market route, the food market (price) route, and the direct farm income route. For each of the three routes, Anríquez and López quantify the relationship between sectoral income growth (agriculture versus non-agricultural), on the one hand, and (1) labor income (through changes in wage rates and in the demand for labor), (2) food price, and (3) direct farm income, respectively. Those quantitative relationships through different routes are estimated separately using available data, and then the relative magnitudes of the impact of sectoral income growth on poverty through alternative 'routes' are compared.

[7] The level of disaggregation is dictated by the availability of the data. Unfortunately, the National Statistics Coordination Board only publishes National Income Accounts at the regional level.

Identifying the Effects of Agricultural Growth on Poverty Reduction Through the "Labor Market Channel"

Anríquez and López's approach to estimating the effects of agricultural (vs. non-agricultural) income growth on poverty *through the labor market channel* relies on the classic approach of econometric estimation of structural parameters of (micro-level) economic agents based on the duality theory. Anríquez and López postulate that the representative producers, assumed to be profit maximizers and to be operating in perfectly competitive output and input markets, produce two types of outputs, agricultural (Q_a) and non-agricultural outputs (Q_n) using three factors of production, skilled labor (L_s), unskilled labor (L_u) and capital (K), with the corresponding factor prices given, respectively, by w_s, w_u and w_r. Such a production technology can be characterized by a 'dual' cost function, and with the additional assumption that the cost function can be approximated by the Generalized Leontief function, which is one of the most commonly used flexible functional forms (Diewert, 1971)[8], Anríquez and López propose to estimate a cost function of the following form:

$$C = Q_a\sum_i \sum_j b_{ij}(w_i w_j)^{1/2} + Q_n\sum_i \sum_j c_{ij}(w_i w_j)^{1/2} + tQ_a\sum_i b_i w_i + tQ_n\sum_i c_i w_i + Q_aQ_n\sum_i d_i w_i + Q_a^2\sum_i e_i w_i + Q_n^2\sum_i f_i w_i, \quad (1)$$

where C is the total (variable) costs of producing agricultural and non-agricultural outputs and i, j = s (skilled labor), u (unskilled labor), and r (capital). Estimating the cost function, however, is equivalent to estimating the derived (through Shephard's lemma) factor demand functions for skilled and unskilled labor, as follows:

$$L_s = \sum_{j=s,u,r} b_{sj}\,(w_j/w_s)^{1/2}Q_a + \sum_{j=s,u,r} c_{sj}\,(w_j/w_s)^{1/2}Q_n + b_stQ_a + c_stQ_n + d_sQ_aQ_n + e_sQ_a^2 + f_sQ_n^2 \quad (2)$$

$$L_u = \sum_{j=s,u,r} b_{uj}\,(w_j/w_u)^{1/2}Q_a + \sum_{j=s,u,r} c_{uj}\,(w_j/w_u)^{1/2}Q_n + b_utQ_a + c_utQ_n + d_uQ_aQ_n + e_uQ_a^2 + f_uQ_n^2 \quad (3)$$

with $b_{ij} = b_{ji}$ *and* $c_{ij} = c_{ji}$ for $i \neq j$.

Once the regression coefficients of labor demand functions are obtained, then labor demand elasticities with respect to sectoral income growth and wage rates can be calculated. For example, the elasticity of demand for unskilled labor with respect to skilled wage is given by,

$$d\ln L_u / d\ln w_s = 1/(2L_u)[b_{us}Q_a + c_{us}Q_n](w_s/w_u)^{1/2}$$

[8] 'Flexible' in the sense that it imposes no *a priori* restriction on the production technology being captured in terms of separability and substitutability of the factors of production.

and other wage elasticities are given in a similar manner. The elasticity of demand for unskilled labor with respect to agricultural sectoral income is given by,

$$d\ln L_u / d\ln Q_a = [b_{uu} + b_{us}(w_s/w_u)^{1/2} + b_{ur}(w_r/w_u)^{1/2} + b_u t + d_u Q_n + 2e_u Q_a]\, Q_a/L_u$$

and other elasticities with respect to sectoral incomes can be obtained in similar manners.

The Anríquez and López approach involves fitting those labor demand functions to region-level panel data; the approach assumes that the behavior of the region-level aggregates of outputs and input demands can be interpreted as if they result from the behavior of (imaginary) region-level representative firms which maximize profit (minimize costs) and face competitive output and input markets.

Estimation results

The above equations (2) and (3) are estimated with region-level annual panel data covering the period 1991-2009. In estimating equations (2) and (3), time trend (interpretable as measuring technological progress) and region-specific intercepts are added and fixed-effects (rather than random effects) model specification is used.[9] The equations (2) and (3) are estimated jointly as a seemingly unrelated regression (SUR) system with the cross-equation symmetry restrictions ($b_{ij} = b_{ji}$ and $c_{ij} = c_{ji}$ for $i \neq j$) imposed.

In estimating equations (2) and (3), we have three alternative measures of labor demand (L_s, L_u): the total number of employed workers, the median (or average) hours worked, and the total number of employed workers multiplied by the average hours of work (i.e., the combination of the first two measures). We report the results separately based on these three alternative measures of labor demand. In addition, we report the cases with the agricultural sector income (Q_a) including and excluding the 'agribusiness' sector. Wage rates are obtained by average or median monthly earnings of skilled or unskilled employees obtained from the Labor Force Survey data. "Skilled" labor force is defined as those employees whose years of schooling is at the level of elementary school graduate or above, while "unskilled" labor force refers to those below the elementary graduate level.

While market wage rates could safely be assumed as exogenous in standard analyses using micro-unit (individual) level data, our analysis proxies wage rates by regional average (or median) monthly earnings of employed population. As a result, our measure of wage rates is arguably endogenous since both the demand for labor (as

[9] This is based on the finding that Hausman specification tests reject the assumption justifying the use of random-effects models in most of the specifications.

Table 9. First stage regressions for predicting wage rates (region-level panel estimation)

RHS variables	Dependent variable:			
	mean skilled wage	mean unskilled wage	median skilled wage	median unskilled wage
	[FE]	[RE]	[FE]	[RE]
Skilled labor education	334.840[a]	648.469***	387.296**	496.675***
	(208.42)	(225.902)	(160.978)	(120.871)
unskilled labor education	-124.69	-181.626	-140.372	2.916
	(168.91)	(188.032)	(130.463)	(100.304)
Interest rate	0.479**	-0.113	0.286*	-0.1352
	(0.205)	(0.254)	(0.158)	(0.132)
Time trend	75.838**	-132.619***	40.597*	-82.476***
	(31.061)	(34.306)	(23.990)	(18.178)
Total labor force (lagged)	-0.00008	0.0002***	-0.00005	0.00001
	(0.00005)	(0.00006)	(0.00004)	(0.00003)
Regional GDP (lagged)	-0.002***	0.0006	-0.0004	0.0013***
	(0.0006)	(0.0004)	(0.0004)	(0.0002)
Constant	-147664**	262273.2	-79596.09	16515.5
	(60999.1)	(67614.92)	(47113.12)	(35805.84)
# observations	*210*	*210*	*210*	*210*

[a]: p-value = 0.11
Values in parenthesis are standard errors
FE=Fixed effects;RE=random effects

measured by the number of employed or hours of work) and the monthly earnings of those employed can be seen simultaneously determined at the region level. In addition, those wage measures at the regional aggregates could possibly contain substantial measurement errors. Anríquez and López (2007) address the matter by resorting to instrumental variables estimation; in the first stage regression, those observed wages are regressed on what they argue to be exogenous variables, and, in the second stage, the labor demand equations ((2) and (3)) are estimated with the predicted wage variables obtained from the first stage regressions. Those instruments included in the first stage regressions are: mean schooling of skilled and unskilled labor force, interest rates, lagged total population, lagged GDP and a time trend. In our analysis we followed their approach using the same set of first stage instrumental variables[10]. The first stage regression results are summarized in Table 9.

[10] In fact, however, the qualitative results that we report below are not affected if equations (2) and (3) are estimated by assuming wage rates as exogenous.

Table 10.Estimated Elasticity of Skilled (L_s) and Unskilled (L_u) labor demand with respect to agricultural (Q_a) and non-agricultural (Q_n) sector income growth (p-value in parentheses)

Labor demand	Median number employed workers				Average hours worked * Average number employed				Median hours worked				Anriquez & Lopez
Wage	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
Agribusiness included?	yes	yes	Yes	yes	no	no	no	no	yes	yes	no	no	
Δskilled labor/ Δag. income ($d\ln L_s/d\ln Q_a$)	0.122	0.126	-0.098	-0.092	-0.025	-0.025	0.113	0.115	-0.098	-0.092	-0.025	-0.025	0.44
(p-val)	(0.04)	(0.03)	(0.01)	(0.01)	(0.45)	(0.44)	(0.06)	(0.05)	(0.01)	(0.01)	(0.45)	(0.44)	
Δskilled labor/ Δnon-ag. income ($d\ln L_s/d\ln Q_n$)	-0.030	-0.029	0.021	0.022	0.014	0.013	0.115	0.114	0.021	0.022	0.014	0.013	0.7
(p-val)	(0.63)	(0.64)	(0.56)	(0.54)	(0.73)	(0.76)	(0.13)	(0.13)	(0.56)	(0.54)	(0.73)	(0.76)	
Δunskilled labor/ Δag. income ($d\ln L_u/d\ln Q_a$)	-0.545	-0.565	0.041	0.052	0.123	0.125	-0.687	-0.683	0.041	0.052	0.123	0.125	0.58
(p-val)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.50)	(0.39)	(0.04)	(0.03)	
Δunskilled labor/ Δnon-ag. income ($d\ln L_u/d\ln Q_n$)	0.001	-0.001	-0.289	-0.285	-0.001	-0.012	-0.298	-0.297	0.033	0.026	0.041	0.039	0.4
(p-val)	(0.99)	(0.99)	(0.01)	(0.01)	(0.99)	(0.90)	(0.00)	(0.00)	(0.61)	(0.68)	(0.57)	(0.59)	

The estimated coefficients of equations (2) and (3), under alternative specifications as previously described, are summarized in Annex E. While the results are not reproduced here, the underlying assumptions that would enable us to interpret equations (2) and (3) as labor demand functions (and equation (1) as a cost function), i.e., the monotonicity and concavity in factor prices of the cost function, were tested. The results were, however, not encouraging; such tests results were in most cases inconclusive (not significant) or otherwise, in some cases, significant but in the wrong sign. The symmetry conditions were also tested (although the symmetry restrictions were imposed in the final specifications reported); in general, the condition $b_{ij} = b_{ji}$ (for $i \neq j$) was not rejected but the condition $c_{ij} = c_{ji}$ was. Furthermore, and even more disturbingly perhaps, the own price (wage) elasticity of demand for unskilled or skilled labor was found to be positive and significant in some cases, while in other cases the wage elasticity of labor demand was not significantly different from zero.

Table 10 summarizes major elasticity estimates with alternative specifications. For the comparison purpose, the comparable elasticity estimates from Chile by Anríquez and López are reproduced in the first column of Table 10. The main focus of interpreting equation (2) and (3) in our present context, as well as in Anríquez and López's, is the elasticity of labor demand with respect to sectoral output (income) in agriculture in comparison with that with respect to non-agricultural output. The key elasticity value of our interest is $d\ln L_u / d\ln Q_a$, that is, the unskilled labor demand elasticity with respect to agricultural output growth, indicating the extent to which agricultural growth is 'pro-poor' ('the poor' being proxied here by unskilled laborers). Disturbingly, once again, the estimates are either negative and statistically significant, or, otherwise, positive but not statistically significant. Similarly the unskilled labor demand elasticity with respect to non-agricultural growth ($d\ln L_u / d\ln Q_n$) is found to be not significantly different from zero across all possible specifications. In addition, the estimated demand elasticities for skilled labor are also found to be either significantly negative, or, otherwise, not significantly different from zero. Therefore, we seem to be failing to obtain sensible estimates for the key elasticity values which are prerequisite for the simulation exercise that would estimate the quantitative magnitude of the impact of sectoral (agricultural vs. non-agricultural) output growth on poverty reduction.

How can we interpret the "Labor Market Channel" results?

Our finding of the labor demand elasticities (esp. with respect to agricultural or non-agricultural output growth) that are not statistically significantly different from zero could arguably be suggesting that the pro-poor (pro-unskilled labor) impact of agricultural growth through the labor market channel in the Philippines is negligible, and the poverty reduction impact of agricultural (as well as non-agricultural) growth works through other mechanisms, such as the food price/market channel. Given the

(theoretical) expectation that the negative (food) price effects of agricultural output growth occur only under the condition of closed economy (while there would be no impact on food prices under the condition of a small open economy), the results are not surprising. The contrast between the Philippine and Chilean cases in terms of the contrasting findings on the relative importance of alternative channels through which agricultural growth reduces poverty may well be due to the relatively more outward orientation of the Chilean economy/agriculture in contrast with the relatively more inward orientation of the Philippine economy/agriculture.

Another possible interpretation, however, seems to be that the Philippine dataset of ours, unlike the original Anríquez and López study on Chile, is not capable of supporting the application of the Anríquez and López methodology. There appear to be a number of indications suggesting that the estimation of a sensible cost function (and thus, factor demand functions) is failing with our data[11]; one natural interpretation would be that the data generating process of the regional level aggregates (on labor demand and output production) in the Philippines is not consistent with the underlying assumptions of the Anríquez and López approach. Interpreting equations (2) and (3) as region-level demand functions for labor requires, for example, the assumption that the regional aggregate data behave as though they were generated by region-level representative firms acting as cost minimizers and operating in perfectly competitive markets in both outputs and inputs. It has been well-recognized in the literature, however, that optimizing behavior of micro-level (e.g., firm level) agents and similar behavioral assumptions at the level of aggregate data (e.g., region level) are generally inconsistent except under rather unrealistic circumstances. The regional aggregates of output and input data are usually obtained by summing the outputs and inputs, respectively, of micro-unit (e.g., firm-level) observations, or at least, that is what the regional-level aggregate data are supposed to measure. However, it can be shown (e.g., Chambers 1988) that preservation of consistency across different levels of observations based on such linear aggregation of inputs and outputs requires that all the firms have an identical technology with constant marginal cost (independent of output levels). Put in another way and stated more generally, "it is not possible to specify firm-level technologies satisfying properties [that typically characterize profit maximizing firm behavior in standard textbooks[12] and] that allow for consistent aggregation across firms with non-identical technologies" (Chambers, 1988: chapter 5). While Anríquez and

[11] In addition. our first stage wage determination functions contain some puzzling results as well. Unlike the Anríquez and López results, unskilled labor education level is never a significant determinant and often enters with a wrong sign), total labor force (lagged) has a positive effect on mean unskilled wages, and regional GDP (lagged) negatively affects mean skilled wage rates.

[12] Those include, among others, the cost function being non-negative and non-decreasing, as well as concave and continuous, in input prices, linear homogeneity, and non-decreasing in output levels.

López appeared to be successful in analyzing and interpreting the regional level aggregate data in Chile based on a representative firm framework, it should not be particularly surprising to find cases where the behavior of aggregate data does not quite follow the pattern predicted by optimizing behavior as postulated by microeconomic theory at the firm level.

Yet another possibility is that the relatively weak response of poverty to aggregate income growth (i.e., the small growth elasticity of poverty reduction) that has been found in the Philippines in previous studies (e. g., Balisacan and Fuwa 2004) is making it difficult to identify the mechanisms through which such a relationship arises; the phenomenon being explained is of small magnitude and thus there is relatively little to be explained in the first place. Table 11 below summarizes the changes (growth) during the period 1991-2009 of the main variables of interest used in our analysis plus the headcount poverty ratio in the 14 Philippine regions. During the period, the headcount poverty ratio declined by 33% on average (across 14 regions) between 1991 and 2009, while real value added from the agricultural (including that from the agribusiness subsector) and non-agricultural sectors increased by 60% and 70%, respectively. Once again, the magnitude of the change in poverty appears to be quite small compared to the growth rate of income. For example, during the period between 1987 and 2003, the period under study by Anríquez and López (2007), headcount poverty ratio declined by 60% or at the annual average rate of 5.5%, while (per capita) agribusiness sector GDP and aggregate GDP grew at the annual rate of 1.3% and 1.7%, respectively. In contrast, in the Philippine case, the average annual rate of poverty reduction across 14 regions during 1991-2009 is only 1.9%, which is less than half the equivalent figure from Chile, even though the annual average growth rate of agribusiness sector during the same period was much higher than the comparative figure from Chile at 3.5%.

Table 11. Changes in region-level aggregates between 1991-2008 (no. of obs. =14 regions)

Indicators	Mean	Min	Max
Headcount poverty ratio	-0.327	-0.708	0.216
Number of skilled employed workers	0.488	0.265	0.727
Number of unskilled employed workers	-0.088	-0.541	0.332
Median hours worked by skilled workers	-0.027	-0.182	0.091
Median hours worked by unskilled workers	-0.082	-0.223	0.000
Median real monthly wage of skilled workers	0.104	-0.219	0.376
Median real monthly wage of unskilled workers	0.207	-0.415	0.530
Real gross value added in agricultural sector	0.482	0.302	0.677
Real gross value added in agricultural and agribusiness sector	0.600	0.450	0.733
Real gross value added in non-agricultural sector	0.696	0.471	0.850

Food price channel

Expansion in agriculture can affect poverty by reducing the prices of food or the price of non-tradable food commodities. The reduction in the prices of non-tradable food commodities affect poverty in two ways: first, a fall in food prices increases real income and second, the cost of the food basket used in the computation of the poverty line decreases (it lowers the poverty line).

In the Philippines, there are several studies showing the link between food prices and poverty. Son (2008) analyzed the impact of higher food prices on the average standard of living and on poverty. The study showed the dominating effect of rising food prices on poverty over the period 2003-2006. The inflation hits poor consumers harder. Specifically, the poor are highly sensitive to price changes in food, particularly staple food items such as rice. Estimates on the price elasticity of poverty by commodity suggest that a 10% increase in food prices will create an additional 2.3 million poor people. Moreover, the study also showed that a 10% increase in the price of rice will force an additional 0.66 million people into poverty.

Reyes, Sobrevinas, Bancolita and de Jesus (2009) estimated the simultaneous increase in the prices of rice and fuel experienced in 2008 on poverty incidence. The study showed that increases in the prices of rice and fuel (in 2008) will increase poverty incidence by about 2 to 2.5 percentage points or about 1.8 to 2.2 million people would be forced to fall below the poverty threshold.

Mapa, Han and Estrada (2011) examined the impact of food prices and underemployment on hunger incidence in the Philippines, using the hunger incidence data from the Social Weather Stations from first quarter of 1999 to the fourth quarter of 2009. The authors made use of the vector autoregressive (VAR) model to determine the effect of a shock or increase in food prices and underemployment on total involuntary hunger. The results show that an increase in food prices at the current quarter will increase hunger incidence in the next five quarters.

The sub-section will test the hypothesis that an expansion in agriculture output reduces the real price of food products and will lower poverty incidence by increasing the real income of the households. A time-series econometric model using quarterly data, from the First Quarter of 1994 to the Fourth Quarter of 2010, was used to determine the marginal effect of agricultural growth on food prices. The model specification is given by,

$$y_t = c + \beta_1 RER_t + \beta_2 PINF_t + \beta_3 \ln Q_{at} + \beta_4 \ln Q_{nt} + \varepsilon_t \qquad t = 1, 2, \ldots, \tag{4}$$

where y_t is the real food price index using the Food Component of the Consumer Price Index (CPI), *RER* is the real exchange rate, *PINF* is the real non-food price index (Non-

Food Component of the CPI), Q_a is the agricultural output and Q_n is the non-agricultural output, c is the constant term and ε is the error term.

The data set was compiled from the National Income Accounts (NIA) of the National Statistical Coordination Board (NSCB) for agricultural (Q_a) and non-agricultural (Q_n) outputs; the Bangko Sentral ng Pilipinas (BSP) for the real exchange rate (*RER*); the National Statistics Office (NSO) for the real food price index and the real non-food price index. The food component comprises about 46.58% of the total Consumer Price Index.

As a commonly used procedure in time series analysis, each variable was tested for presence of unit root and the series in the model for possible co-integration (or co-movement). If co-integration exists, then we can say that while the real food price index may deviate from the path of the explanatory variables in the short term, these variables move together and that they have an equilibrium long-run relationship. We can then estimate the long-run elasticity of food prices to agricultural output (represented by β_3 in the model in equation (4)).

Moreover, the compensated elasticity of food prices to agricultural output can be calculated as,

$$\left.\frac{d \ln y_t}{d \ln Q_{at}}\right|_{dQ=0} = \frac{\partial \ln y_t}{\partial \ln Q_{at}} + \frac{\partial \ln y_t}{\partial \ln Q_{nt}} * \left.\frac{d \ln Q_{nt}}{d \ln Q_{at}}\right|_{dQ=0} \qquad (5)$$

If co-integration is present in the variables specified in (4)[13], an error-correction model (ECM) will be estimated to analyze the short-run relationship of the variables. The ECM is given by,

$$\Delta y_t = \alpha + \phi_1 \Delta RER_t + \phi_2 \Delta PINF_t + \phi_3 \Delta \ln Q_{at} + \phi_4 \Delta \ln Q_{nt} + \underline{\Delta x_t}'\underline{\eta} + \lambda \hat{\varepsilon}_{t-1} + \mu_t \qquad (6)$$
$$t = 1, 2, \ldots, T$$

where α is the constant term, $\hat{\varepsilon}_{t-1}$ is the residual at time ($t - 1$) from equation 11 and u_t is the disturbance term. The parameters of interest are the ϕ_i's, representing the short-run relationships. The parameter λ is the speed of adjustment back to the long-run relationship after a shock. A large value of λ (absolute value that is close to 1) implies that the adjustment to the long-run relationship is fast.[14]

[13] The presence of co-integration was tested using the residual-based procedure of Engle and Granger (1987).

[14] Anríquez and López (2007), using data from Chile, found the estimated λ to be equal to - 0.97.

Discussion of Results

The figures in Table 12 below show the summary statistics of the variables used in the model. Food prices have been growing at an average (quarter-to-quarter) rate of 1.32 percent which is slightly lower than the growth rate of non-food prices at 1.41 percent. The average quarter-to-quarter growth rate of Agricultural Output is 0.68 percent which is lower compared to the average growth rate of the non-agricultural output in the same period at 1.19 percent. Computing for the coefficient of variation, it can be shown that Food Prices (CV = 98%) are more volatile than Non-Food Prices (CV = 72%). Moreover, Agricultural Output is more volatile (CV =397%) compared to Non-Agricultural Output (CV =79%).

Table 12.Summary statistics of the variables in the model (quarter to quarter growth, 1994-2009)

	Food prices	Non-food prices	RER	Agri *	Non-agri *
Mean	1.32	1.41	0.23	0.68	1.19
Median	1.07	1.48	0.95	0.4	1.28
Maximum	6.93	4.14	12.07	6.71	3.82
Minimum	-1.58	-1.75	-15.02	-6.65	-1.97
Std. Dev.	1.3	1.02	4.27	2.7	0.94

** Agricultural and Non-Agricultural Outputs were adjusted for seasonality for the purpose of the study.*

To determine the marginal effect of agricultural growth on food prices, we estimate equation (4) where the real food price index (y_t) is regressed on the real exchange rate (RER), real non-food price index (PINF), agricultural output (Q_{at}) and non-agricultural output (Q_{nt}). However, since these variables are known to be integrated of order 1 or non-stationary, the regression may yield invalid results and will lead to spurious regression unless there is co-integration existing among the variables. Thus, before doing further analysis we perform tests to determine the order of integration of the variables using the Augmented Dickey Fuller (ADF) test and presence of co-integration using the Engle-Granger procedure.

The figures in Table 13 show the results of the ADF test for the variables (expressed in natural logarithm) and their firt differences. As expected, the natural logarithm of the seasonally-adjusted agricultural output is non-stationary, the same with the natural logarithm of the seasonally-adjusted non-agricultural output. The ADF test does not reject the null hypothesis that the series in levels are non-stationary (or with unit root). However, the ADF test strongly rejects that the first difference transformation of the variable contains unit root.

Our conclusion is that both Agricultural and Non-Agricultural Outputs are integrated of order 1. The ADF tests also suggest strong evidence that the other variables: natural logarithm of Food Price Index, natural logarithm of non-food price index and the natural logarithm of the real exchange rate are all integrated of order 1.

Table 13. Unit root tests for the variables in the food price equation

Variable (in ln)	Level		First difference	
	ADF	p-value	ADF	p-value
Food CPI	-2.60	0.2830	-5.38	0.0000
Non-Food CPI	-2.02	0.2797	-5.56	0.0000
Real Exchange Rate	0.21	0.7448	-5.72	0.0000
Agricultural Output	-2.15	0.5068	-11.06	0.0000
Non-Agricultural Output	-1.90	0.6456	-5.75	0.0000

In the ADF test H_0: the series has a unit root; 2 lags were used to control for auto-correlation in the tests for the series in levels; Agricultural and Non-Agricultural Outputs are seasonally-adjusted series; number of observations is 68 quarters.

Since the tests for presence of unit root via the Augmented Dickey Fuller showed that all variables are integrated of order 1, we then proceed to the test for co-integration among the variables. Our variable of interest in here is the natural logarithm of Food Price (dependent variable) and we use the Engle-Granger (1987) test for co-integration. The Engle-Granger procedure will test if the residual of the equation (4) for is stationary or non-stationary using the ADF test. If the residual series is stationary, then the series in the model are co-integrated. Otherwise, the series are not co-integrated.

The ADF test using the residual series of equation (4) yielded a test statistic value of -3.72 suggesting that the series is stationary and equivalently, the series in equation (4) as co-integrated. This result further shows that the resulting regression estimates are not spurious. Moreover, the series being co-integrated implies the presence of long-run equilibrium. We can say that while the real food price index may deviate from the path of the explanatory variables (real non-food price, agricultural output, non-agricultural output and real exchange rate) in the short term, these variables move together in the long term.

The estimated coefficients of equation (4) are given in Table 14 below. The results show that the real food price is positively correlated with non-agricultural output, real price of non-food and real exchange rate. Moreover, the relationship between agricultural output and real food price is negative. The coefficient of the natural logarithm of agricultural output implies that the long-run elasticity of real food prices to agricultural output is -0.44. This means that if agricultural output increases by 1%, the average food prices will decrease by about 0.44%, holding other factors constant.

Table 14. Estimated long run effects

Dependent variable: food CPI (in natural logarithm (LN))

Variable	coefficient	s.e	t-stat	p-value
Constant	-2.3827	1.2055	-1.9766	0.0525
Non-Food CPI (in LN)	0.5041	0.0758	6.6533	0.0000
Real Exchange Rate (in LN)	0.1784	0.0439	4.0618	0.0001
Agricultural Output (in LN)	-0.4427	0.1616	-2.7388	0.0080
Non-Agricultural Output (in LN)	0.7134	0.1109	6.4316	0.0000

R-squared = 0.98; n=69 (from 1994Q1 to 2010Q4)

We then estimate the compensated elasticity of real food prices to agricultural output as,

$$\left.\frac{d \ln y_t}{d \ln Q_{at}}\right|_{dQ=0} = -0.44 + 0.71^* (-0.20/0.80) = - 0.6175$$

That is, a 1% compensated increase in agricultural output (which needs a 0.20/0.80 = 0.25% fall in non-agricultural output)[15] will result in the reduction in the average food prices of about 0.62%. The compensated elasticity is higher that the uncompensated elasticity because in the compensated elasticity the non-agricultural output is required to fall and the non-agricultural output is positively correlated with the real food prices.

Once the long-run effect on Food Price Index has been established, we also estimated the short-run relationships using the error-correction model (ECM). This is the equation given in (6).

The estimated coefficients of the ECM are reported in Table 15. The results show that the signs of the short-run coefficients are the same as the signs of the long-run coefficients, except for the growth rate of non-agricultural output where the short-run sign is negative, albeit insignificantly different from zero. A more important result is that the short-run effect of agricultural output on food prices (-0.07) is smaller than the long-run effect (-0.44), which is consistent with our expectation.

The short-run model shows that a one-percentage increase in the growth rate of agricultural output decreases the average growth rate of food prices by about 8 basis points, holding other factors constant. Moreover, the coefficient of the lagged error, representing the proportion of the short-run deviation at time (t-1) that is offset by the

[15] The assumption is that the share of agricultural output in the GDP is about 20%, while that of non-agricultural output is 80%. The average share of agricultural output in the GDP using the sample data is 19.62%

movement in the Food Price Index (y_t) is just about -0.10 suggesting a slow adjustment back to the long-run equilibrium. A "shock" that causes departure in the series from its long-run equilibrium relationship will be eliminated only after about 10 quarters (or 2.5 years).

Table 15. Error Correction Model (short run effects)
Dependent variable: change in real food prices

Variable	coefficient	s.e.	t-stat	p-value
Constant	0.0085	0.0026	3.2658	0.0018
Change in Non-Food Real Prices	0.4507	0.1530	2.9459	0.0046
Change in Real Exchange Rate	0.0632	0.0262	2.4142	0.0188
Growth Rate of Agricultural Output	-0.0749	0.0284	-2.6394	0.0105
Growth Rate of Non-Agricultural Output	-0.1083	0.1097	-0.9878	0.3272
Lagged Error	-0.0987	0.0561	-1.7592	0.0836

Simulating the Impact of Food Prices on Poverty Incidence

The reduction in the prices of food commodities affect poverty in two ways, first, a fall in food prices increases real income and second, the cost of the food basket used in the computation of the poverty line decreases, lowering the poverty line. Using the estimated impact of agricultural output (uncompensated and compensated) on food prices, in equations (4) and (5), we performed several simulations to measure the changes in poverty incidence resulting from increasing real household income.[16] For this study, we performed simulations under two scenarios: scenario 1 assumes a 3% growth rate in agricultural output and scenario 2 assumes a 5% growth rate. The impact of the uncompensated and compensated increases in agricultural output will also be computed for each scenario.

The change in the real income due to the reduction in food prices can be estimated using the weights of the food items in the national Consumer Price Index (CPI). As of year 2000, the over-all weight assigned to food items in the CPI is 46.58% (NSO), that is, an average household spends about 47% of its budget on food. Thus, a 1% reduction in the price of food will increase real income by about 0.47%. With this information, we simulate the impact of an expansion in agricultural output by 3% (scenario 1) and 5% (scenario 2), both by itself (uncompensated) and holding the total output constant (compensated). The results of the simulations are shown in Table 16.

[16] Anríquez and López (2007) performed simulations on the effects of agricultural expansion on poverty in Chile by assuming a 4.5% growth in the agricultural sector.

Table 16. Effects of agricultural expansion on poverty: Food price channel

Effect on Income and Poverty	Scenario 1 (3% Growth)		Scenario 2 (5% Growth)	
	(a)	(b)	(a)	(b)
Increase in Average Income (%)	0.62	0.87	1.04	1.46
Percentage Point Reduction in Poverty Incidence	0.30	0.40	0.50	0.70
Poverty Incidence (%)	26.0	25.9	25.8	25.6
Number of Poor Individuals	22.88 million	22.79million	22.70 million	22.52 million
Poverty Depth (2009 Baseline: 7.2)	7.0	7.0	7.0	6.9
Poverty Severity (2009 Baseline: 2.8)	2.7	2.7	2.7	2.6
Reduction in the Number of Poor Individuals (estimate)	264,000	352,000	440,000	616,000

** Scenario 1 assumes a 3% growth Agricultural Output while Scenario 2 assumes a 5% growth in Agricultural Output; (a) Uncompensated Simulations; (b) Compensated Simulations; Baseline (2009) Poverty Incidence is 26.3% (NSCB) and Number of Poor Individuals (in 2009) is about 23.14 million (NSCB).*

Increasing the agricultural output by 3% (for scenario 1) will increase the average income by about 0.62% (uncompensated) to 0.87% (compensated). This increase in income is estimated to decrease poverty incidence by around 0.30 to 0.40 percentage point and using the 2009 poverty incidence as baseline, this will reduce the number of poor Filipinos anywhere from 264,000 to 352,000.

Under scenario 2 that assumes a 5% growth in agricultural output, the average real income will increase by 1.04% (uncompensated) to 1.46% (compensated) due to the reduction in food prices. The increase in the average income will reduce poverty incidence estimated to be between 0.50 to 0.70 percentage-point. Moreover, the number of Filipinos that will be taken out of poverty is estimated to be between 440,000 to 616,000 in this scenario.

The impact of the expansion in agriculture on poverty via the food price channel is larger in the compensated case than in the uncompensated case. The reason for this is the fact that under the compensated case, non-agricultural output falls (to make the total output constant) causing a further reduction in food price since non-agricultural output and food price index are positively correlated.

The results of the simulation exercise further suggest that the price effect of expanding the agricultural output by 5% would at most reduce poverty incidence by 0.70 percentage point.

Direct income channel

In addition to the effect of expansion of agricultural output to poverty, via the food price channel, the direct effect of agricultural expansion, through the income of poor farmers, was also estimated. Following Anríquez and López (2007), to determine the importance of agricultural/agro-processing output in the income of poor farmers we estimated a model where the income of poor farmers is regressed using agricultural output and off-farm income as explanatory variables.

Table 17. Effects of agricultural output on the poor farmer's total income

Dependent variable: natural logarithm of poor farmer's total income

Variables	Estimated Coefficient	Standard Error[a]
Natural Logarithm of Off-Farm Income	0.3642 *	0.0525
Natural Logarithm of Agricultural Output	0.1292 *	0.0179
Constant	4.6802 *	0.5456

[a] *White Robust Standard Errors; Fixed Effects Model*

** significant at 1% level*

Number of Observations: 91 (13 Regions; 7 Years (1991, 1994, 1997, 2000, 2003, 2006, 2009)

The data on agricultural output is generated from the Regional Income Accounts while the total income and off-farm income of the poor farmers are derived from the Family Income and Expenditure Survey (FIES). The results in tables 17 and 18 show that an elasticity in the vicinity of 0.1, that is expanding the agricultural/agribusiness output by 1%, increases the average income of poor farmers by about 0.1%, controlling for the farmer's off-farm income. [17]

Table 18. Effects of agricultural and agribusiness output on the poor farmer's total income

Dependent variable: natural logarithm of poor farmer's total income

Variables	Estimated Coefficient	Standard Error[a]
Natural Logarithm of Off-Farm Income	0.39396 *	0.05165
Natural Logarithm of (Agricultural Output Plus Agribusiness Output)	0.11299 *	0.01450
Constant	4.55585 *	0.53005

[a] *White Robust Standard Errors; Fixed Effects Model*

** significant at 1% level*

Number of Observations: 91 (13 Regions; 7 Years (1991, 1994, 1997, 2000, 2003, 2006, 2009)

[17] The estimated elasticity computed from this study almost similar to the estimated elasticity reported by Anríquez and López (2007)

VI. CONCLUSIONS AND POVERTY IMPLICATIONS

As would be expected in a growing economy, the relative importance of Philippine agriculture in total output and employment has dwindled over time. At the turn of the present decade, agriculture accounted for only about 18 percent of GDP and 33 percent of employment. Visibly, poverty reduction in the large majority of provinces has been accompanied by higher growth rates in non-agricultural incomes than in agricultural incomes. These patterns thus seem to suggest that the key driver to poverty reduction in the years ahead would be the growth of the non-agricultural sector.

However, as this study has shown, not recognizing agriculture's crucial linkages with the other sectors of the economy can seriously understate the relative importance of agriculture in output, employment, and poverty reduction. The full range of economic activities in the agri-supply chains—from primary agriculture to agri-processing and trading—accounts for about a third of GDP and one-half of total employment. Growth of agricultural output is thus expected to have potentially large employment multiplier effects throughout the supply chains. These effects are particularly beneficial for the unskilled segments of the labor market, where poverty is typically intense and concentrated. That is, the growth is expected to increase the demand for unskilled labor (and possibly raise wages), thereby raising labor income and hence reducing poverty. Moreover, to the extent that agricultural growth exerts downward effects on food prices, households' real incomes are expected to rise, particularly for low-income households whose food expenditures usually take a high proportion of their total income.

The positive effects of agricultural growth on labor income through the labor-market channel were not quite evident in the regression results based on regional panel data, although confirmed by the simulation results based on a computable general equilibrium (CGE) model of the Philippine economy. In contrast, the poverty-reducing effects of agricultural growth through the food-price channel are quite strong and robust. The regression results based on quarterly national data suggest that food prices respond negatively to growth of agricultural output: the elasticity of food prices with respect to agricultural output is about -0.07 in the short run and -0.44 in the long run. Simulation results further show that a 3% increase in agricultural output, which is quite close to the country's national average in the past decade, raises average real household income by 0.62% to 0.87%. This translates to a reduction of poverty incidence by around 0.30 to 0.40 percentage point, or (using the 2009 official poverty incidence as baseline) a decrease in the number of poor Filipinos anywhere from 264,000 to 352,000. A higher agricultural growth of 5%, which is quite feasible given the

development experiences of the country's dynamically growing neighbors, leads to an increase of average real income by 1.04% to 1.46%, thereby reducing poverty incidence by 0.5 to 0.7 percentage point (i.e., a decrease in the number of poor persons by 440,000 to 616,000). Still, the effects of such growth on the poor are likely to be even higher than what these estimates suggest since the estimation ignores the fact that the proportion of food expenditures in total household budget is substantially higher for the poor than for the average household (particularly for the non-poor).

Evidently, developments in agriculture have potentially far-reaching effects on the economy, with the possibility that the income and employment benefits to non-agricultural sectors may even exceed those in agriculture. The CGE simulation results show, for example, that a sector-wide improvement of agricultural productivity (or, alternatively, an increase in agricultural investment) leads to a smaller proportionate increase in employment in agriculture than in non-agricultural sectors. The impact is particularly strong in agri-using industries as well as in sectors providing services to agriculture. Moreover, because aggregate food prices fall relative to nonfood prices, the real incomes of poor households rise, amplifying the poverty-reducing effects of agricultural productivity improvement on the demand for unskilled labor.

That agricultural growth should be seen as a complementary component of a poverty reduction strategy, even as primary agriculture now constitutes only a relatively small component of GDP, is evident in this study. To harness the potential of the sector in contributing to faster poverty reduction and inclusive growth, sustained improvement in agricultural productivity has to be high in the development agenda. Government has to substantially improve the investment climate in agriculture and rural areas. This would require moving away from the "business as usual" approach to governing the sector. In particular, the binding constraints to productivity and income growth in agriculture and rural areas need to be addressed.

Foremost among these constraints is the high "cost of doing business" in rural areas. Addressing this would require investing in basic infrastructure (transport, power, communication, and irrigation), improving governance, and, in many places, maintaining peace and order. Efficiency-inhibiting regulatory measures in all segments of the supply chains (e.g., Cabotage Law in shipping) also have to be removed. Such measures create high transactions costs, reducing the earnings of poor farmers and landless workers, and making food more expensive and less accessible to poor urban consumers and even small farmers who are net buyers of food.

Access to credit is another critical constraint to productivity growth. The CARP (and its replacement, CARPer) has muted the efficient functioning of agricultural land markets. Efforts to get credit flowing to agriculture should involve making the CLOAs (Certificate

of Land Ownership Awards) bankable. This would require the elimination of restrictions on land transferability, land use, and contractual arrangements.

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ANNEX A – AGRIBUSINESS SUB-SECTORS

Annex Table 1. Full list of agribusiness sub-sectors

Full List	Input coefficient	GVA share	Employment share	Composite index
Slaughtering and meat packing	0.74911	0.00026	0.00042	0.50074
Rice and corn milling	0.63418	0.01691	0.04422	0.48571
Restaurants, bars, canteens andother eating and drinking places	0.10364	0.08950	0.30776	0.45952
Flour, cassava and other grains milling	0.63717	0.00768	0.00197	0.43892
Wholesale and retail trade	0.01802	0.15939	0.17595	0.40491
Sugar milling and refining	0.53536	0.01301	0.00663	0.38310
Production of crude coconut oil, copra cake and meal	0.52116	0.01837	0.00128	0.37769
Manufacture of desiccated coconut	0.51314	0.00369	0.00313	0.35081
Fish canning	0.42593	0.01033	0.00982	0.30844
Canning and preserving of fruits and vegetables	0.32184	0.02056	0.00941	0.25467
Coffee roasting and processing	0.31669	0.01202	0.00039	0.23051
Manufacture of starch and starch products	0.34012	0.00077	0.00081	0.22885
Other crude vegetable oil, fish and other marine oils and fats (except coconut oil)	0.29117	0.00827	0.00163	0.20860
Manufacture of animal feeds	0.20339	0.03296	0.00585	0.19216
Manufacture of drugs and medicines	0.14708	0.05304	0.01229	0.19130
Manufacture of misc wood, cork and cane products	0.27211	0.00069	0.00168	0.18403
Fish drying, smoking and manufacturing of other seafood products	0.26850	0.00085	0.00170	0.18189
Tobacco leaf flue-curing and redrying	0.22946	0.00040	0.00109	0.15462
Manufacture of hardboard and particle board	0.22413	0.00002	0.00005	0.14962
Sawmills and planing of wood	0.21049	0.00067	0.00088	0.14223
Manufacture of veneer and plywood	0.16917	0.00415	0.00479	0.12327
Manufacture of other rubber products, n.e.c.	0.16522	0.00168	0.00190	0.11442
Miscellaneous food products	0.13703	0.00399	0.00379	0.10076
Manufacture of jewelry and related articles	0.13252	0.00065	0.00227	0.09128
Manufacture of wood carvings	0.11880	0.00077	0.00353	0.08332
Manufacture of bakery products except noodles	0.03365	0.03664	0.07563	0.14131
Private medical, dental and other health services	0.02965	0.03375	0.07959	0.13734
Manufacture of flavoring extracts, mayonnaise and food coloring products	0.11636	0.01824	0.00085	0.10691

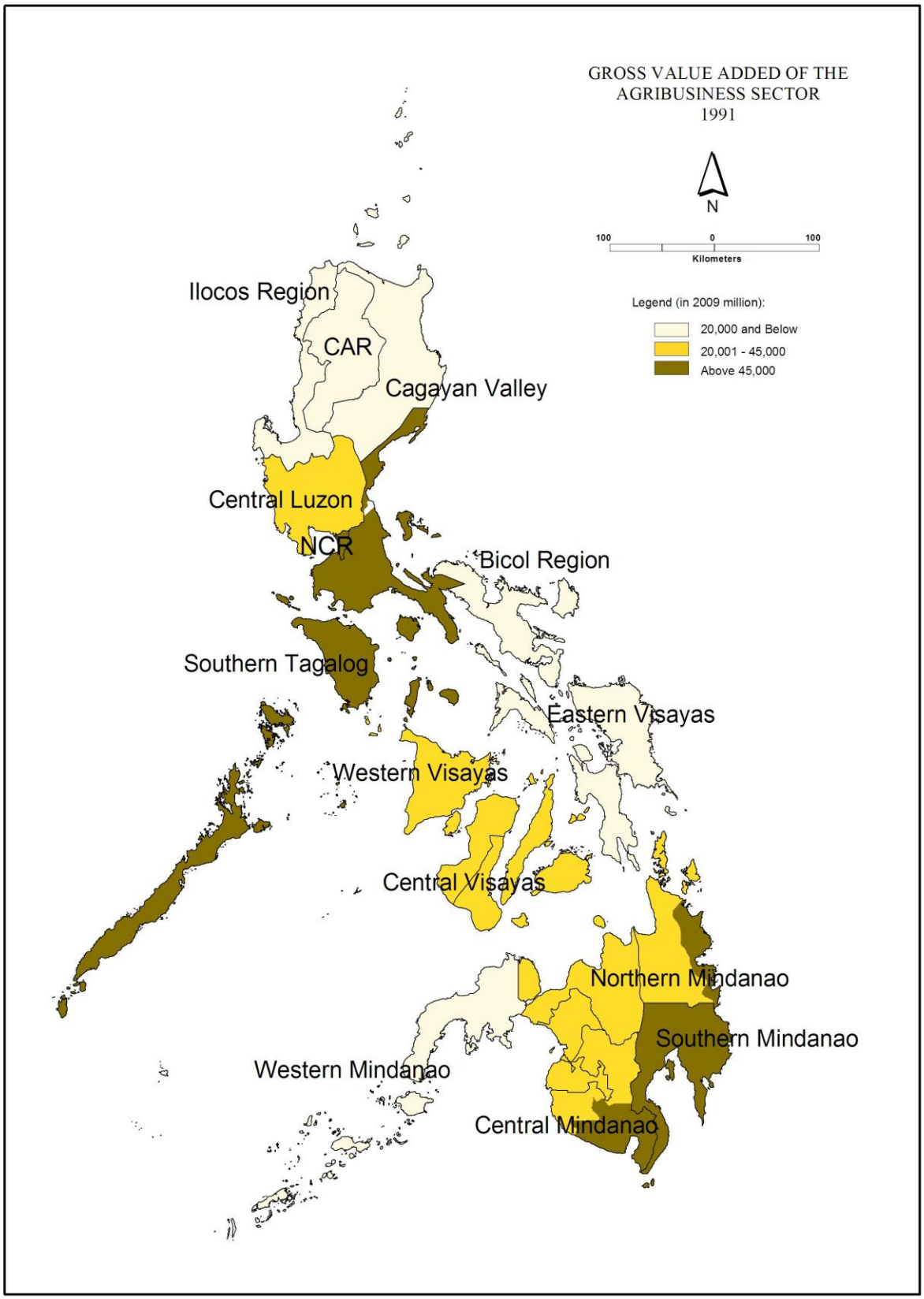
Full List	Input coefficient	GVA share	Employment share	Composite index
Manufacture of cocoa, chocolate and sugar confectionery products	0.10202	0.01004	0.00391	0.08697
Meat and meat products processing	0.07333	0.01828	0.00597	0.08242
Manufacture of pulp, paper and paperboard	0.08989	0.01134	0.00412	0.08109
Hotels and motels	0.02101	0.02402	0.03327	0.07867
Manufacture of fiber batting, padding, upholstery fillings including coir, linoleum and other hard surfaced floor coverings	0.10809	0.00016	0.00034	0.07263
Rubber tire and tube manufacturing	0.08782	0.00556	0.00151	0.06851
Textile, spinning, weaving, texturizing and finishing	0.06714	0.00959	0.00927	0.06733
Milk processing	0.00856	0.03776	0.00270	0.06709
Cigarette manufacturing	0.00199	0.03846	0.00394	0.06480
Manufacture of perfumes, cosmetics and other toilet preparations	0.08106	0.00577	0.00205	0.06477
Cordage, rope, twine and net manufacturing	0.08971	0.00138	0.00125	0.06301
Manufacture of fertilizers	0.05971	0.01366	0.00116	0.06217
Other recreational and cultural services	0.00006	0.02590	0.02450	0.06051
Cigar, chewing and smoking tobacco	0.08358	0.00093	0.00097	0.05798
Manufacture of articles made of native materials	0.07822	0.00006	0.00008	0.05232
Sea and coastal water transport	0.00708	0.02610	0.00804	0.05213
Manufacture and repair of rattan furniture including upholstery	0.05981	0.00406	0.00721	0.05210
Alcoholic liquors and wine	0.04464	0.01211	0.00217	0.05050
Wood drying and preserving plants	0.06431	0.00006	0.00008	0.04303
Manufacture and repair of wooden furniture including upholstery	0.00251	0.01236	0.02627	0.04235
Softdrinks and carbonated water	0.00053	0.02408	0.00510	0.04221
Manufacture of soap and detergents	0.00125	0.02284	0.00214	0.03834
Water	0.00002	0.01675	0.01441	0.03794
Manufacture of refined coconut oil and vegetable oil	0.02149	0.01232	0.00161	0.03493
Manufacture of synthetic resins, plastic materials and other man-made fiber except glass	0.00689	0.01456	0.00513	0.03156
Malt liquors and malt	0.00812	0.01307	0.00162	0.02718
Ice cream, sherbets and other flavored ices	0.00119	0.01450	0.00181	0.02496
Construction	0.00005	0.00746	0.01175	0.02123
Manufacture of articles of paper and paperboard	0.00012	0.01013	0.00483	0.01983
Shipyards and boatyards	0.00011	0.01107	0.00291	0.01974
Noodles manufacturing	0.00266	0.00313	0.01106	0.01562
Social Work	0.02010	0.00014	0.00050	0.01398

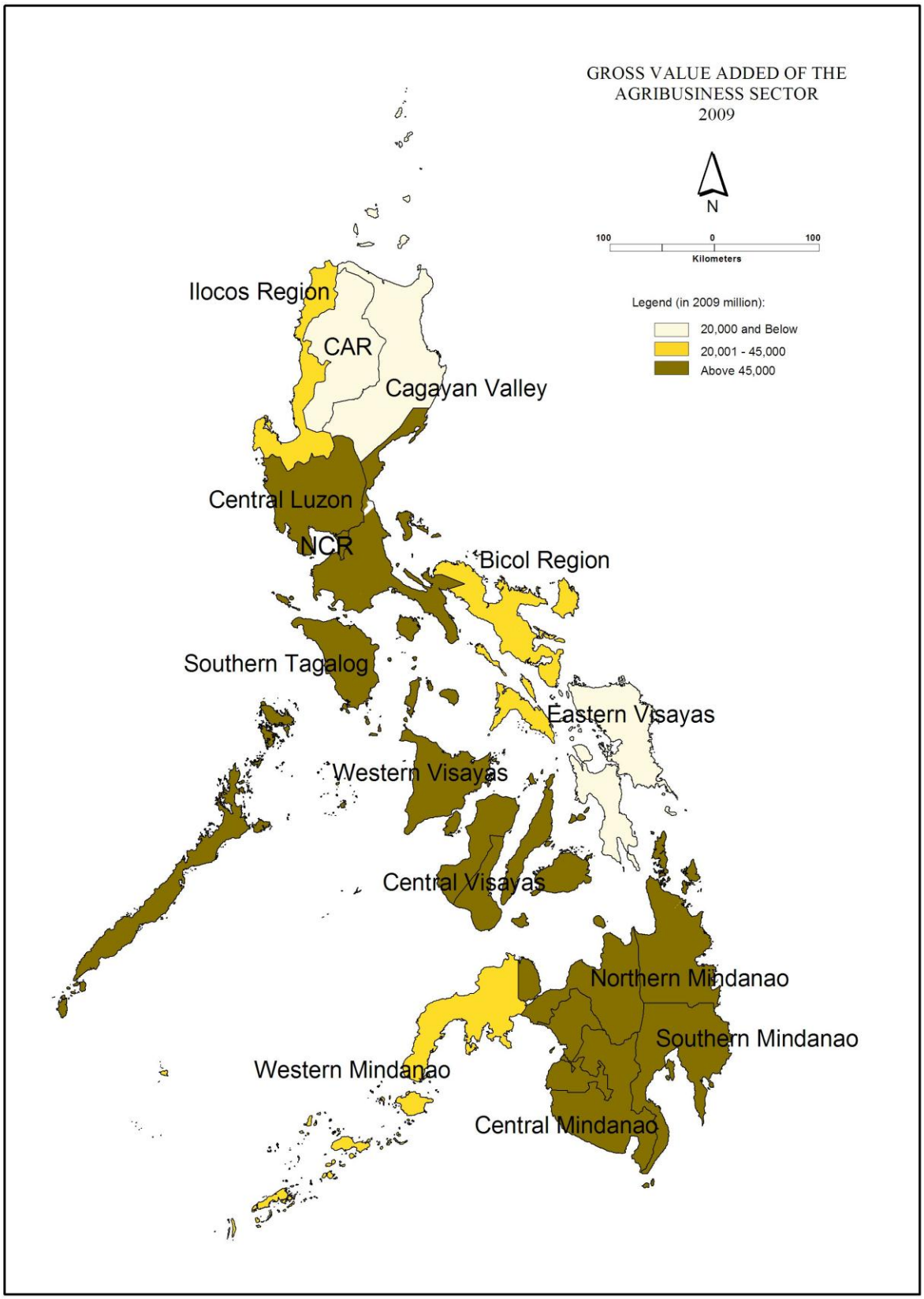
Full List	Input coefficient	GVA share	Employment share	Composite index
Fabric knitting mills	0.00545	0.00365	0.00509	0.01344
Millwork plants	0.00166	0.00458	0.00552	0.01272
Manufacture of miscellaneous chemical products	0.00037	0.00565	0.00212	0.01078
Chromite mining	0.01498	0.00010	0.00014	0.01021
Manufacture of glass container	0.00004	0.00522	0.00129	0.00921
Inland water transport (including renting of ship with operator)	0.00679	0.00056	0.00348	0.00818
Copper mining	0.00136	0.00362	0.00194	0.00812
Manufacture of carpets and rugs	0.01045	0.00045	0.00051	0.00804
Manufacture of artificial leather and impregnated and coated fabrics	0.00147	0.00230	0.00344	0.00732
Coal mining	0.00045	0.00387	0.00014	0.00644
Nickel mining	0.00199	0.00225	0.00154	0.00605
Manufacture and repair of furniture and fixtures, made primarily of metal	0.00097	0.00202	0.00240	0.00571
Gold mining	0.00231	0.00139	0.00200	0.00530
Other dairy products	0.00423	0.00103	0.00036	0.00468
Manufacture of structural clay products	0.00196	0.00127	0.00156	0.00452
Manufacture and repair of other furnitures and fixtures, n.e.c.	0.00461	0.00032	0.00084	0.00422
Manufacture of pottery,china and earthenwares	0.00005	0.00091	0.00289	0.00375
Manufacture of asphalt, lubricants and miscellaneous products of petroleum and coal	0.00420	0.00033	0.00010	0.00334
Manufacture of other non-metallic mineral products, n.e.c.	0.00025	0.00190	0.00012	0.00319
Tanneries and leather finishing	0.00152	0.00066	0.00143	0.00315
Manufacture of pesticides, insecticides, etc.	0.00051	0.00065	0.00050	0.00171
Other short-stay accommodation, n.e.c.	0.00242	0.00004	0.00007	0.00169
Manufacture of made-up textile goods except wearing apparel	0.00007	0.00030	0.00098	0.00126
Other metallic mining (including silver mining)	0.00195	0.00000	0.00001	0.00126
Other non-metallic mining (including salt mining)	0.00066	0.00004	0.00051	0.00087

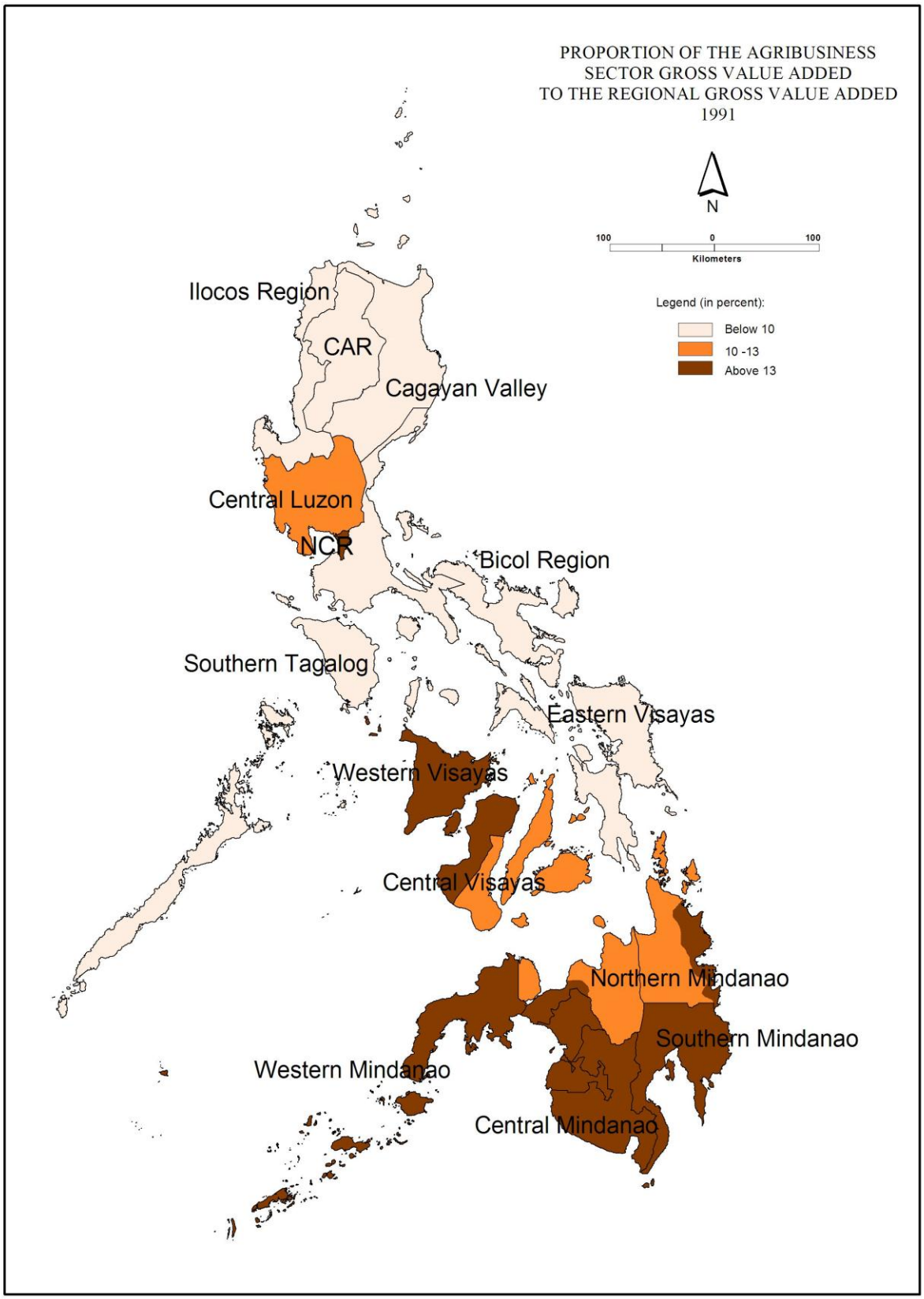
Note: GVA and employment shares were computed based on the initial listing such that the sum of shares of the sub-sectors included in the initial list would sum to 1.

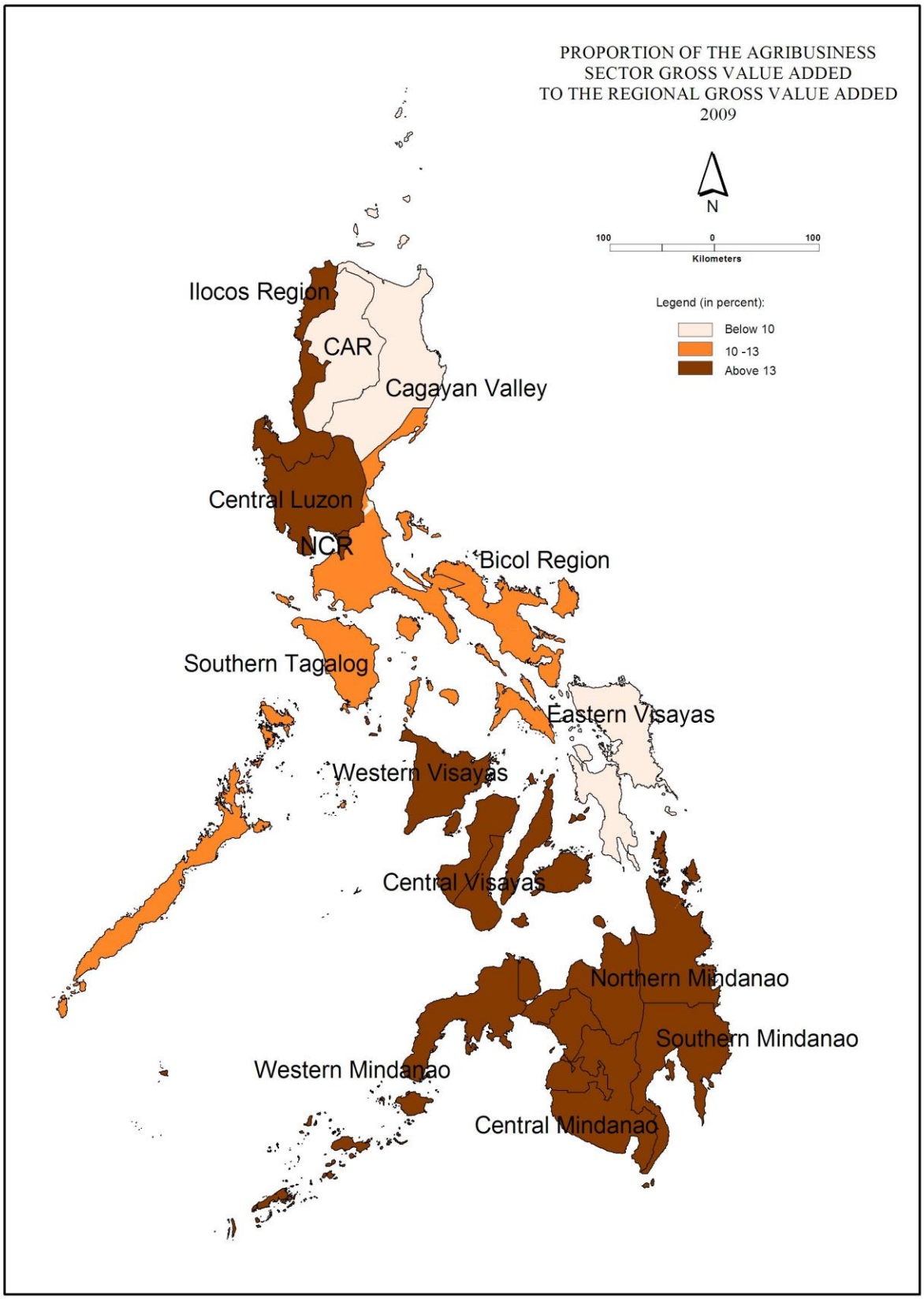
Composite index was computed based on a 50-25-25 split between the input coefficient, employment and GVA shares.

ANNEX B – GROSS VALUE ADDED MAPS OF AGRIBUSINESS

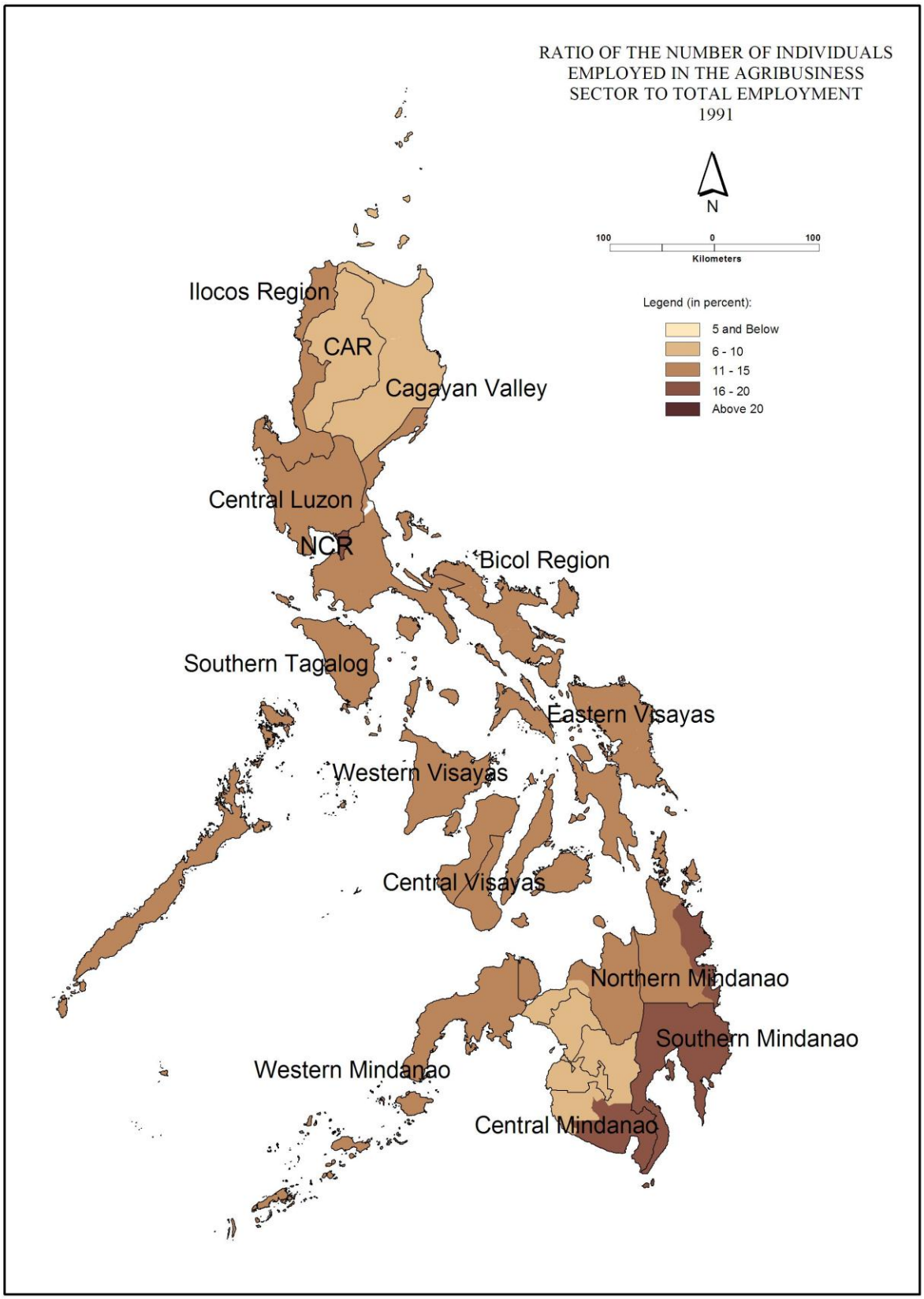

GROSS VALUE ADDED OF THE
AGRIBUSINESS SECTOR
1991
N
100
0
100
Kilometers
Legend (in 2009 million):
20,000 and Below
20,001 - 45,000
Above 45,000
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao

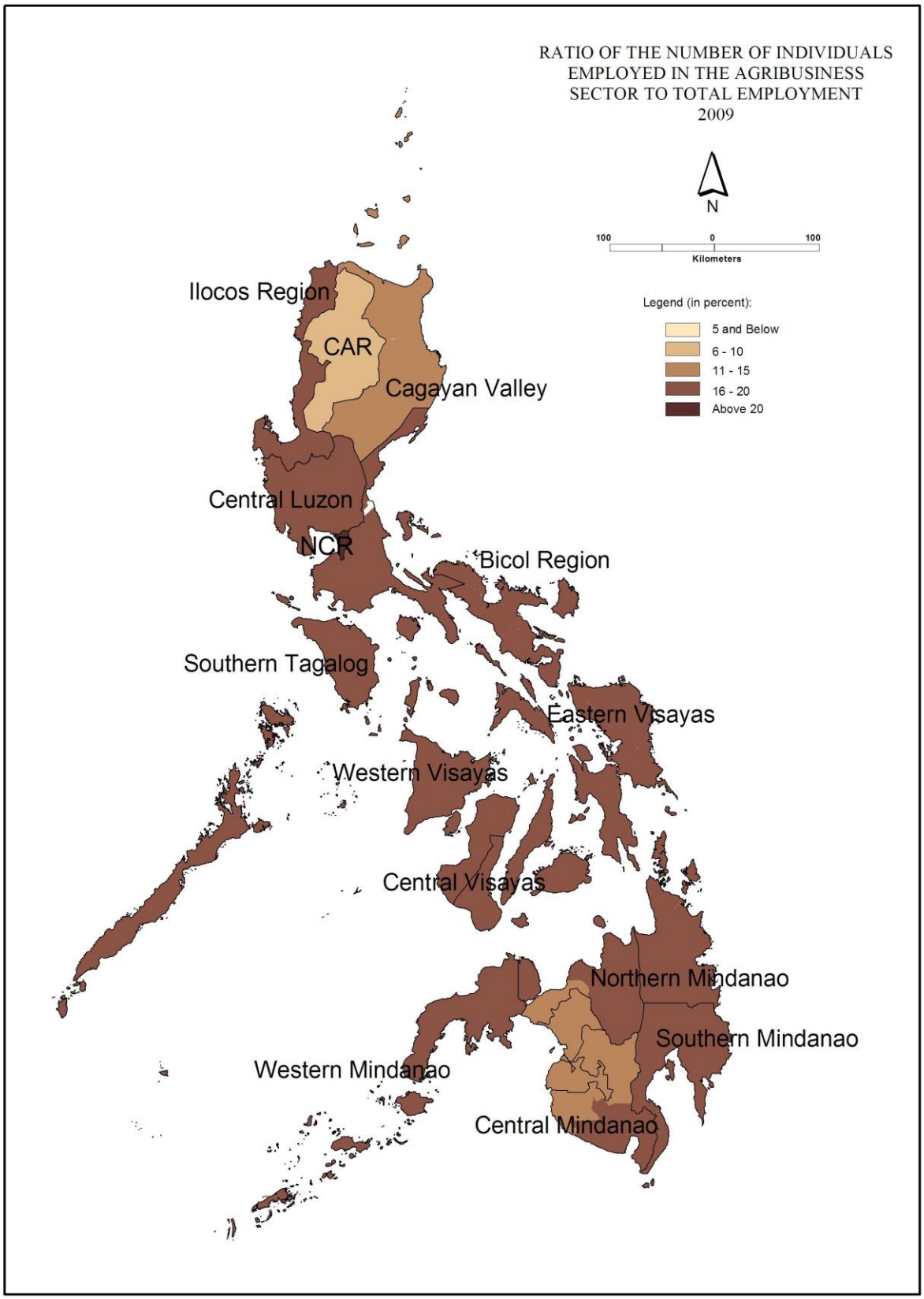

GROSS VALUE ADDED OF THE
AGRIBUSINESS SECTOR
2009
N
100
0
100
Kilometers
Legend (in 2009 million):
20,000 and Below
20,001 - 45,000
Above 45,000
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao

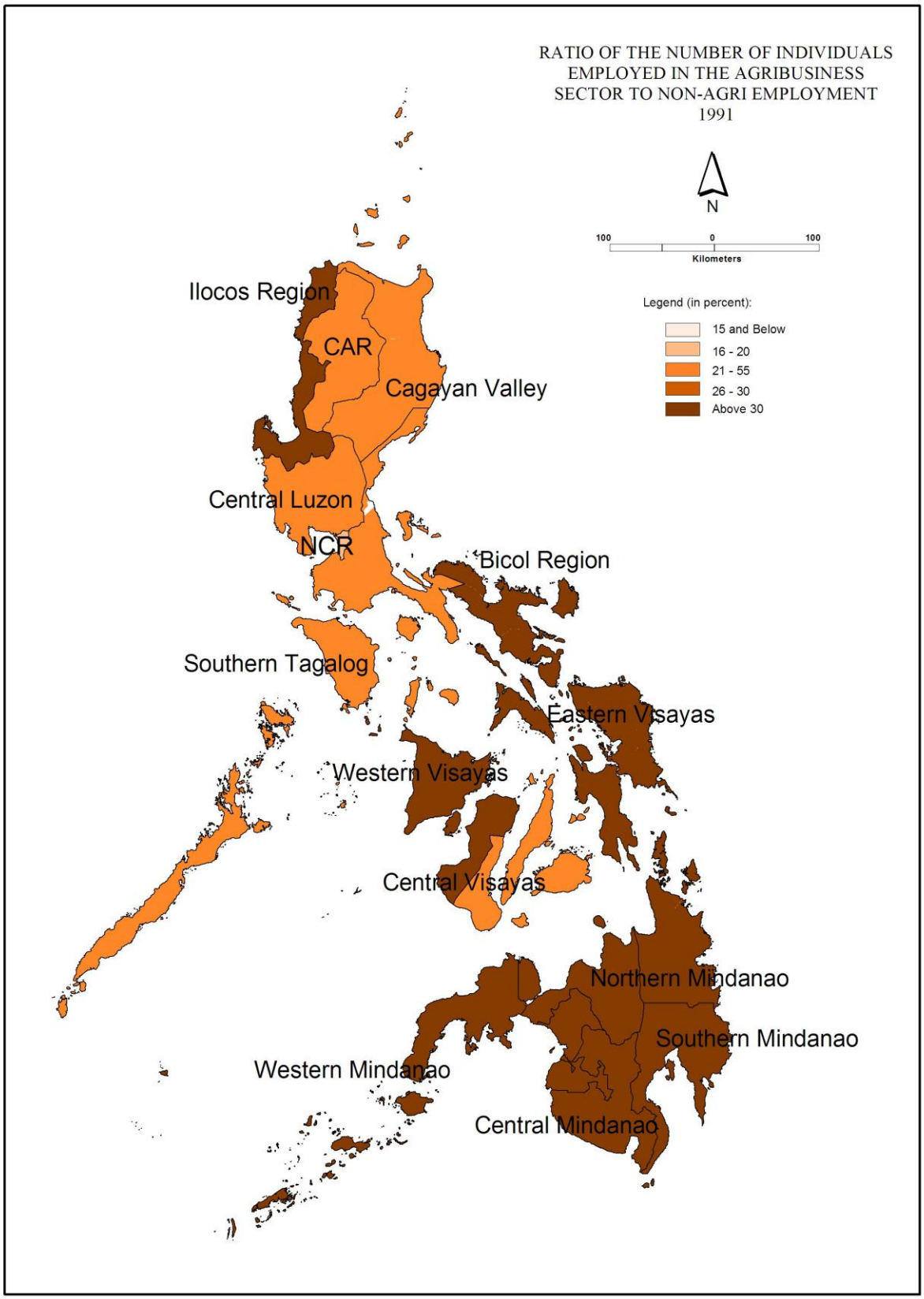

PROPORTION OF THE AGRIBUSINESS
SECTOR GROSS VALUE ADDED
TO THE REGIONAL GROSS VALUE ADDED
1991
N
100
0
100
Kilometers
Legend (in percent):
Below 10
10 -13
Above 13
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao

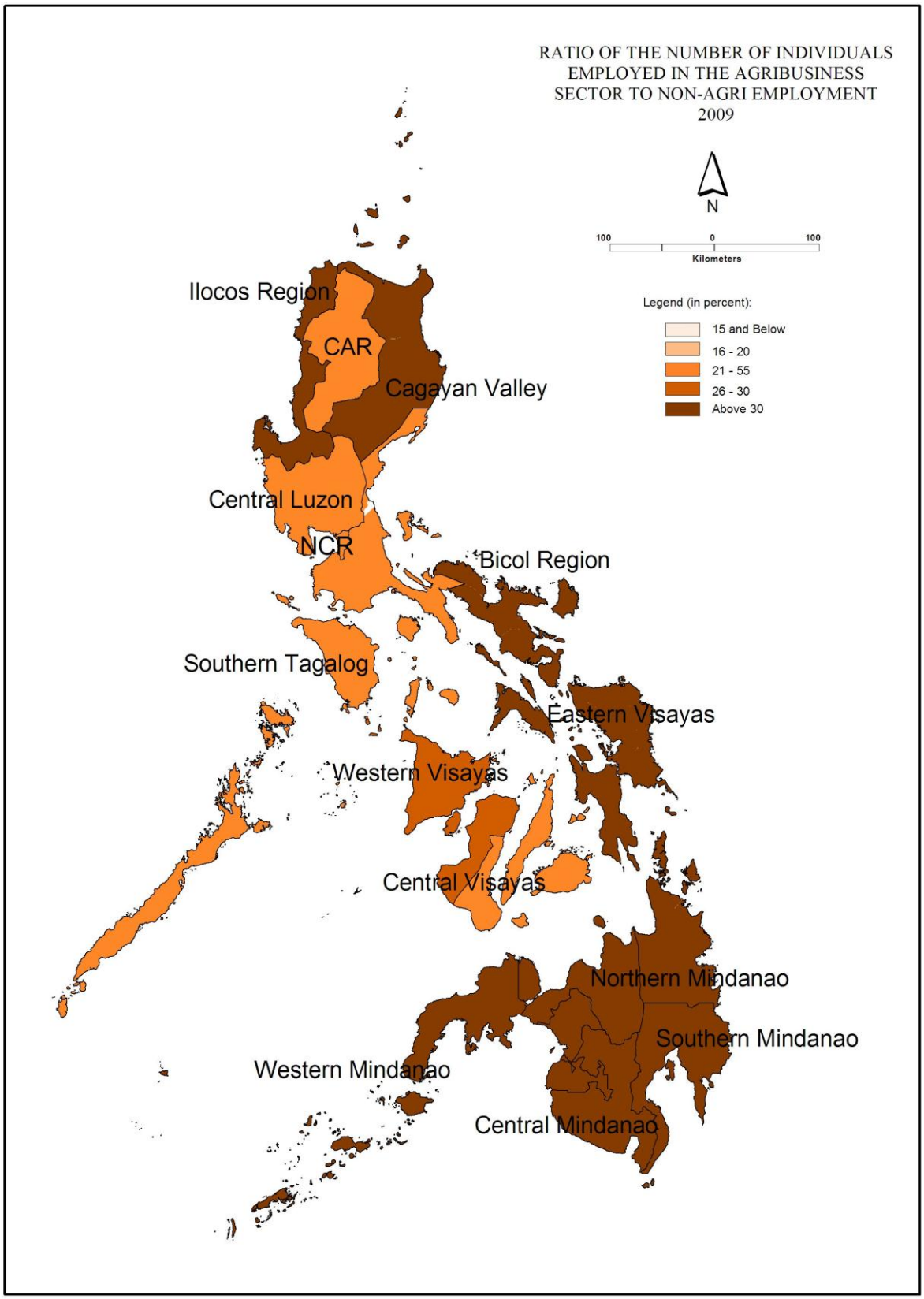

PROPORTION OF THE AGRIBUSINESS
SECTOR GROSS VALUE ADDED
TO THE REGIONAL GROSS VALUE ADDED
2009
N
100
0
100
Kilometers
Legend (in percent):
Below 10
10 -13
Above 13
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao

ANNEX C – EMPLOYMENT MAPS OF AGRIBUSINESS


RATIO OF THE NUMBER OF INDIVIDUALS
EMPLOYED IN THE AGRIBUSINESS
SECTOR TO TOTAL EMPLOYMENT
1991
N
100
0
100
Kilometers
Legend (in percent):
5 and Below
6 - 10
11 - 15
16 - 20
Above 20
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao


RATIO OF THE NUMBER OF INDIVIDUALS
EMPLOYED IN THE AGRIBUSINESS
SECTOR TO TOTAL EMPLOYMENT
2009
N
100
0
100
Kilometers
Legend (in percent):
5 and Below
6 - 10
11 - 15
16 - 20
Above 20
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao


RATIO OF THE NUMBER OF INDIVIDUALS
EMPLOYED IN THE AGRIBUSINESS
SECTOR TO NON-AGRI EMPLOYMENT
1991
N
100
0
100
Kilometers
Legend (in percent):
15 and Below
16 - 20
21 - 55
26 - 30
Above 30
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao


RATIO OF THE NUMBER OF INDIVIDUALS EMPLOYED IN THE AGRIBUSINESS SECTOR TO NON-AGRI EMPLOYMENT
2009
N
100
0
100
Kilometers
Legend (in percent):
15 and Below
16 - 20
21 - 55
26 - 30
Above 30
Ilocos Region
CAR
Cagayan Valley
Central Luzon
NCR
Bicol Region
Southern Tagalog
Eastern Visayas
Western Visayas
Central Visayas
Northern Mindanao
Southern Mindanao
Western Mindanao
Central Mindanao

ANNEX D – MODEL EQUATIONS AND VARIABLE DEFINITIONS

Production block

Industry value added
$$VA_i = \alpha_i L_i^{\beta_i} K_i^{1-\beta_i} \; ; \; i \in I \tag{1}$$

Labor demand
$$L_i = \frac{\beta_i \cdot PVA_i \cdot VA_i}{W} ; \; i \in I \tag{2}$$

Price of value added
$$PVA_i = \frac{PCS_i - \sum_j A_{ij} \cdot PCD_i - \tau_{1i} \cdot P_i}{A_i} ; \; i, j \in I \tag{3}$$

Return to fixed capital
$$RFK_i = PVA_i \cdot VA_i - W \cdot L_i ; \; i \in I \tag{4}$$

Industry output
$$Q_i = \frac{VA_i}{A_i} ; \; i \in I \tag{5}$$

Intermediate demand
$$ID_{ji} = A_{ji} \cdot Q_i \; ; \; i, j \in I \tag{6}$$

Household Block

Gross income of HHs
$$Y = \sum_i W \cdot L_i + \left(1 - \tau_2\right) \cdot (1 - \eta_1) \cdot \sum_i RFK_i \; ; \; i, j \in I \tag{7}$$

Disposable income of HHs
$$YD = Y + TRHG + TRHF - TAXY \tag{8}$$

Household savings
$$SH = \eta_2 \cdot YD \tag{9}$$

Household consumption
$$C_i = \frac{\gamma_i \cdot \left(1 - \eta_2\right) \cdot YD}{PCD_i} ; \; i \in I \tag{10}$$

Government Block

Government revenues
$$GREV = TAXI + TAXY + TAXM + TAXC \tag{11}$$

Revenues from indirect taxes
$$TAXI = \sum_i \tau_{1i} \cdot P_i \cdot Q_i \; ; \; i \in I \tag{12}$$

Revenues from income taxes
$$TAXY = \tau_3 \cdot Y ; \; i \in I \tag{13}$$

Revenues from import taxes
$$TAXM = \sum_i \tau_{4i} \cdot PMF_i \cdot EXC \cdot M_i \; ; \; i \in MG \tag{14}$$

Revenues from corporate taxes
$$TAXC = \tau_2 \cdot \sum_i RFK_i \; ; \; i \in I \tag{15}$$

Government spending on goods $GSPEND = \sum_i PCD_i \cdot G_i \; ; \qquad i \in I$ (17)

Government savings $SG = GREV - GSPEND - TRHG - TRRG$ (18)

Foreign Trade

Foreign savings

$$ST = \sum_i PMF_i \cdot EXC \cdot M_i + TRRG - TRHR - \sum_i PXF_i \cdot EXC \cdot X_i \; ; i \in MG, \; j \in XG \quad (19)$$

Export supply, by commodity

$$X_i = DD_i \cdot \left[\frac{\delta_i^X}{1-\delta_i^X} \cdot \frac{PX_i}{P_i} \right]^{\sigma_i^X} \; ; \; i \in XG$$

$$X_i = 0; \; ; \; i \in XGN \quad (20)$$

Imports, by commodity

$$M_i = DD_i \cdot \left[\frac{\delta_i^M}{1-\delta_i^M} \cdot \frac{P_i}{PM_i} \right]^{\sigma_i^M} \; ; \; i \in MG$$

$$M_i = 0 \; ; \; i \in MGN \quad (21)$$

Domestic price of exports, by commodity

$$PX_i = PXF_i \cdot EXC; \qquad i \in XG \quad (22)$$

Domestic price of imports, by commodity

$$PM_i = PMF_i \cdot EXC \cdot (1+\tau_{4i}); \; i \in MG \quad (23)$$

Other equations

Product market equilibrium

$$Q_i = DA_i + X_i - M_i \qquad i \in I \quad (24)$$

Domestic spending by commodity

$$DA_i = C_i + INV_i + G_i + \sum_j ID_{ij} \; ; \qquad i, j \in I \quad (25)$$

Investment

$$INV_i = \frac{\psi_i \cdot S}{PCD_i}; \quad i \in I \tag{26}$$

Total savings

$$S = SH + SG + ST + \eta_1 \cdot \left(1 - \tau_2\right) \cdot \sum_i RFK_i \; ; \qquad i \in I \tag{27}$$

Domestic demand for the domestically produced commodity

$$DD_i = Q_i - X_i \; ; \quad i \in I \tag{28}$$

Labor market equilibrium

$$LTOT = \bar{L} \tag{29}$$

Total employment

$$LTOT = \sum_i L_i \; ; \quad i \in I \tag{30}$$

Composite price in demand

$$PCD_i = \frac{P_i \cdot DD_i + PM_i \cdot M_i}{DA_i}; \quad i \in I \tag{31}$$

Composite price in supply

$$PCS_i = \frac{P_i \cdot DD_i + PX_i \cdot X_i}{Q_i}; \qquad i \in I \tag{32}$$

Annex Table 2. List of Variables

Variables	Description
Endogenous variables	
C_i	Household consumption of commodity *i*
DA_i	Domestic spending on commodity *i*
DD_i	Domestic demand for the domestically produced component of commodity *i*
GREV	Government revenues
GSPEND	Government spending on goods
ID_{ij}	Intermediate demand for commodity *j* of industry *j*
INV_i	Investment demand for commodity *j*
L_i	Labor demand of industry *i*
LTOT	Total employment
M_{ri}	Imports of commodity *I*
PCD_i	Composite price in demand of commodity *i*
PCS_i	Composite price in supply of commodity *i*
P_i	Output price of industry *i*
PM_{ri}	Domestic currency price of importable good *i*
PVA_i	Price of value added of industry *i*
PX_{ri}	Domestic currency price of exportable good *i*
Q_i	Output of industry *i*
RFK_i	Return to fixed capital in industry *i*
S	Total savings
SG	Government savings
SH	Household savings
ST	Foreign savings
TAXC	Tax revenues from corporations
TAXI	Tax revenues from indirect taxes
TAXM	Tax revenues from import tariffs
TAXY	Tax revenues from income
VA_i	Value added of industry *i*
W	Wage rate
X_{ri}	Exports of commodity *I*
Y	Household income
YD	Household disposable income

Annex Table 2. List of variables, continued

Variables	Description
Exogenous variables	
γ_i	Share of commodity *i* in total household spending
τ_{1i}	Tax rate on goods and services
τ_2	Tax rate on corporate income
τ_3	Tax rate on household income
τ_{4i}	Tariff rate on commodity *i,* imported from region *r*
η_1	Corporate savings rate
η_2	Household savings rate
α_i	Constant in the production function
δ_i^X	share parameter in the transformation function (i.e., between exports and domestic output)
δ_i^M	share parameter in the Armington function (i.e., between imports and domestic output)
σ_i^X	elasticity of transformation between domestic goods and exports
σ_i^M	elasticity of substitution between domestic goods and imports
ψ_i	Investment share of industry *i*
A_i	Proportion of value added in production
A_{ij}	Input-output coefficient
EXC	Exchange rate
G_i	Government expenditure on good *i*
$\bar{L}$	Labor supply
PMF_i	Import price of commodity *i,* foreign currency
PXF_i	Export price of commodity *i,* foreign currency
TRHF	Net transfers from foreigners to households
TRHG	Net transfers from government to households
TRRG	Net transfers from government to foreigners

Annex Table 3. Sets

Set	Description	Relationships
I	All commodities	
MG	Commodities that are imported	$MG \subset I;\ MG \cup MGN = I$
MGN	Commodities that are not imported	$MG \subset I;\ MG \cup MGN = I$
XG	Commodities that are exported	$XG \subset I;\ XG \cup XGN = I$

ANNEX E – LABOR MARKET CHANNEL ESTIMATION RESULTS

Annex Table 4. Regression Coefficients with alternative specifications (labor demand measured by the median number of employed workers) [Two-stage least squares with region dummies SUR estimation]

coefficients:	Labor demand: median number employed							
	Mean wage with agribusiness		Median wage with agribusiness		Mean wage without agribusiness		Median wage without agribusiness	
	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand
b_{ss}	-17.378		0.538		2.610		17.859	
	(96.856)		(97.810)		(112.050)		(112.668)	
b_{su}	0.322		0.019		-0.050		0.140	
	(0.522)		(0.776)		(0.601)		(0.886)	
b_{sr}	-4.489**		-4.073***		-5.897***		-5.456***	
	(1.761)		(1.531)		(1.878)		(1.642)	
c_{ss}	-357.429***		-358.861***		-271.023***		-272.485***	
	(41.382)		(42.071)		(31.414)		(31.596)	
c_{su}	-0.029		-0.184		-0.038		-0.268	
	(0.174)		(0.369)		(0.096)		(0.232)	
c_{sr}	1.474***		1.324**		0.828***		0.773***	
	(0.568)		(0.534)		(0.284)		(0.280)	
b_s	0.010		0.001		-0.001		-0.009	
	(0.048)		(0.049)		(0.056)		(0.056)	
c_s	0.178***		0.179***		0.135***		0.136***	
	(0.021)		(0.021)		(0.016)		(0.016)	
d_s	0.000***		0.000***		0.000***		0.000***	
	(0.000)		(0.000)		(0.000)		(0.000)	
e_s	-0.000		-0.000		0.000		0.000	
	(0.000)		(0.000)		(0.000)		(0.000)	
f_s	-0.000***		-0.000***		-0.000***		-0.000***	
	(0.000)		(0.000)		(0.000)		(0.000)	
t	5,768.251*	-3,068.497**	5,876.810*	-3,229.999**	9,264.764***	-3,029.156*	9,191.763***	-3,163.189**

coefficients:	Labor demand: median number employed							
	Mean wage with agribusiness		Median wage with agribusiness		Mean wage without agribusiness		Median wage without agribusiness	
	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand
	(3,184.056)	(1,491.735)	(3,178.464)	(1,494.874)	(3,520.562)	(1,584.666)	(3,518.070)	(1,577.950)
_lregn_2	-382,639.47***	28,223.35	-382,678.98***	27,000.09	-405,885.84***	28,702.54*	-405,357.32***	28,121.47*
	(39,122.037)	(18,277.486)	(39,034.600)	(18,273.034)	(36,404.616)	(16,323.412)	(36,342.241)	(16,254.413)
_lregn_3	898,053.247***	271,281.812***	896,730.153***	271,158.063***	938,069.080***	345,706.910***	936,371.849***	342,341.300***
	(106,282.63)	(49,110.17)	(105,955.76)	(49,105.32)	(107,280.71)	(47,516.50)	(106,866.60)	(47,322.00)
_lregn_4	1725366.21***	750,711.12***	1718759.07***	751,850.76***	1654463.93***	837,468.08***	1648785.46***	832,709.33***
	(194,173.101)	(89,430.118)	(193,338.604)	(89,550.954)	(201,322.696)	(89,299.964)	(200,578.559)	(88,913.108)
_lregn_5	153,797.998***	175,208.414***	154,180.657***	175,221.831***	139,634.968***	156,920.450***	140,727.399***	157,930.362***
	(32,005.301)	(14,993.110)	(31,940.321)	(14,999.314)	(32,965.436)	(14,841.645)	(32,927.858)	(14,775.945)
_lregn_6	320,590.601***	637,160.636***	317,409.185***	641,900.538***	373,826.389***	649,190.251***	372,357.773***	649,476.937***
	(82,387.483)	(38,271.885)	(82,140.991)	(38,304.781)	(78,025.366)	(34,725.663)	(77,810.446)	(34,576.582)
_lregn_7	52,952.443	537,181.030***	53,139.378	534,295.545***	82,992.215	461,332.885***	85,409.702	460,475.649***
	(76,598.164)	(35,583.530)	(76,505.022)	(35,690.877)	(82,266.758)	(36,677.016)	(82,266.969)	(36,571.016)
_lregn_8	-375,461.50***	309,445.09***	-375,615.42***	308,139.99***	-403,615.18***	275,908.00***	-402,516.43***	276,643.49***
	(38,212.12)	(17,915.57)	(38,144.62)	(17,963.10)	(39,659.40)	(17,876.63)	(39,604.30)	(17,797.15)
_lregn_9	-461,536.86***	375,743.35***	-461,976.43***	377,925.41***	-455,437.91***	367,026.14***	-455,920.53***	368,499.35***
	(30,784.472)	(14,429.692)	(30,747.559)	(14,526.441)	(30,297.748)	(13,631.123)	(30,277.966)	(13,639.326)
_lregn_10	10,006.210	397,283.993***	8,857.907	399,256.393***	42,078.951	401,699.041***	41,603.272	401,654.912***
	(51,008.164)	(23,739.868)	(50,874.770)	(23,746.335)	(48,686.614)	(21,726.933)	(48,580.367)	(21,641.959)
_lregn_11	211,770.861**	575,997.989***	205,609.900**	584,083.588***	247,469.607***	521,997.909***	247,253.566***	524,514.318***
	(94,542.282)	(44,114.171)	(94,309.633)	(44,336.501)	(84,799.115)	(37,941.179)	(84,712.807)	(37,843.496)
_lregn_12	-367,428.68***	280,137.82***	-368,244.29***	282,185.16***	-361,185.42***	261,979.39***	-361,692.89***	262,769.61***
	(31,336.951)	(14,681.227)	(31,288.713)	(14,751.039)	(28,985.552)	(13,035.193)	(28,955.407)	(12,992.170)
_lregn_13	-870,632.30***	-186,442.80***	-872,621.93***	-188,984.04***	-949,115.90***	-325,143.36***	-945,198.79***	-323,533.71***
	(65,881.320)	(30,903.679)	(65,759.575)	(31,014.196)	(81,651.842)	(36,822.248)	(81,506.723)	(36,672.004)
_lregn_14	3560316.50***	178,868.29	3577363.12***	170,391.26	3924652.83***	-988,894.40***	4001336.25***	-1025815.25***
	(522,685.63)	(242,790.94)	(523,698.14)	(248,710.80)	(619,340.71)	(278,647.04)	(622,736.19)	(283,081.85)
b_{us}		0.322		0.019		-0.050		0.140
		(0.522)		(0.776)		(0.601)		(0.886)
b_{uu}		-141.733***		-143.293***		-232.099***		-225.051***
		(47.330)		(49.374)		(52.929)		(53.463)

coefficients:	Labor demand: median number employed							
	Mean wage with agribusiness		Median wage with agribusiness		Mean wage without agribusiness		Median wage without agribusiness	
	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand
b_{ur}		-2.145***		-1.872***		-1.627**		-1.464**
		(0.647)		(0.613)		(0.679)		(0.641)
c_{us}		-0.029		-0.184		-0.038		-0.268
		(0.174)		(0.369)		(0.096)		(0.232)
c_{uu}		20.042		14.172		3.331		2.741
		(19.782)		(20.902)		(13.912)		(14.382)
c_{ur}		0.605**		0.607**		0.035		0.073
		(0.241)		(0.245)		(0.127)		(0.132)
b_u		0.070***		0.071***		0.112***		0.108***
		(0.024)		(0.025)		(0.027)		(0.027)
c_u		-0.010		-0.007		-0.001		-0.001
		(0.010)		(0.010)		(0.007)		(0.007)
d_u		-0.000		-0.000		-0.000***		-0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
e_u		0.000		0.000		0.000***		0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
f_u		0.000**		0.000*		-0.000**		-0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
Constant	-1.026e+07	6510921.571**	-1.047e+07*	6836841.733**	-1.711e+07**	6631067.147**	-1.697e+07**	6896913.089**
	(6312420.61)	(2957386.53)	(6301259.05)	(2963822.10)	(6975866.49)	(3140004.74)	(6970983.12)	(3126753.66)
Observations	280	280	280	280	280	280	280	280
R-squared	0.990	0.955	0.990	0.956	0.991	0.959	0.991	0.960

Annex Table 5. Regression Coefficients with alternative specifications
(labor demand measured by the average hours worked multiplied by the average number of employed workers)
[Two-stage least squares with region dummies SUR estimation]

Coefficients	Labor demand: average # hours worked*average #employed							
	Mean wage with agribusiness		Median wage with agribusiness		Mean wage without agribusiness		Median wage without agribusiness	
	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand
b_{ss}	-1,799.964		-1,882.197		-2,056.903		-2,094.395	
	(4,233.127)		(4,282.635)		(4,972.630)		(5,003.616)	
b_{su}	12.637		19.901		3.089		31.317	
	(18.416)		(27.129)		(21.533)		(31.408)	
b_{sr}	-90.491		-68.962		-132.067		-112.805	
	(77.153)		(67.190)		(83.564)		(72.997)	
c_{ss}	-13,100.881***		-12,907.777***		-9,836.089***		-9,842.966***	
	(1,809.674)		(1,844.882)		(1,395.555)		(1,404.818)	
c_{su}	-1.108		-17.411		-1.521		-14.546*	
	(6.417)		(13.188)		(3.644)		(8.432)	
c_{sr}	18.086		10.578		15.426		13.140	
	(24.892)		(23.397)		(12.628)		(12.437)	
b_s	0.939		0.973		1.047		1.057	
	(2.112)		(2.137)		(2.477)		(2.492)	
c_s	6.559***		6.469***		4.920***		4.927***	
	(0.897)		(0.914)		(0.690)		(0.694)	
d_s	0.000***		0.000***		0.000***		0.000***	
	(0.000)		(0.000)		(0.000)		(0.000)	
e_s	-0.000		-0.000		-0.000		-0.000	
	(0.000)		(0.000)		(0.001)		(0.001)	
f_s	-0.000***		-0.000***		-0.000***		-0.000***	
	(0.000)		(0.000)		(0.000)		(0.000)	
t	1,820.43	-210,642.27***	4,248.78	-210,348.41***	124,347.94	-230,060.27***	122,343.26	-231,666.01***
	(139,180.31)	(49,158.81)	(139,438.07)	(49,045.05)	(156,388.86)	(53,023.18)	(156,459.24)	(52,630.60)
_lregn_2	-1.547e+07***	1052319.215*	-1.549e+07***	1022562.852*	-1.625e+07***	1260300.068**	-1.625e+07***	1228633.065**
	(1710565.68)	(602,429.94)	(1712584.06)	(599,351.96)	(1617204.78)	(546,296.07)	(1616288.32)	(542,215.38)

Coefficients	Labor demand: average # hours worked*average #employed							
	Mean wage with agribusiness		Median wage with agribusiness		Mean wage without agribusiness		Median wage without agribusiness	
	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand
_lregn_3	39271329.94***	11841508.30***	39296483.40***	11905694.09***	40257129.05***	14153880.21***	40297302.73***	14131853.87***
	(4647714.986)	(1619716.865)	(4648703.697)	(1610786.503)	(4766191.001)	(1590965.830)	(4752786.547)	(1578475.369)
_lregn_4	61363868.89***	27516191.20***	61367795.96***	27524836.32***	57482823.89***	29973021.35***	57513732.68***	29907457.55***
	(8491482.81)	(2949079.32)	(8482286.14)	(2937077.47)	(8944063.35)	(2989816.25)	(8920547.46)	(2965658.73)
_lregn_5	2210211.54	4879482.72***	2206636.27	4897893.66***	1771188.94	4464116.76***	1792976.37	4497150.48***
	(1399367.92)	(494,070.79)	(1401323.73)	(491,982.91)	(1464321.02)	(496,548.45)	(1464413.86)	(492,819.44)
_lregn_6	4981762.27	21909304.87***	4923162.28	22061728.46***	6854447.34**	21977718.76***	6868071.27**	22031581.55***
	(3602588.04)	(1262100.46)	(3603599.68)	(1256798.83)	(3466365.12)	(1162596.35)	(3460584.44)	(1153499.77)
_lregn_7	569,072.37	19576924.19***	586,422.43	19625505.06***	1964819.18	17321744.73***	2075191.06	17397125.37***
	(3349171.18)	(1173422.26)	(3356117.25)	(1171489.00)	(3654135.92)	(1227724.00)	(3658262.52)	(1220244.36)
_lregn_8	-1.583e+07***	10424749.54***	-1.586e+07***	10433755.45***	-1.673e+07***	9615986.53***	-1.672e+07***	9660627.79***
	(1670752.87)	(590,375.76)	(1673346.36)	(589,326.90)	(1761555.20)	(598,146.26)	(1761276.58)	(593,659.64)
_lregn_9	-1.671e+07***	15262117.99***	-1.671e+07***	15267701.63***	-1.645e+07***	14815602.69***	-1.645e+07***	14806837.79***
	(1345974.22)	(475,519.97)	(1348689.84)	(476,823.18)	(1345887.31)	(456,041.56)	(1346362.34)	(455,146.35)
_lregn_10	-4468687.11**	12195320.61***	-4486771.42**	12272945.44***	-3344043.32	12145436.15***	-3333471.78	12181629.40***
	(2230410.09)	(782,716.64)	(2232049.60)	(779,056.59)	(2162909.16)	(727,292.91)	(2160586.28)	(722,026.10)
_lregn_11	5296808.84	19724400.16***	5134415.51	19951172.76***	6707743.50*	17385463.84***	6751533.88*	17481937.58***
	(4133549.62)	(1454501.65)	(4136280.53)	(1455451.16)	(3766950.36)	(1269935.97)	(3767197.14)	(1262843.58)
_lregn_12	-1.803e+07***	9039533.08***	-1.804e+07***	9067689.29***	-1.781e+07***	8343157.90***	-1.782e+07***	8358979.95***
	(1370138.74)	(483,797.29)	(1372477.68)	(484,055.62)	(1287598.11)	(436,107.46)	(1287724.92)	(433,358.72)
_lregn_13	-3.288e+07***	-6299406.99***	-3.301e+07***	-6257641.35***	-3.528e+07***	-1.024e+07***	-3.521e+07***	-1.012e+07***
	(2880476.23)	(1018419.23)	(2884615.09)	(1017605.91)	(3626122.27)	(1232084.02)	(3624733.12)	(1223384.24)
_lregn_14	1.406e+08***	8623221.56	1.417e+08***	7630522.55	1.601e+08***	-2.959e+07***	1.633e+08***	-3.154e+07***
	(22857063.11)	(8006693.93)	(22963619.60)	(8169699.91)	(27511931.16)	(9326790.15)	(27678001.60)	(9453120.61)
b_{us}		12.637		19.901		3.089		31.317
		(18.416)		(27.129)		(21.533)		(31.408)
b_{uu}		-6,016.880***		-6,047.483***		-8,916.037***		-8,690.412***
		(1,579.674)		(1,638.521)		(1,792.495)		(1,797.090)
b_{ur}		-56.831***		-49.775**		-39.483*		-37.778*
		(21.605)		(20.430)		(23.050)		(21.731)

Coefficients	Labor demand: average # hours worked*average #employed							
	Mean wage with agribusiness		Median wage with agribusiness		Mean wage without agribusiness		Median wage without agribusiness	
	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand	skilled labor demand	unskilled labor demand
c_{us}		-1.108		-17.411		-1.521		-14.546*
		(6.417)		(13.188)		(3.644)		(8.432)
c_{uu}		813.576		566.529		-117.435		-176.594
		(663.701)		(689.189)		(471.673)		(480.649)
c_{ur}		16.459**		18.906**		0.690		3.332
		(8.099)		(8.150)		(4.322)		(4.493)
b_u		2.972***		2.983***		4.316***		4.187***
		(0.795)		(0.826)		(0.900)		(0.903)
c_u		-0.409		-0.276		0.068		0.105
		(0.331)		(0.344)		(0.234)		(0.239)
d_u		-0.000*		-0.000*		-0.000***		-0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
e_u		0.000*		0.000		0.002***		0.002***
		(0.000)		(0.000)		(0.000)		(0.000)
f_u		0.000**		0.000*		-0.000**		-0.000***
		(0.000)		(0.000)		(0.000)		(0.000)
Constant	43731003.645	4.346e+08***	39020379.585	4.341e+08***	-1.969e+08	4.792e+08***	-1.930e+08	4.823e+08***
	(2.759e+08)	(97458175.72)	(2.764e+08)	(97239991.32)	(3.099e+08)	(1.051e+08)	(3.100e+08)	(1.043e+08)
observations	280	280	280	280	280	280	280	280
R-squared	0.992	0.958	0.992	0.958	0.992	0.961	0.992	0.961