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Agricultural Diversification and the Fruits and Vegetables Subsector: Policy Issues and Development Constraints in the Philippines

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Agricultural Diversification and the Fruits and Vegetables Subsector: Policy Issues and Development Constraints in the Philippines

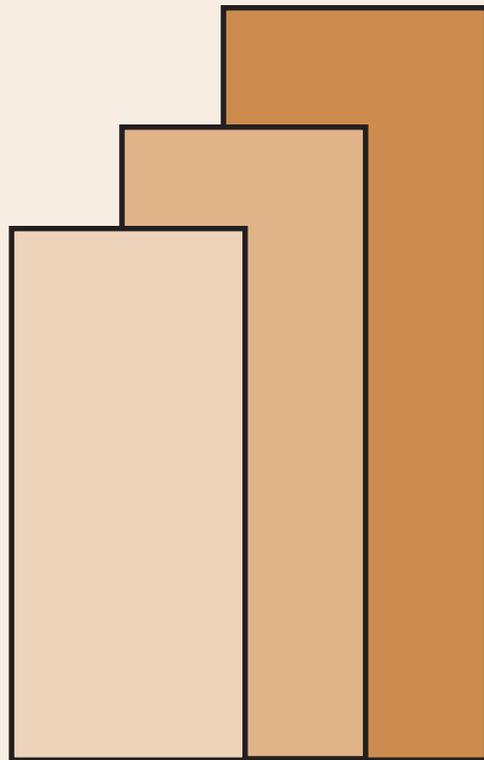
Roehlano M. Briones

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AGRICULTURAL DIVERSIFICATION AND THE FRUITS AND VEGETABLES SUB-SECTOR: POLICY ISSUES AND DEVELOPMENT CONSTRAINTS IN THE PHILIPPINES

Roehlano M. Briones*

ABSTRACT

Fruits and vegetables comprise a large and dynamic sub-sector within Philippine agriculture. However the country's agricultural development strategy continues to emphasize traditional crops. Evidence points to a significant role for fruits and vegetables in agricultural diversification and rural development. They represent a significant set of "high-value" activities, some of which are produced within organized supply chains. As the economy develops, fruits and vegetable should become increasingly important, both as a share in agricultural output and in the food basket. Diversification could be pro-poor as it may raise incomes of smallholders and workers.

In the Philippines, the major fruit crops are banana, mango, pineapple, and calamondin; the major vegetables are tomato, garlic, onion, cabbage, and eggplant. There are clear benefits to both producers and consumers from the expansion of the sub-sector; fruits and vegetables output has indeed grown more rapidly than agriculture as a whole. However there remain impediments in reallocating resources to the high value crops. Agribusiness supply chains have arisen to overcome some of these obstacles, though these chains may be inadvertently promoting inequitable and unsustainable patterns agricultural growth.

Despite numerous policies and programs to overcome these impediments and promote agricultural growth and diversification, constraints to development persist. These include: resource degradation; weak protection and tradability of land rights; distortionary policies in favor of traditional crops; geographic dispersion, inadequate marketing and logistics infrastructure; failure to realize scale economies in marketing; and inadequate supply of producer services such as agricultural credit, technology innovation, and technical assistance to smallholders. Policy change and institutional reforms are essential for the fruits and vegetables sub-sector to realize its potential for agricultural diversification and rural development.

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1. INTRODUCTION

Fruits and vegetables comprise a large and dynamic sub-sector within Philippine agriculture. It accounts for 31% of agricultural output (by value); in the past three decades it has been growing at a rate of 2.8% per year, compared to just 1.8% for agriculture as a whole. Many of the vaunted “high value crops”, such as those identified in the government’s official programs, are fruits and vegetables.¹ In common with the rest of agriculture, development of the fruits and vegetables sub-sector is highly dependent on technological change (Weinberger and Lumpkin, 2007). For example, yield improvement for banana and pineapple began in large plantations with access to international know-how, which then spread to smaller farms; for mango, chemical spraying promoted its area expansion and yield growth (David 2003). Hence understanding the development of the sub-sector requires an examination of R&D and technology adoption issues.

By other measures however, fruits and vegetables are a minor component of agriculture. Only one-tenth of total agricultural area is planted to fruits and vegetables. The sub-sector receives less attention from national programs and policies compared to traditional crops, particularly after the 2007 – 2008 “rice crisis”. Recent reviews of the agricultural sector treat fruits and vegetables peripherally; moreover these are little-informed by burgeoning literature on diversification and the role of nontraditional crops in the transformation of agriculture. Assessments of development issues and constraints to development specific to the sub-sector, including adoption of new technologies, are relatively sparse. Note that this gap is not unique to the Philippine literature; at the global level, a “silent revolution” in horticulture has largely gone unnoticed as policymakers continue to focus on traditional staples (Weinberger and Lumpkin, 2007).

This policy review attempts to address this gap. It specifically aims at the following:

- 1) Develop a framework for understanding the role of fruits and vegetables in agricultural and rural development, and the impact of the policy environment and technological change on the development of the sub-sector;
- 2) Describe sector patterns and trends, identify constraints to development, and describe policies and programs relevant to the sub-sector;
- 3) Assess these policies and draw implications for policy reform.

The remaining sections of this paper roughly correspond to these objectives: Section 2 develops the framework; Section 3 describes the sector; Section 4 identifies

constraints, describes policies programs, and evaluates these policies. Section 5 concludes with suggestions for further research and policy reform.

2. THE ROLE OF FRUITS AND VEGETABLES SUB-SECTOR IN DEVELOPMENT

Agricultural diversification

Economic development entails growth of per capita income. Accompanying this quantitative increment is a qualitative change in the economic structure, namely the diversification of sector composition of output from agriculture to industry and services. This is one of the best established patterns of economic development (Kuznets, 1959; Johnson, 1997). Explanations of this pattern cover both demand and supply factors. On the demand side there is the Engel effect combined with nontradability of most of agriculture (Timmer, 1988). On the supply side is the shift in resources, such as labor, from low productivity (traditional) to high productivity (modern) sectors (Ranis and Fei, 1961). Factor proportions or Rybczynski effects may also be at work: as capital accumulates relative to labor, the output of the relatively capital-intensive sector rises, while that of the labor-intensive sector declines (Martin and Warr, 1993).

Within agriculture itself, the process of development is likewise accompanied by diversification. Rosegrant and Hazell (2000) offer the following stylized fact, at least for Asia (p. 57):

As economies grow, there is a gradual movement out of subsistence food-crop production (mostly of basic staple crops) to a diversified market-oriented production system. The process of diversification out of staple-food production is triggered by rapid technological change in agricultural production, by improved rural infrastructure, and by diversification in food-demand patterns. The slowdown in income-induced demand growth for staple foods is accompanied by a shift of diets to higher-value foods such as meats, fish, fruits, and vegetables.

According to Rosegrant and Hazell, the food-demand diversification is due to income elasticities for staples, and the urban transition (i.e. the dependence of an urbanizing population for high-quality, nutritious, marketed food). Diversification to commercialized, high-returns agriculture may also be driven by supply factors. The process of rapid agricultural growth is sustained by not only through raising yields of traditional crops, but also by shifting resources towards crops with higher net returns per ha (i.e. the “high value” crops).

Diversification at the household level

Factors affecting diversification choices at the farm level can be more systematically explored with the help of the agricultural household model (Taylor and Adelman, 2003; Mendola, 2007), which we elaborate with the minimum of formal notation. The behavior of a household is assumed to be consistent with maximizing a pay-off function: $V = \sum_t \beta^t EU(C_t, L_t)$, where t is a time period index, C an index of consumption, L an index of leisure, EU an expected utility function, and β a discount factor.

We may identify several constraints:

- i) Budget constraint: consumption in each period equals income plus borrowing, less investment, saving, and net interest payments. Income is obtained from several sources, namely:
 - a. profit generated from sale of outputs, obtained by combining inputs, which are either purchased from the market or utilize household endowments;
 - b. returns from financial assets; and finally,
 - c. transfers.
- ii) Time constraint: time for leisure, self-employed production, human capital formation, and outside wage employment, must add up to a fixed duration per period.
- iii) Asset accumulation: financial wealth accumulates every period through interest income and savings; capital accumulates every period through investment, net of depreciation.

Note that under *expected utility*, uncertainty is a factor in household decisions and outcomes. Hence, multi-period expected utility maximization leads to a reduced form in which the level of production for each product type per period is a function of the following factors:

- the risk associated with alternative product combinations, security of rights over assets, and the household's aversion to risk;
- The rate of time preference (i.e. the discount rate);
- Level of technology
- Prices of outputs and inputs, including the market wage;
- Interest rate on financial assets;
- Interest rate and quantity ceilings on borrowing.

This framework can explain technology adoption and the role of policies and institutions. In general, a technology would be adopted if the long-term maximum pay-off with adoption is higher compared to without adoption. Meanwhile, the policy environment sets the conditions under which the abovementioned factors are determined. Policies can influence the prices of inputs and outputs, through regulation of the marketing and logistics sector, as well as direct or indirect price policies. Institutions can determine property rights over assets. Programs can determine the quantity and quality of public good investments, such as rural infrastructure. This type of general framework would not however be able to ascertain directions of effect, e.g. whether a higher discount rate may lead to more or less diversification. Such analysis would entail more precise forms of the objective function and constraints, which is beyond the scope of this paper.

Constraints to agricultural diversification

Ali (2000) notes that hot, humid, lowland tropics are generally unsuitable for cultivating many types of vegetables, hence are much less diversified compared to uplands. Agroclimatic factors also account for the high degree of seasonality of supply. Similarly, many fruits, often grown from trees or other perennials, also exhibit climatic sensitivity and seasonality. Fruits and vegetables tend to require greater postharvest care, to avoid damage and spoilage, exacerbating the distribution problem.

Environmental shocks and other factors also introduce considerable risk in fruit and vegetable production, which may constrain diversification. As discussed previously, what matters to producers is not simply profit, but *expected* profit. Nevertheless, the enormous differences in net returns per ha suggests that, even adjusting for risk, the incentive to diversify may remain strong. Furthermore with well-developed financial and insurance markets, risk can be diversified by a judicious selection of the insurance and asset portfolio.

In general, under perfectly functioning markets with no transaction costs, we may expect a smooth transition from traditional to diversified agriculture. However in reality the transition is constrained by many factors, including: low investments in and diffusion of new technology; inadequate rural infrastructure, leading to market fragmentation; insecure property rights, including faulty contract enforcement; and government interventions such as restrictions on marketing and foreign trade, ostensibly to promote self-sufficiency and food security (Rosegrant and Hazell, 2000).

One significant form of market failure arises from the existence of scale economies. Emran and Shilpi (2002) point out that fixed costs in marketing and transport services lead to thick market effects and pecuniary externalities. That is, traders find it more worthwhile to visit villages that offer a higher marketable surplus, as more units of output are available for a given fixed cost. Hence the trader (who can be a multi-product intermediary) can offer better prices to a farm household residing in a village with higher aggregate surplus (whether of a single or multiple commodities). In this way each farmer generates pecuniary externalities for other farmers in the village.

Under increasing returns, equilibrium may not be unique. Lower levels of equilibrium may result when marketable surplus is low, supply of marketing service is deficient, discouraging output expansion. On the other hand, higher levels of equilibrium may result when market surplus is high, encouraging trading activity and therefore upstream production. Emran and Shilpi distinguish three types of equilibrium, corresponding to the stages of market development. The first is the *isolated market*, in which market size is too small for long distance traders (who link villages to urban centers) to operate. The second is the *intermediate* stage, in which long distance traders do operate, but there remain cross-commodity externalities; and the *developed* stage, in which traders specialize in one commodity and no cross-commodity externalities prevail. They test this model against Bangladesh household data and find that the rice market is at a developed stage, whereas the vegetable market is at an isolated stage.

Underdevelopment and thick market effects can extend to a wide range of *producer services*, linked but not exclusive to marketing, such as transport and logistics, processing, handling and storage, communication, and finance. Ali (2000) notes that cash requirements of vegetable production are high relative to staples, owing to higher intensity of intermediate and labor input; for instance labor requirements may be three times higher on average for vegetables compared to cereals. In the case of fruits, which are mostly grown from trees and perennials, long term finance is required, making the absence of financial services an even more daunting challenge. Owing to underdeveloped markets, Delgado and Siamwalla (1999) note that the natural pace of diversification may be too slow, due to the aforementioned constraints, hence accelerated diversification may become an explicit goal for agricultural policy.

Supply chains

In the presence of transaction costs, the private sector has itself evolved institutional arrangements to coordinate production and distribution in the high value crops sector. Even in traditional agriculture, traders often act as sources of working capital for farmers, within a tied marketing-credit relation (Floro and Yotopoulos, 1991). Modern systems elevate these relationships into a *supply chain*, typically associated with agribusiness organization. The supermarket “revolution” extends the chain all the way from retail to primary production. Large-scale organization at the retail end caters to mass consumption of standardized food products. Procurement by retailers is moving away from traditional systems based on spot markets at the wholesale level, towards preferred suppliers, with transactions coordinated indirectly through a specialized wholesaler, or even directly by the retailer (Reardon and Timmer, 2007).

Impact on the poor and the environment

The expansion of coordinated supply chains raises concerns about the exclusion of resource-poor farmers. Reardon and Timmer note that smallholders do participate in the high value crops supply chains; however, these smallholders tend to be “asset-rich”, both in financial and human capital. Hence such supply chains would appear to exacerbate inequalities in the countryside.

On the other hand, diversification may have pro-poor impacts (Barghouti et al, 2004). On-farm labor intensity of vegetable production is nearly double that of cereal production, when all types of related activities are considered, e.g. such as seed and seedling production, precision land preparation, irrigation, harvesting, cleaning, grading, and packaging (Ali and Abedullah, 2002). Likewise labor requirements for a rice-vegetable cycle (involving onions, vegetables, and other high value crops) are much higher than labor requirements of rice monocrop, due to greater requirements for drainage, land preparation, planting, weeding, maintenance, harvest, postharvest activities, and supervision (Pingali, 2004).

Diversification may also have a beneficial effect on the environment, as it usually breaks existing cereal-cereal cropping practices, which are of questionable sustainability (Ali, 2000; Cassman and Pingali, 1995). Furthermore fruits grown from trees and perennials are associated with permanent crop cover which limits soil erosion and land degradation. On the other hand, other forms diversified cropping may have its own adverse impact on the environment. Annual vegetable crops grown in the uplands are

about as erosive as upland coarse grains, such as corn (Sidel et al 2006). High-input vegetable farming systems are themselves problematic due to the externalities from fertilizer and pesticide application, as well as massive nutrient mining and the subsequent challenge of soil nutrient management.

3. FRUITS AND VEGETABLES SUB-SECTOR IN THE PHILIPPINES

Patterns and trends

Diversification at the sectoral level has been observed over the course of Philippine economic development. In 1970, two-thirds of the labor force was in agriculture; by 2004 this share had dropped to just 38%. The share of agriculture in DP started out much lower, at just 30%, attesting to past structural transformation since the 1950s. By 2001 this share had already halved to 15%.

Figure 1: Agriculture share in GDP and labor force, Philippines, 1970 – 2004

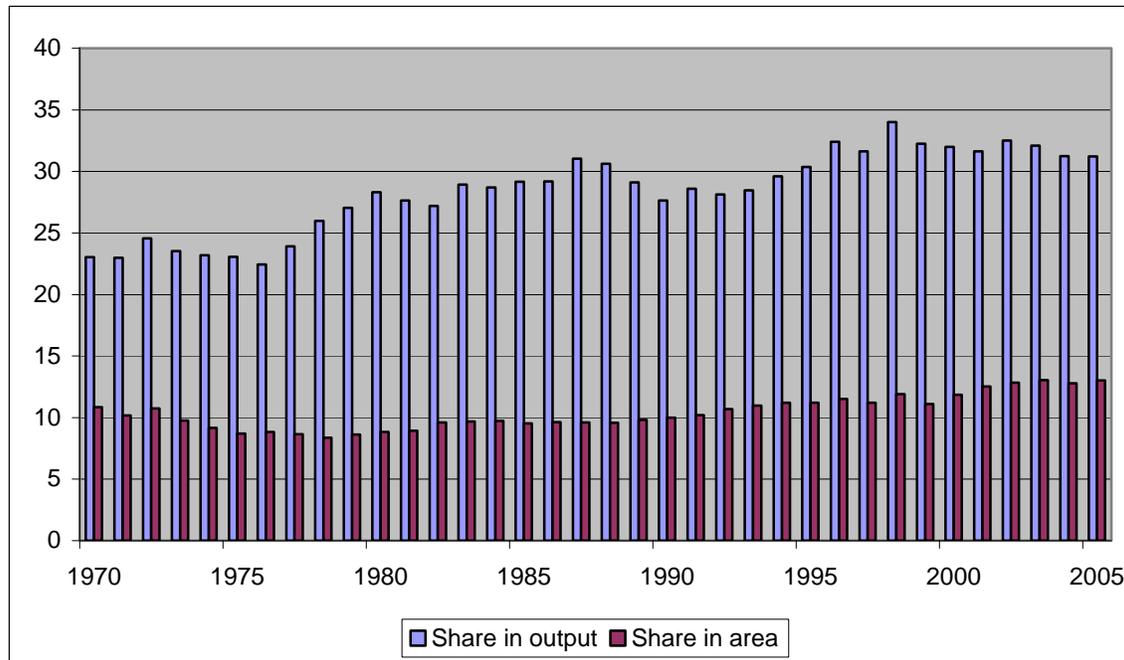


Source: WDI and FAOStat. (Note: GDP share in constant 2000 dollars.)

It is noteworthy that the rate of decline of employment share has lagged behind that of output share, suggesting the inability of low productivity labor in the sector to move to higher productivity sectors such as industry and services. Moreover, there was a slowdown in sector growth, from an average of over 6% in the 1970s (Bautista, 1997), down to 0.1% in the 1980s, before gradually picking up to 1.7% in the 1990s, accelerating to 3.3% in the 2000s.

Over the same period, the share of fruits and vegetables in agricultural output and area was also rising, although fairly slowly and erratically, from 23% to 31% (Figure 2). Meanwhile the area share of fruits and vegetables hardly moved. Hence, agriculture is diversifying, but at a slow pace compared to the overall rate of structural change in the economy.

Figure 2: Shares of the fruit and vegetable sub-sector in agricultural output and area, in %, 1970 – 2005



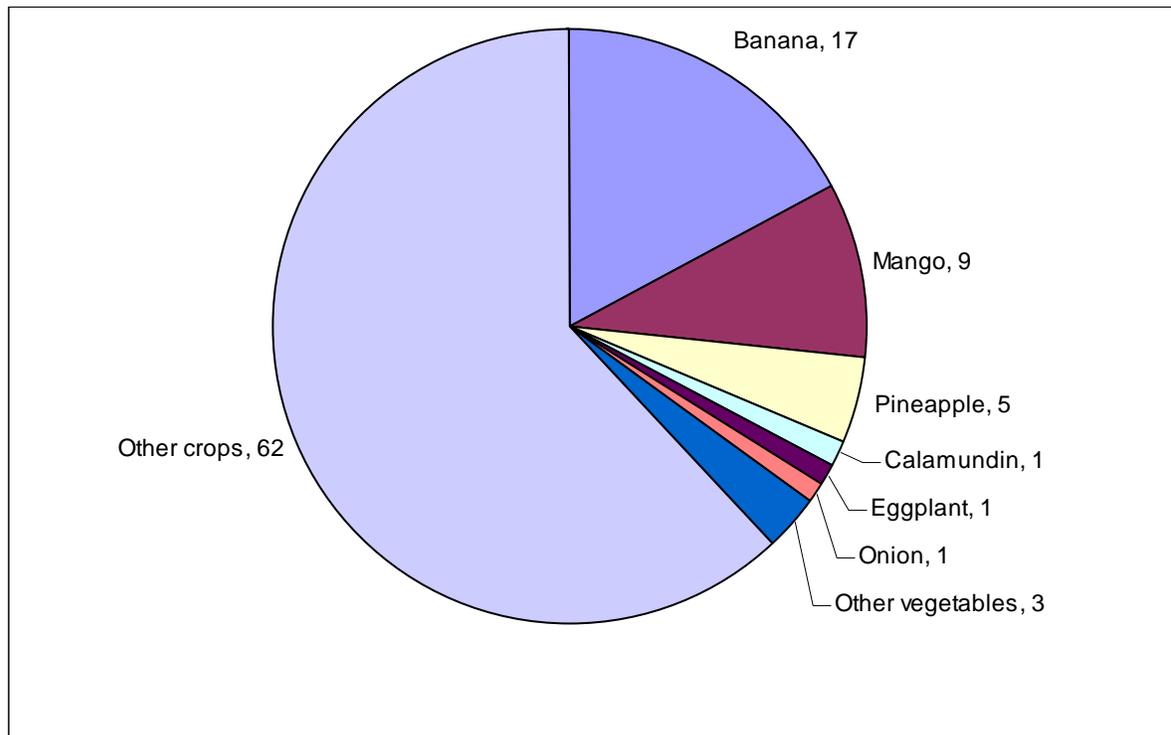
Source: FAOStat.

Within the sub-sector, the major fruits are: banana, pineapple, mango, and calamondin (*kalamansi*); the major vegetables are peanut, mungbean, tomato, garlic, onion, cabbage, and eggplant. One must however keep these proportions in perspective (Figure 3): even excluding rice and corn, the major fruits and vegetables account for just 38% of agricultural output. The top fruits account for 32%, leaving the top vegetables with only 6% share. Banana alone accounts for 17%. Among the vegetables, only eggplant and onion round off to 1% share of output value – the other vegetables combine for the remaining 3%. The biggest shares belong to the lowland vegetables (e.g. onion, garlic, legumes); some upland areas (notably Benguet province) specialize in growing temperate vegetables at a high altitude.

In the Philippines, many vegetables exhibit seasonal responses to temperature fluctuations, rainfall, and the frequency of typhoons. In general, prices of most

vegetables are higher during May – July and October – December, compared to February – April (Librero and Rola, 2000). Seasonality also characterizes some of the major fruits, such as mango, rambutan, lanzones, durian, and so on. Given its even climate and absence of typhoons, Mindanao has emerged as the major supplier of temperate vegetables to Metro Manila during the wet season of June to November (Batt et al, 2007).

Figure 3: Share of major crops in output of agriculture (excluding rice and corn), in %, 2007



Source: BAS.

Some of the major fruits and vegetables deserve their reputation as high value crops (Table 1). The data are from cost and returns surveys conducted by the BAS; costs cover both cash and non-cash costs. The table presents yield, net returns per ha, and the profit/cost ratio (roughly, the return in pesos per peso outlay). Large disparities in yield is expected owing to differences in plant physiology and cropping practices. There are also tremendous differences in net returns and returns to capital. The highest profit-cost ratios belong to the fruit crops (pineapple, mango, and calamondin), with only potato breaking into the top rank; returns per ha are also highest, even considering returns from multiple cropping for the other crops, as well as the gestation periods for the fruit crops (e.g. 5 years, in the case of mango).² The lowest returns per ha are clearly

those of cereal production. Whereas white (food) corn exhibits inferior profit/cost ratio, yellow (feed) corn outperforms the vegetables, whereas palay is well within the range of some of the less profitable vegetable crops.

Despite the relatively high returns of these fruit and vegetable crops, the bulk of the country's agricultural area continues planted to the main traditional crops, namely rice, corn, coconut, and sugarcane. These crops combine for nearly a three-quarters of the total agricultural area; rice alone accounts for nearly one-third. Contrary to what would be expected under competitive markets, land does not in fact move from low-return to high-return crops. This inertia may explain the lack of robustness in the growth of the agricultural sector (World Bank, 2007).

Table 1: Cost and returns indicators per cycle, major fruits and vegetables, 2004

	Yield (kg/ha)	Net returns (P/ha)	Profit/cost ratio
Pineapple	36,842	120,529	2.25
Mango	6,087	77,523	1.71
Calamondin	8,945	64,813	1.60
Potato	12,754	127,734	1.24
Durian	3,148	44,413	0.74
Yellow corn	2,302	10,055	0.56
Onion	10,121	56,100	0.56
Tomato	9,744	28,258	0.42
Palay, irrigated	3,919	9,635	0.35
Cabbage	12,042	23,362	0.29
Eggplant	8,674	22,912	0.26
Garlic	2,824	25,811	0.25
Palay, rainfed	2,664	4,900	0.24
Papaya (2001)	15,173	17,417	0.21
White corn	1,426	1,282	0.11

Source: BAS.

Inertia may be attributed in part to entry barriers in the high value sector, such as high working capital requirement (i.e. cash cost) combined with an imperfect credit market. In general, total and cash costs are much higher for fruits and vegetables compared to cereals; similarly fertilizer, pesticide, and hired labor, account for larger shares in total cost (Table 2).

Table 2: Cost per ha, and shares in total cost (%), 2004

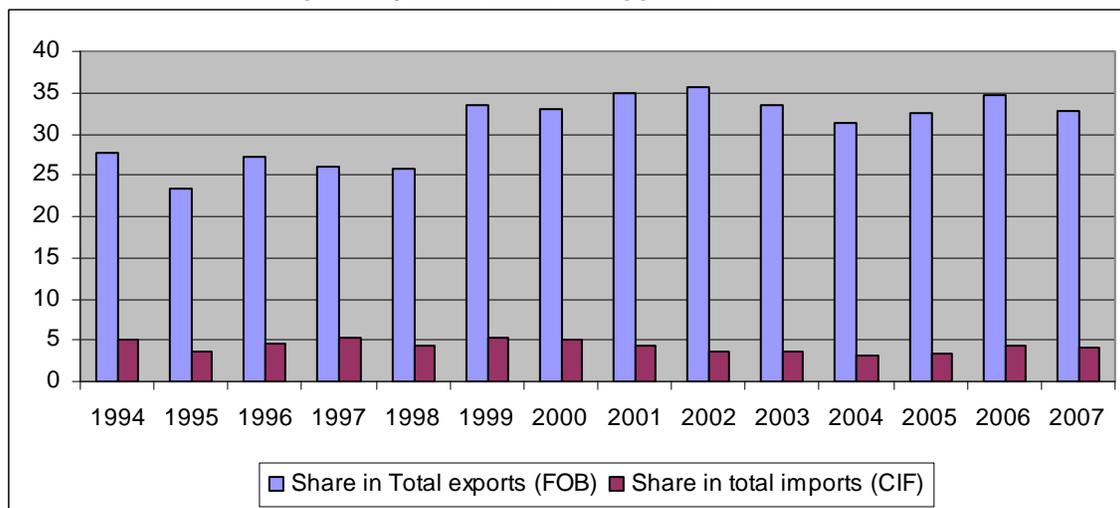
	Total cost	Cash cost	Item shares			
			Fertilizer	Pesticide	Hired labor	Non-cash
Pineapple	53,490	41,020	24.7	3.5	14.5	23.3
Mango	45,313	27,423	14.1	18.7	15.6	39.5
Calamondin	40,205	27,078	11.5	2.6	44.5	32.6
Potato	102,978	59,926	15.8	7.4	13.3	41.8
Durian	59,691	16,453	14.9	1.1	5.6	72.4
Yellow corn	17,979	10,972	19.6	2.1	17.3	42.3
Onion	100,573	74,113	13.3	3.6	19.8	26.3
Tomato	67,038	49,463	22.9	14.6	21.8	26.2
Palay, irrigated	27,399	11,925	13.5	4.7	13.5	56.5
Cabbage	81,042	482,528	19.6	7.3	15.1	40.5
Eggplant	86,727	56,988	18.3	14.2	13.6	34.3
Garlic	103,331	45,494	9.0	3.8	13.8	56.0
Palay, rainfed	20,278	7,651	7.9	4.0	11.2	50.2
Papaya (2001)	75,852	57,295	21.1	6.8	26.1	24.2
White corn	11,737	4,787	18.5	0.9	12.2	59.2

Source: basic data from BAS.

For those able to overcome market entry barriers, financial rewards can be large as much of the country's fruit and vegetable products are internationally competitive and command relatively high prices in global markets (Figure 4). The sub-sector accounts for a large share of total agricultural exports, far out of proportion to its area and output shares. Being only a minor component of agricultural imports, the sub-sector is therefore a significant net earner of foreign exchange.

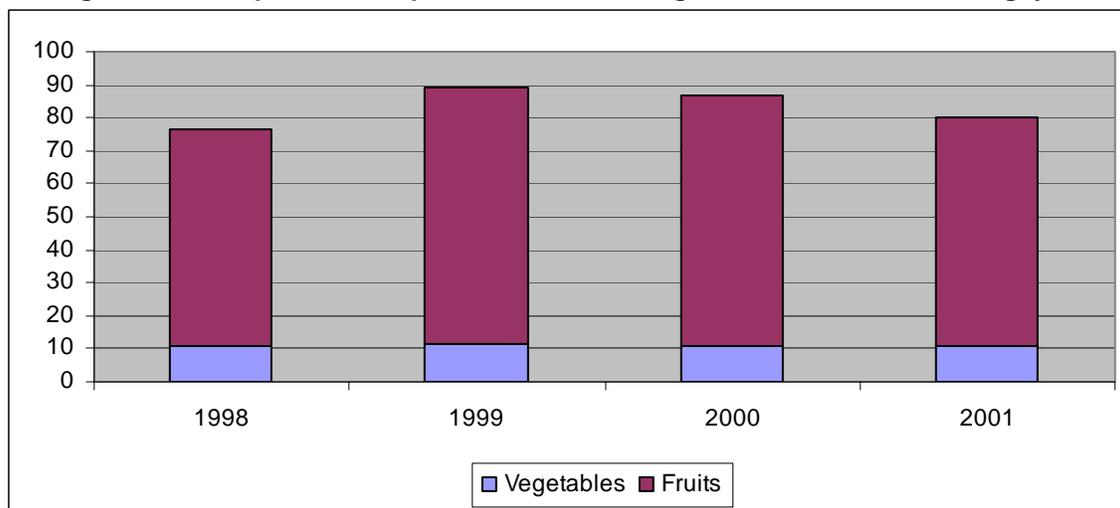
On the demand side, domestic vegetable consumption is however far below the per capita recommendations of the World Health Organization of at least 142 kg/capita (Figure 5). One reason may be cultural; most Filipinos treat vegetable as a small part of a meat or fish dish (Batt et al, 2007). Consumption of fruits though is much higher, averaging nearly 70 kg apparent consumption per year by 2007.

Figure 4: Shares of the major fruits and vegetables in total agricultural exports and imports by value, in %, Philippines, 1994 – 2007



Source: BAS

Figure 5: Per capita consumption of fruits and vegetables, 1998 – 2007, in kg/ year



Source: BAS.

Supply chains

Production and marketing of vegetables flows along two types of channels, characterized as *traditional* and *modern* (Concepcion and Digal, 2006). Under the traditional system, growers send their produce to wholesalers, who then trade to retailers in the wet market. Occasionally wholesalers also supply to supermarkets as well as hotels and restaurants (including fast food chains). The wholesale stage is still generally organized as a spot market (for example, 58% of transactions in the large Northern Luzon markets of Benguet are traded in this manner). Most Filipino consumers still

prefer to purchase vegetables from the wet market, and most vegetables are still transacted along the traditional route (Rasco et al, 2004).

Recently however modern arrangements have evolved as an alternative to this traditional set-up. First is the *market specialist* chain, where brand name suppliers provide a wide range of products to a supermarket chain (e.g. Gomez Farms). This is obtained from a variety of sources, such as farmers and marketing agents. The supermarket typically identifies a preferred supplier, who in turn commits to a schedule for delivering an assortment of products of specified quantity and quality.

Second is the *product specialist* chain. This chain also spans a range of sources, but product specialization is evident. In the case of FreshCorp, tomato farmers who wish to supply to the company sign a marketing contract over a specific weekly volume and price band. The quantities are determined by the farmer, who agrees to the ceiling price; meanwhile FreshCorp agrees to sell the product with a floor price, and with a brokerage commission. FreshCorp also informs farmers about quality specifications.

Third is the *processor-managed chain*, which emerged to meet the requirements of fast food operators, which demands pre-cut and washed salad vegetables and processed coleslaw. Their suppliers either found reliable processors, or evolved into processors themselves.

Fourth is the *producer-managed* chain, of which an archetypal example is NorminVeggies of Northern Mindanao. This group was organized by farmers as a marketing cluster, able to realize scale economies in transport, gain access to development assistance from NGOs and government, and share technologies and market intelligence. The cluster established a corporation called NorminCorp to function as a marketing arm, in return for a sales commission. Unlike in the other chains, farmers obtain the entire revenue paid by the institutional buyer, or the vegetable wholesaler.

Incidence of benefits from fruits and vegetables farming

Little information is available on the incidence of benefits from agricultural diversification. One big vegetable production area is centered in Benguet province, which caters mostly to the traditional wholesalers and wet markets, especially in Metro Manila. Landholdings in the province are predominantly small (below one ha in size); tenure is mostly informal, as 90% of land is officially classified as forest reserve or watershed areas. Meanwhile vegetable producers in Southern Luzon (Laguna and Cavite provinces) also supply to Manila, and tend to favor specialized outlets such as

hotels, restaurants, and high end supermarkets. Cavite farmers for instance have been able to gain access to resources to upgrade product quality and postharvest handling, e.g. cold chain facilities (Batt et al, 2007), suggesting that these farmers are endowed with a health asset base.

Meanwhile for Mindanao a farm household survey for vegetable growers has been conducted for Lantapan, Bukidnon (Nguyen et al, 2007). The village, which hosts 513 households, has about 109 vegetable farmers, of whom the majority (55%) farmed less than 1.5 ha. A sample of 50 farmers were surveyed. While farming was the major occupation of 70% of the respondents, it turns out agriculture accounts for just 40% of household income on average; 50% came from nonfarm sources, and the remainder from off-farm. These upland farmers were overwhelmingly poor: per capita household income was only Php 2,200 per year, compared to the relevant poverty threshold of Php 14,800; poverty headcount was 80%. Food insecurity was widespread: 37% reported experiencing insufficient food availability throughout the year.

In summary, farmers with resources and management know-how are able to realize higher returns from engaging in more sophisticated supply chains, even though their farm sizes place them in the smallholder category. On the other hand, many vegetable farmers remain resource-poor, and presumably tend to concentrate on supplying through traditional supply chains. A similar characterization may hold for fruit farmers (see e.g. Intal and Ranit, 2004); a crucial difference though is that large scale integrated production and processing may be observed in major fruits such as bananas and pineapples (Pabuayon, 2000). This dispenses altogether with long supply chains that link independent producers, processors, and traders.

4. POLICIES AND PROGRAMS FOR DEVELOPMENT

Constraints to the development of the sub-sector

Constraints on vegetable supply are enumerated in Librero and Rola (2000):

1. High input cost or low output price (*price*);
2. Losses to pests and diseases (*pests*);
3. Lack of seeds or planting materials (*seeds*);
4. Institutional constraints, including lack of capital, inputs, or information; poor extension, research, roads, suboptimal use of inputs, etc. (*institutions*);
5. Lack of postharvest and storage facilities (*postharvest*);
6. Inadequate marketing systems (*marketing*);

7. Biological constraints, including poor plant growth and poor fruit setting (*biology*);
8. Poor cultural practices (*management*);
9. Excessive rains, flooding, or bad weather (*weather*)
10. Lack of appropriate variety (*breeds*)
11. Policy constraints, including size of landholding, subsidies, taxes, etc. (*policies*).

Relevance of these constraints to specific crops is given in Table 3, based on a review of related literature (mostly from the 1970s and 1980s). The more practical set of problems (e.g. prices, pests and disease) appear frequently, though institutional constraints, which underlie these proximate problems, are also prominent.

Table 3: Constraints relevant to specific vegetable crops (various locations)

Vegetable	Constraint
Asparagus	Seeds
Cabbage	Price, Pests
Cucurbits	Pests, Institutions, Biology, Weather
Eggplant	Postharvest
Garlic	Seeds, Institutions, Postharvest
Gourd	Pests
Onion	Prices, Pests, Institutions
Potato	Prices, Seeds
Soybean	Biology
Tomato	Prices, Pests, Seeds, Biology

Source: Librero and Rola (2000).

Postharvest problems are another oft-mentioned problem. Serrano (2006) cites figures of postharvest loss as high as 40% for vegetables. There is however a wide range of estimates, ranging from 5 – 30%. Losses tend to be least for refrigerated transport and cold storage (the “cold chain” approach), followed by non-refrigerated transport and ambient storage, with highest losses for refrigerated transport and ambient storage. Meanwhile, Rapusas (2006) reviews estimates of postharvest loss for the major fruits, such as banana (30 – 40%), pineapple 28 – 40%), and papaya (27 – 42%). In the case of mango, only 50% of harvested produce are export grade; of the rejects, only 8 – 13% are attributed to pre-harvest problems and the remainder to faulty postharvest handling.

Policies and programs affecting development of the sub-sector

A number of programs and policies affecting the development of the sub-sector are currently in place, either to specifically address the abovementioned constraints, or as part of a broad strategy of agricultural and rural development. The following deals with key legislations, trade measures, and specific programs.

Key legislations

The *Agriculture and Fisheries Modernization Act (AFMA)* of 1997 seeks the modernization of agriculture and fisheries by increasing budget allocation and introducing policy reforms in several areas, namely: land use, agricultural finance, irrigation, market assistance, farm-to-market road construction and maintenance, utilities, product standards, R&D, extension, incentives for agriculture-linked industries, and administration (such as monitoring and evaluation systems).

The *High Value Crops Development Act* of 1995 seeks to accelerate the growth of agriculture, enhance rural incomes, and improve the investment climate of agribusiness, by promoting the production, processing, marketing, and distribution of high value crops. High value crops are defined as crops other than rice, corn, coconut, and sugarcane, which are called the traditional crops. The Act creates a High Value Crops Development Fund, managed by the government financial institutions (Land Bank and Development Bank of the Philippines). The Fund is targeted to farmer organizations composed primarily of agrarian reform beneficiaries. The Act also mandates the identification of lands suitable for high value crops, for operation by farmer cooperatives, with tax exemptions and other investment incentives, including coverage under the public crop insurance program. The Act instructs the Department of Agriculture (DA), Department of Trade and Industry (DTI), and other key agencies to partner in agribusiness development of high value crops.

The *Comprehensive Agrarian Reform Law (CARL)* of 1988 seeks to reform agrarian relations by redistributing all types of agricultural lands. Private agricultural land above a retention limit (5 ha) is subject to acquisition by the state and redistribution to landless cultivators. Alienable and disposable public lands are also set aside for redistribution. The Law continues the prohibition on share tenancy, and provides for the integrated development of agrarian reform communities created under the Comprehensive Agrarian Reform Program (CARP).

Trade-related measures

Since the mid-1980s the government had been implementing reforms to liberalize foreign trade. For agriculture it had abolished export taxes as well as government trade monopolies, exception for rice importation. In the 1990s a key policy decision was to ratify the World Trade Organization treaty in 1994. This involved the removal of quantitative restrictions, the imposition of ceiling rates on tariffs scheduled to decline over time, with lower tariff rates set for imports below a set quota. The country also entered into the Common Effective Preferential Tariff (CEPT) under the ASEAN Free Trade Agreement (AFTA). Currently the country has a free trade agreement with Japan, known as the Japan-Philippines Economic Partnership Agreement (JPEPA). The country has also pursued unilateral trade liberalization known as Tariff Reform Programs (TRPs). Under Phase III, the government targeted a uniform 5% tariff by the mid-2000s. Phase IV (begun in 2001) exempted a few sensitive agricultural and manufactured items.

Specific programs

Currently the main government program for non-traditional crops is the GMA-HVCC (Ginintuang Masaganang Ani – High Value Commercial Crops) Program. The Program adopts a market-oriented approach. One set of strategies are *market driven*, forming Producer Linkages with Users (PLUS) in strategic agricultural areas; establishing of techno-demo farms and integrated systems; and promoting private investments in postharvest and processing facilities. The main program components are:

- Policy reform, market development, and promotion;
- Infrastructure support – aimed at irrigation, trading posts, postharvest facilities, laboratory and testing facilities;
- Technology development, training, extension, and communication support;
- Program advocacy – to promote public-private sector partnerships develop business networks.

A prominent donor-supported program is the the Diversified Farm Income and Market Development Project (DFIMDP), a DA-World Bank collaboration. The DFIMDP focuses on capacity building within the DA, in terms of data and regulatory systems, support for applied research, and institution-building for market promotion, information systems, expenditure management, and training. The Project also has an infrastructure

support component in focus areas for market infrastructure and postharvest facilities, on a cost-sharing basis with LGUs and the private sector.

Some Mindanao-based projects, supported by donors and NGOs, are also assisting fruit and vegetable farmers (Batt et al, 2007). These include the Growth with Equity in Mindanao (GEM) project funded by the US Agency for International Development, and the Upland Development Project funded by the European Union. The Catholic Relief Services (CRS) is implementing a Small Farms Marketing Project, a prominent NGO initiative focusing on integrating vegetable farmers in high value chains.

Assessment and recommendations

Our assessment of policies and programs to promote the sector follows the policy scoping exercise of SEARCA – ACIAR (Balisacan et al, 2007). This study highlights the problem of persistently low productivity of Philippine agriculture, attributed to the following:

- Degraded natural resources and weak institutions for resource protection;
- Problems in protecting and administering agricultural land rights;
- Geographic diversity, resulting in economic fragmentation;
- Poor state of rural infrastructure for economic integration and support farm production (i.e. irrigation facilities);
- Undeveloped rural financial markets;
- Archaic price and market policies which distorted commodity prices and perpetuated monopolistic and oligopolistic systems;
- Slow development and dissemination of new technologies;

While these factors afflict agriculture as a whole, a similar set of factors are at work within the fruits and vegetables sub-sector. Each of these factors is discussed in the following.

Resource degradation

Briones (2006) identifies a set of environmental problems associated with agricultural practices and farming systems, particularly intensive cultivation in the lowlands, and encroachment of annual crop cultivation in the uplands. Fruit and vegetable farming is implicated in these to the extent that it is practiced in the uplands (in the case of temperate crops) and in the lowlands (for tropical crops). These include: soil erosion, loss of biodiversity, sedimentation, water pollution, and worsening pest and

disease problems. Note though that perennial fruit crops tend to be less destructive as these are less erosion-prone, although problems of chemical contamination and biodiversity loss remain. These problems impose serious negative externalities off-site (e.g. diminishing irrigation coverage), as well as threaten long term on-site productivity (e.g. from topsoil loss).

To promote sustainable farming, all types of vegetable production systems should adopt soil conservation, plant protection, and cropping techniques. High external input systems would benefit from a more judicious application of fertilizer, diversified cropping pattern, and shift to labor saving technologies (e.g. mechanization). Reduced application of inorganic fertilizer is not however a universal prescription; in fact low external input systems, which are also fairly widespread, would benefit from greater fertilizer application (Poudel, Midmore, and Hargrove, 1998).

While the principle of sustainable development is well enshrined in principle within current strategies for the sub-sector, implementation is complicated by a lack of resources, political will, and a myopic emphasis on short-term livelihoods. Addressing these problems entails investing in institutions, at the state and community levels, for long term and socially responsible governance of natural resources. There is also a need to reorient and train extension personnel, especially in LGUs, towards supporting environmental programs at the community and farm level. Finally it is essential to invest heavily in R&D to develop new technologies, as well as M&E and impact assessment of natural resource management programs (Briones, 2006). The new technologies to be developed should not only be environmentally-friendly, but also of proven profitability, so as to encourage adoption by fruit and vegetable farmers.

Property rights in private lands

Property rights reform remains a problem in private lands, despite decades of agrarian reform. Implementation of the program has been slow, having twice exceeded its timetable, and with currently an enormous backlog. Most of the “accomplishments” have mostly occurred in government-owned lands and settlements, in which reform is reduced a titling program rather than an actual asset transfer. Protracted implementation however undermines farm investments, particularly in permanent land improvements (Briones, 2004). In the case of permanent crops such as fruit trees, land reform may be implicated in the absence of new planting by traditional landowners (World Bank, 1998). Moreover, most awarded land (72%) is covered by collective rather than individual land

title (Asia Pacific Policy Center, 2007), undermining investment incentives for agrarian reform beneficiaries. Finally, land reform brings with it an array of formal restrictions on the transfer, sale, conveyance, and rental of agricultural land, imposing grave distortions on rural land markets (Ballesteros and Cortez, 2007).

Price policies

Upon the country's accession to the WTO, in the 1990s the pattern of protection shifted in favor of agriculture, unlike in previous decades when agriculture was the penalized sector (David, 2003). In the course of tariffication, the Philippines (in common with many developing countries) negotiated for high ceiling rates. Based on the nominal rate of assistance, the major import-competing products now receive strong market price support, with the highest rates observed for sugar, corn, chicken, and rice (Table 4).³ On the other hand, exportable commodities within agriculture (e.g. coconut and banana) receive a net penalty (negative nominal assistance), as domestic prices are typically *below* the comparable world price.

Table 4: Nominal rates of assistance by agricultural commodity, in percent

	1980-84	1985-89	1990-94	1995-99	2000-04
Exportables	-22.6	-16.5	-11.4	-5.4	-8.7
Coconut	-27.1	-20.6	-15.3	-7.8	-14.1
Banana	-4.0	-0.8	0.0	0.0	0.0
Importables	2.2	30.2	25.1	48.1	31.4
Rice	-16.3	14.5	20.9	52.7	50.7
Maize	20.1	59.8	62.6	78.5	54.5
Sugar	59.5	123.2	49.3	97.2	79.3
Beef	5.0	17.0	28.0	28.0	10.0
Pigs	35.8	51.0	25.1	20.6	-8.3
Chicken	38.4	42.9	56.5	42.2	52.1

Source: David, Intal, and Balisacan (2007)

Domestic protection is implemented through both tariff and non-tariff policies. Importation of rice and corn is a state monopoly and is tightly regulated; moreover they are subject to high tariffs (50% for rice and 40% for corn). Importation of sugarcane is also slapped a high tariff (50%). Moreover, a market segmentation policy allows the Sugar Regulatory Agency (SRA) to classify sugar imports as “reserve”, i.e. not for sale in the current crop year, strongly discouraging sugar importation. Pork is also slapped a high tariff (40%), and enjoyed considerable though declining protection up to the 1990s.⁴

The pervasiveness of market distortions in import-competing products has been justified by domestic self-sufficiency, which has been conflated with food security in policy discourse. For instance the AFMA asserts: “The production of rice and white corn shall be optimized to meet our local consumption and shall be given adequate support by the State (Sect. 1).”

The country’s food security policy has skewed its public spending priorities and deprived funding for worthy initiatives, such as investment in agricultural diversification towards high value crops. Rice marketing and trade has in particular been the object of heavy government intervention, aimed at both consumer protection and farmer support, i.e. retail prices have been kept low while procurement prices have been kept high. The lethal combination has drawn massive subsidies into the National Food Authority (the official trading arm), which may have well commandeered much of the public sector resources intended for agricultural development (World Bank, 2007).

In the case of agricultural inputs, David, Intal, and Balisacan (2007) find that protection for agricultural inputs has decreased over a similar period. For instance the consumer tax equivalent of assistance to fertilizers and machinery has been down to 3% since the 1990s. In contrast, the Medium Term Development Plan (NEDA, 2004) takes the view that local fertilizers are overpriced, as prices paid by Filipino farmers were nearly double that of the world price – a margin attributed to monopolistic pricing, as well as inefficient application of regulatory procedures and requirements. The difference in estimates may be due to the method adopted: David, Intal, and Balisacan (2007) compare the ex-warehouse price to the CIF import unit value, while the MTPDP (and other studies with similar findings) compare domestic prices with a reference world price, converted by the market exchange rate. More definitive measures of the market support for chemical inputs is crucial as this has downstream effects on fruit and vegetable farmers.

Rural finance

Agriculture’s share in total formal sector credit shrank rapidly over the period 1980 – 2005, at a much faster rate than the sector’s decline as a share in total output. Of this amount, only 35% are for production loans; of the production loans, only a minor share goes to small farmers. In general, smallholder agriculture has been largely bypassed by the formal credit system. Smallholders who desire credit must resort to informal sources. Expansion of the rural financial sector has been hindered by

inconsistent policies, such as credit subsidies, directed sector loans, and loan targeting (Balisacan et al, 2007).

The tree crops sector faces an even more acute problem owing to the absence of long term finance. Government financial institutions and credit bodies should pilot-test new instruments for long term credit for smallholders, perhaps with donor assistance, while maintaining advocacy and information dissemination for private banks to consider long term lending for fruit production. Obviously prudential practices should still be maintained (World Bank, 1998).

There is reason to be optimistic however on the expansion of rural financial services, given recent reforms in rural finance policy. These reforms have phased out direct credit programs while supporting private sector-led finance. In particular credit markets have witnessed the gradual mainstreaming of microfinance, with the increasing number of accredited microfinance institutions, as well as rural banks extending microfinance. Mainstreaming was largely the result of regulatory reforms, set in motion by the National Strategy on Microfinance, with strong support from the BSP, the country's Central Bank (Llanto, 2007). Whether this would redound eventually to the benefit of cash-strapped fruit and vegetable farmers however remains to be seen.

Geography and infrastructure

Given the country's archipelagic layout, the distribution of goods from agricultural areas to population centers requires long transport links over land and sea. These However the country's distribution system is costly and inefficient. Farm-to-market roads are insufficient, depreciated, and of poor quality. Sea and air transport facilities (outside a few urban enclaves) are small and antiquated. Fragmentation is exacerbated by the weak flow of information across actors, as exemplified by the absence of a uniform, objective product grading system. Such fragmentation undermines competitive market behavior and may weaken bargaining power of farmers relative to traders (Digal, 2001).

According to Intal and Ranit (2004), transport cost forms the bulk of distribution cost; for instance it accounts for 64 – 78% of marketing cost for mungbean, depending on location. Inadequate infrastructure raises transport costs; vehicle operating cost is 50% higher on poor roads, and 100% higher on very bad roads. An even greater concern is shipping; domestic port operations are inefficient, making service costs the highest in the region. In the North Harbor, servicing time are too long, accounting for 50 – 70% of domestic liner vessels operating time.

Port inefficiency is linked to the regulatory environment. The Philippine Port Authority (PPA) is designated as the regulator of private port operations, and is in charge of issuing operating permits. However it also owns and operates many of the country's major ports, leading to a conflict of interest. To avoid competition between its own ports and the private sector, the Authority could simply restrict entry or otherwise limit service provision in the industry. The PPA's charter should be amended to separate regulatory from operation functions, which should be left to the private sector. For port operations, the PPA should move to leasing port facilities, rather than collecting a percentage of revenues. Pricing can be liberalized, subject to restrictions against the exercise of market power. Award of cargo handling contracts should be done with greater transparency. The institutional set-up should be transformed, predicated on decentralized port operation, administration by an independent board, and professionalized management staff (Llanto, Basilio, and Basilio, 2005).

Technology generation and adoption

Adoption and impact assessment studies of ACIAR research in the Philippines, summarized in Balisacan et al (see e.g. Mangabat et al, 2002) identify several adoption constraints, namely:

- i) Bureaucratic barriers, that limit development and implementation of project results;
- ii) Shortage of essential facilities and/or equipment and/or expertise to use it;
- iii) Limited number of field trials and demonstrations to provide visible proof of the effectiveness of the new approach;
- iv) Competition from cheaper alternatives;
- v) Time lag – where the results from implementing research are not immediately apparent;
- vi) No existing domestic market and/or poor infrastructure to support industry development.

These findings are not unique to ACIAR research. According to a review by Gapasin (2006), while some types of R&D investment posted high rates of return, these returns are realized for only a few cases and commodities. In general adoption rates are low (about 25%). Low adoption indicates a gap due to incompatibility of the technology to farm-level conditions, weak extension, inadequate support services, including credit,

and low market demand. For instance, commercialization of new varieties for papaya and duck were hindered by a lack of planting materials and animal stocks.

Poor quality of technology may be due to the traditional commodity orientation of research, involving the generation, verification, and promotion of productivity-enhancing technologies. The research staff of the system remains most familiar with this type of R&D work. Only recently and in a limited manner is government supporting market-oriented R&D, such as for high value crops, seaweeds, cut flowers, and so on. Furthermore the organization of the public agricultural R&D system has evolved into a complex, sprawling set of institutions that are rigid, difficult to coordinate, and resistant to more demand-driven approaches to R&D.

A similar set of problems plague the extension system; there are too many autonomous extension units in a dispersed system, with tenuous links to R&D and private sector institutions. There is no M&E system and no mechanism to ensure accountability. LGU extension workers are numerous, but their technical know-how has been largely left behind by the pace of technological development and knowledge at the frontier. Moreover, few are assigned to the municipal level where they can link directly with farmers. There is clearly a need for a sustained, high quality training program as well as continuing equipment upgrade.

5. CONCLUDING REMARKS

The review has covered numerous areas, thereby uncovering many policy issues for which further research is warranted. The following listing is intended to be indicative rather than exhaustive, viz.:

- i) Socio-economic profile of fruit and vegetable farmers, in relation to living standards, poverty status, incidence of incomes earned from farming, and the nature of their livelihood possibilities and constraints, including risk, access to markets, asset holdings, social capital, etc.
- ii) The marketing side of fruit and vegetable supply, in terms of:
 - a. The role of scale economies, logistics infrastructure, the regulatory environment (especially in transport);
 - b. The formation and function of agribusiness supply chains that engage small farmers in high value activities;
- iii) The impacts of various types of R&D and extension options, and identifying best practices and spending priorities, i.e. in natural resource management,

productivity enhancement, quality improvement, etc., both ex ante and ex post;

- iv) The importance of fruits and vegetables in economic diversification, the extent to which expansion of high value activities is a cause rather than effect of agricultural development
- v) The exact nature of market price and public expenditure policies as they affect resource allocation to and within the fruits and vegetables sub-sector;
- vi) Prospects for growth and development of fruits and vegetables, under business-as-usual and alternative scenarios,

These research directions would require more extensive case work, the collection of microdata from farm household surveys, more intensive analysis of existing secondary data, the innovation of conceptual frameworks to handle the behavior of farm households and rural organizations, and the development of quantitative modeling tools, e.g. supply-demand modeling and economic surplus analysis.

In conclusion, throughout this paper we have drawn attention to the stylized fact of agricultural diversification and the role played by fruits and vegetables sub-sector in agricultural development. The growth and sustainable development of the sub-sector has been constrained by a several factors, related to natural conditions (such as geography and climate), but also strongly determined by institutional arrangements (such as the supply chain), quality of governance, and the policy environment. In particular the spread of new technologies is slow, as research outputs and innovations are inconsistent with adoption incentives.

To accelerate technological change, particularly among smallholders, investment and policy reform should aim at integrating markets and removing policy distortions. Finally, the national agricultural research and extension system must be synchronized with the wide-ranging and fast-changing requirements of agribusiness enterprises along the value chain. Addressing these policy and governance issues would have a far-reaching impact on the agricultural sector as a whole through realizing dynamic benefits from diversification and transformation within agriculture.

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REFERENCES

- Aldaba, R., 2005. The impact of market reforms on competition, structure, and performance of the Philippine economy. Discussion Paper Series No. 2005-24. PIDS, Makati.
- Ali, M., 2000. Dynamics of vegetables in Asia: a synthesis. In: M. Ali, ed. *Dynamics of Vegetables in Asia*. World Vegetable Center, Shanhua, Taiwan.
- Ali, M. and Abedullah, 2002. Economic and nutritional benefits from enhanced vegetable production and consumption in developing countries. *Journal of Crop Production* 6(1-2):145-147.
- Asia Pacific Policy Center, 2007 *Study on the Impact of CARP on Poverty Reduction and Prospects for Long Term Growth*. Report prepared for the Department of Agrarian Reform.
- Balisacan, A.M., 1993. Agricultural growth, landlessness, off-farm employment, and rural poverty. *Economic Development and Cultural Change* 41(3):533 – 562.
- Balisacan, A.M., S. Cuthbertson, M.S. Sombilla, and J. Corbishley, 2008. Philippines policy linkages scoping study. PLIA/2005/151. ACIAR, Canberra.
- Barghouti, S., S. Kane, K. Sorby, and M. Ali (2004). Agricultural Diversification for the Poor: Guidelines for Practitioners. Discussion Paper No. 1, Agriculture and Rural Development, World Bank, Washington D.C.
- Batt, P.J., S. Concepcion, K. Dagupen, M.C. Lizada, and R. Murray-Prior, 2005. “The vegetable industry in the Philippines.” Final Report: Small Research and Development Activity. ASEM/2005/062. ACIAR, Canberra.
- Briones, R., 2002. Agricultural investments and the pace of land reform. *Loyola Schools Review (Social Sciences Edition)* 2: 29-42.
- Briones, N., 2007. Environmental sustainability issues in Philippine agriculture. *Asian Journal of Agriculture and Development* 2(1/2):67 – 78.
- Bautista, R.M., 1997. Rapid agricultural growth is not enough: the Philippines, 1965 – 1980. In: J. W. Mellor, ed. *Agriculture on the Road to Industrialization*. Johns Hopkins University Press, Baltimore.
- Cassman, K.G., and P.L. Pingali, 1995. Extrapolating trends from long term experiments to farmers’ fields: the case of irrigated rice systems in Asia. In: V. Barnette, R.

- Payne, and R. Steiner, eds. *Agricultural Sustainability: Economic, Environmental and Statistical Considerations*. John Wiley and Sons Ltd., New York.
- Concepcion, S., and L. Digal, 2006. Alternative vegetable supply chains in the Philippines. In: P. Batt and J-J. Cadilhon, eds. *Proceedings of the International Symposium on Fresh Produce Supply Chain Management*. RAP Publication 2007/21. Food and Agriculture Organization, Rome.
- David, C., 2003. Agriculture. In: *The Philippine Economy: Development, Policies, and Challenges*. A. Balisacan and H. Hill, eds. Ateneo de Manila University Press, Quezon City.
- David, C., P. Intal, and A. Balisacan, 2007. Distortions to agricultural incentives in the Philippines. Agricultural Distortions Working Paper No. 28. World Bank, Washington D.C.
- Delgado, C. and A. Siamwalla (1999). Rural economy and farm income diversification in developing countries. In: G.H. Peters and J. von Braun, eds. *Food Security, Diversification and Resource Management: Refocusing the Role of Agriculture?* Ashgate, Aldershot, U.K.
- Emran, M.S., and F. Shilpi, 2002. Marketing externalities and market development. Policy Research Working Paper 2839. World Bank, Washington D.C.
- Floro, S., and P. Yotopoulos, 1991. *Informal Credit Markets and the New Institutional Economics: The Case of Philippine Agriculture*. Westview Press, Boulder.
- Gapasin, D.P., 2006. Agricultural Research, Development, and Extension. Philippines: Rural Growth and Development Revisited Study. Rural Development and Natural Resources Sector Unit, East Asia and the Pacific Region, World Bank. World Bank, Washington, D.C.
- Intal, P., and P. Ranit, 2004. "Literature review of the agricultural distribution services sector: performance, efficiency, and research issues." In: E. Ponce, ed. *Special Issues in Agriculture*. Philippine Institute for Development Studies, Makati.
- Johnson, D., 1997. Agriculture and the wealth of nations. *American Economic Review* 87(2):1-12.
- Kuznets, S., 1959. *Six Lectures on Economic Growth*. Glenco, Ill.
- Librero, A., and A. Rola, 2000. Philippines. In: M. Ali, ed. *Dynamics of Vegetables in Asia*. World Vegetable Center, Shanhua, Taiwan.

- Llanto, G. M., 2007. Rural finance. In: A.M. Balisacan and L.S. Sebastian, eds. *Securing Rice, Reducing Poverty: Challenges and Policy Directions*. SEARCA, PhilRice, and DA-BAR, College, Laguna, Philippines.
- Llanto, G. M., E.L. Baslio, and L. Basillio, 2005. Competition policy and regulation in ports and shipping. Discussion Paper Series No. 2005 – 02. Philippine Institute for Development Studies, Makati City.
- Mangabat, M.C., N.T. Yanson, E. Sanguyo, A. Natividad, N.D.M. Carambas, M.A. Ilagan, E. Esplana, M. Rondon, J. Lantican, N.M. de Leon, and E.V. Tepora. Impact assessment of 25 ACIAR-supported projects in the Department of Agriculture of the Philippines. Impact Assessment Program Working Paper Series No. 42. ACIAR, Canberra.
- Martin, W. and P. Warr, 1993. Explaining the relative decline of agriculture: a supply-side analysis for Indonesia. *World Bank Economic Review* 7(3): 381-401.
- Mendola, M., 2007. Farm household production theories: a review of institutional and behavioral responses. *Asian Development Review* 24(1):49-68.
- National Economic Development Authority [NEDA] 2004. *Medium Term Development Plan 2004 – 2010*. NEDA, Pasig City, Philippines.
- Nguyen, M., J. de Mesa, and A. Rola, 2007. Vegetable agro-forestry system: baseline survey results in Songco, Lantapan, Bukidnon, Philippines, 2006. Working Paper No. 05-07. SANREM – CRSP, VirginiaTech, VA.
- Pabuayon, I.M., 2000. Fruits program area research planning and prioritization: background analysis. Discussion Paper Series No. 2000 – 18, Philippine Institute for Development Studies, Makati.
- Pingali, P. (2005). Agricultural diversification: opportunities and constraints. In: *Rice is life: scientific perspectives for the 21st century*. World Rice Research Conference Proceedings. International Rice Research Institute, Los Banos, and Japan International Research Center for Agricultural Sciences, Tsukuba, 420-422.
- Poudel, D.D., D.J. Midmore, W.L. Hargrove, 1998. An analysis of commercial vegetable farms in relation to sustainability in the uplands of Southeast Asia. *Agricultural Systems* 58(1):107-128.
- Predo, C., and H. Francisco, 2008. Improving productivity, profitability, and sustainability of degraded grasslands through tree-based land use systems in the Philippines. In: D. Snelder and R. Lasco, eds. *Smallholder Tree Growing for Rural*

- Development and Environmental Services. Advances in Agroforestry* vol. 5. Springer Science, Dordrecht, the Netherlands.
- Ranis, G., and J. Fei (1961). A theory of economic development. *American Economic Review* 51(4):533–65.
- Rapusas, R.S., 2006. Philippines (2). In: R.S. Rolle, ed. Postharvest Management of Fruit and Vegetables in the Asia-Pacific Region. Asian Productivity Organization, Tokyo.
- Rasco, E.T., E. A. del Mundo, M.D. Maquilan, M.A. Mendoza, L.R. Migalbin, L.T. Hualda, S.B. Concepcion, L.N. Digal, A.G. Moran, R. Murray-Prior, P.J. Batt, M.J. McGregor, M.F. Rola-Rubzen, and N.M. Manalili, 2005. Sustainability of vegetable farming in Kapatagan, Digos, Davao del Sur: III. Yield and profitability on growing six major crops. *Philippine Agricultural Scientist* 88(1): 8 – 18.
- Reardon, T., and C.P. Timmer, 2007. The supermarket revolution with Asian characteristics. In: A.M. Balisacan and N. Fuwa, eds. *Reasserting the Rural Development Agenda: Lessons Learned and Emerging Challenges in Asia*, 369 – 394. SEARCA and Institute of Southeast Asian Studies, Singapore.
- Rosegrant, M., and P. Hazell, 2000. *Transforming the Rural Asian Economy: the Unfinished Revolution*. Oxford University Press (China) Ltd., Hong Kong, for the ADB (Asian Development Bank), Manila.
- Serrano, E.P., 2006. Philippines (1). In: R.S. Rolle, ed. Postharvest Management of Fruit and Vegetables in the Asia-Pacific Region. Asian Productivity Organization, Tokyo.
- Side, R., A. Ziegler, J. Negishi, A. Rahim Nik, R. Siew, F. Turkelboom. 2006. Erosion processes in steep terrain – truths, myths, and uncertainties related to forest management in Southeast Asia. *Forest Ecology and Management* 224:199-225.
- Taylor, J.E., and I. Adelman, 2003. Agricultural household models: genesis, evolution, extensions. *Review of Economics of the Household* 1(1/2):33-58.
- Teruel, R., and Y. Kuroda, 2005. Public infrastructure and productivity growth in Philippine agriculture, 1974-2000. *Journal of Asian Economics* 16: 555-576.
- Timmer, P., 1988. The agricultural transformation. In: *Handbook of Development Economics* v. 1. Chenery, H., and T.N. Srinivasan, eds. North-Holland, Amsterdam.
- Weinberger, K., and T.A. Lumpkin, 2007. Diversification into horticulture and poverty reduction: a research agenda. *World Development* 35(8):1464-1480.

World Bank (1998). *Philippines: Promoting Equitable Rural Growth*. Report No. 17979-PH. Rural Development and Natural Resources Sector Unit, East Asia and Pacific Region. World Bank, Washington D.C.

World Bank, 2007. *Philippines: Agriculture Public Expenditure Review*. Technical working paper of the Rural Development, Natural Resources and Environment Sector Unit, World Bank, Washington D.C.

Yotopoulos, P.A., and S.L. Floro, 1990. *The Informal Rural Credit Market: An Application of the New Institutional Economics in the Philippines*. Westview Press, Boulder.

¹ Based on data from FAOStat, accessed November, 2008. The official definition includes: coffee, cacao, fruit crops (citrus, cashew, guyabano, papaya, mango, pineapple, strawberry, jackfruit, rambutan, durian, mangosteen, guava, lanzones, and watermelon), root crops (potato and ubi), vegetable crops (asparagus, broccoli, cabbage, celery, carrots, cauliflower, radish, tomato, bell pepper, and patola), legumes, pole sitao (snap beans and garden pea), spices and condiments (black pepper, garlic, ginger, and onion), and cutflower and ornamental foliage plants (chrysanthemum, gladiolus, anthuriums, orchids, and statice).

² The pineapple cycle lasts about 18 months; the fruits are typically on an annual cycle, while vegetables and cereals can be harvested at least one to several times a year.

³ An index similar to the “nominal protection rate”, which is the difference between the world and domestic price as a proportion of the world price.

⁴ Tariffs from E.O. 264 and are out-quota rates, i.e. beyond the minimum access volumes mandated by WTO for importation at lower rates. The negative support for pork in the 2000s is related to the stable domestic price trend over that period, and rising world price based on Singapore prices (CIF).