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Value Chain Issues and Opportunities in Selected Horticulture Crops in Southern Mindanao, Philippines

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Abstract

The agri-food system is undergoing changes that create opportunities and challenges for small-scale producers. In the Philippines, food retail and processing sectors modernize and concentrate to respond to increasing market requirements. On the other hand, production sector is fragmenting and many small farmers struggle to access opportunities particularly in high value horticulture markets. This paper focuses on understanding the challenges and opportunities in selected fruit and vegetable value chains. Price spread, net margins and price transmission analyses were used to examine cost structure, distribution of benefits and efficiency of these horticulture markets. Results show that the share of the farm to retail price is declining due to declining real farm price relative to wholesale and retail prices. While nominal output prices and productivity have increased over time, cost of inputs has increased faster thereby decreasing profitability of the farm sector. With increasing cost of fuel, fertilizers and transport costs have increased significantly and compounded further by poor infrastructure facilities. Results also indicate that farm prices are not fully transmitted particularly between farm and wholesale markets compared to between wholesale and retail markets. This indicates poor infrastructure conditions in the rural areas. Price signals are also not fully transmitted from one market to another which implies inefficiencies in the markets which can be caused by poor infrastructure facilities and price distortions created by market power. There are, however, opportunities to enhance profitability through quality grading and clustering. Clearly, interventions to help farmers improve quality, productivity and access to high value markets are needed to increase their income. A value chain approach is important not only to understand issues but also to develop an integrated package of interventions that make use of the resources of the private sector and augment the limited public funds to help the small producers in the chain.

Keywords: *Agri-food system, Issues, Mindanao, Opportunities, Value Chain*

1.0 Introduction

The changing market and agri-food system has been a global trend, which is driven by higher food standards, urbanization, increasing local and foreign investments, among others. Export and modern retail and fast food chains have been increasing through the years. In the Philippines, the number of retail stores have significantly increased from 1999-2007, with an average growth rate of 16% per year and average sales growth rate of 26% per year (Planet Retail, 2008). The market share of the top five grocers constitute about 35% in 2005, ranking fourth in the Asia Pacific (Planet Retail, 2008).

The food processing is now concentrated, vertically integrated and into contractual arrangements. A number of multinational companies operating in the country are now into vertically integrated operations and are contract arrangements. The suppliers of fresh produce for supermarkets are also consolidating and are getting closer to the source of production. More than a decade ago, these suppliers are sourcing from wholesale markets and only a few of them are going to the production areas. However, about five years ago, supermarkets already prefer the 'concessionaire system' and they have established buying agents and offices near production areas.

These factors driving dynamic market change consequently creates changes in the supply chains of fruits and vegetables. These include changes in technology, management, organization, industry structure, procurement, finance and quality standards. Along with the changing agri-food system, there is a need for continuous upgrading of smallholder farmer's skills and assets to compete in the global market. The country is weak in terms of institutions, governance, infrastructure, labor productivity and innovation, however, various development options can be pursued in terms of policies, institutions, business models, collective action, support systems and research and development.

This study aims to assess the performance of selected fruit and vegetable value chains in Southern Mindanao, Philippines. Understanding the prices and costs and how they behave will help identify opportunities to improve the chain such as lowering costs, investing in technologies and policies that will lower costs or improve products to meet market requirements. This could ultimately help actors or stakeholders in the chain particularly the farmers and help alleviate poverty.

The paper is organized as follows. The Methodology is presented in Section 2, the Key Findings are discussed in Section 3 and the Conclusions and Development Opportunities are presented in Section 4.

2.0 Methodology

This study aims to assess the performance of selected value chains in order to understand the issues and opportunities to improve the chain. The areas of assessment include the cost structure of the players of the chain, the distribution of benefits among the chain actors and the efficiency of the markets. The models/methods used to assess

these areas include the analyses on price spreads, net margins, price transmission, market integration and value chain mapping.

2.1. Price Spread Analysis

Price Spread is the difference between the selling price and the buying price. It provides a picture of the share of farm price to the retail or selling price, and gives indication of the cost of marketing and the value adding required by consumers. Price spreads also provides background information of the chain and flags areas to probe why prices and margins are behaving as such.

2.2. Net margins analysis

Since the analysis of price spreads do not provide information about the profitability of various nodes in the chain (farm, wholesale, retail), net margins analysis is also done. Net margins provide more details on the marketing and production costs at each node. It also examines the cost structure of different nodes in the chain. Net margins analysis indicates where the opportunities lie in terms of improving the chain. Net earnings of various marketing levels involved in the supply chain will be computed using following formula:

$$Nm = Gm - MC$$

where:

Nm is the net margin,

Gm is the gross margin

MC is the marketing costs incurred by a particular marketing level.

2.3. Price Transmission Analysis

The analysis of price transmission tells how buying prices are reflected in the selling prices, and flags problem areas that need to be further examined. A study on the price transmission in imperfectly competitive vertical markets showed that the existence of oligopoly power at the retail level would lead to a decrease in the farm level prices that is greater than the decrease in retail prices (Lloyd, et. al., 2004). This was in accordance with the study of McCorriston (2002 as cited in Lechanova, 2005). By the means of price transmission coefficients, it is possible to evaluate market power of the individual links of the chain. But basically, the coefficients of price transmission were used especially for the estimations of the price elasticities of the secondary demand functions (George, King 1971 as cited in Lechanova, 2005). The elasticity of price transmission from one level, e.g.., the farm to wholesale, was derived by estimating the coefficient for buying to selling with the following theoretical model:

$$P_s = f(P_B, MC) \quad (1)$$

where:

$\boldsymbol{P_s}$ is the selling price,

$\boldsymbol{P_B}$ is the buying price,

MC is the vector of marketing cost which includes the cost of grading, packing, cleaning, transporting, labor, and other costs.

From farm to wholesale, Pb refers to the farm price (Pf) paid by wholesalers to the farmers. On the other hand, Ps refers to the selling price of wholesalers to the next marketing level, commonly the retailers. Similarly, from wholesale to retail, Pb refers to the wholesale price paid by retailers to the wholesalers and Ps refers to the retail price paid by the consumers in wet markets.

Empirical Framework

An econometric model relating prices across the supply chain is estimated to get the coefficients of the buying price to selling price. The empirical counterpart of equation (1) becomes:

$$P_S = \beta_0 + \beta_1 P_B + \beta_2 \sum_{i=1}^{n} CM_i + \varepsilon \qquad (2)$$

where:

P_S = selling price

P_B = buying price

$\sum_{i=1}^{n} CM_i$ = aggregated cost of marketing from C_1 to C_n.

ε = margin of error

From equation (2), the elasticity of price transmission is:

$$\varepsilon = \frac{\%\,\Delta P_S}{\%\,\Delta P_B} = \frac{\%\,\Delta P_S / P_S}{\%\,\Delta P_B / P_B} = \beta_1 \bullet \frac{P_B}{P_S}$$

Note that:

$$\beta_1 = \frac{\Delta P_B}{\Delta P_S}$$

Where:

β_1 = slope of the buying price

ΔP_B = change in the buying price

ΔP_S = change in the selling price

The additive function was assumed because an increase in the production and marketing costs would also mean an increase in the selling price of the product. However, this may vary depending on the nature of data used for the estimation.

2.4. Market Integration

This analysis examines whether the farm, wholesale, and retail markets for relevant crops in the Philippines are integrated. Econometric models were used in the analysis of market integration.

The necessary precondition for a market integration is the assumption that there are homogeneous preferences and technologies. This is applicable for a spatial competitive equilibrium where *n* regions trade with fixed transport costs. There are also restrictions on the continuity, slope and curvature and domain of utility and production functions (Alexander and Wyeth 1994). In a testing for market integration, prices between two markets are traditionally correlated assuming fixed transportation costs. If markets *a* and *b*, for example, are integrated, the difference between their prices is the transportation cost ie. $p^a - p^b = T$. Several approaches have been utilized to test this emprically which include correlation of prices, Ravallion model, error correction model, cointegration of prices, and parity bounds model. Since the correlation analysis and Ravallion model do consider the non-stationarity of data, the problem of spurious regression is encountered. And, even though cointegration analysis accounts for non-stationarity of data, this does not test for full market integration which requires that the cointegration vector must be equal to one as in the Ravallion model or its error correction form which addresses non-stationarity.

2.5. Research Procedures, Data Used and Respondents

The scope for the price transmission and net margins of the selected crops were tabulated in Table 1. The data used and scope of the study vary due to time and budget constraints. The data used for the price spreads and price transmission analyses were time-series data gathered from the Bureau of Agricultural Statistics database. These include farm price, wholesale price, retail price, lending rates and agricultural wage rates. Moreover, the data on fuel prices were taken from the Department of Energy. Issues encountered in the estimation of the models such as autocorrelation and multicollinearity were addressed by making use of different methods such as the logarithmic form of the data, deflated data and first difference models. The best result from among the methods used was then utilized for the analysis. On the other hand, net margins analysis required data obtained from survey and key informant interviews. The respondents for the net margins analysis were farmers, wholesalers, and retailers. There were also other actors in the supply chain who were interviewed such as farm laborers, storekeepers, "*kargadors*" (a local term for a laborer who loads and unloads sacks of vegetable from a transport vehicle), and service providers. These actors provided information which were relevant in understanding the entire supply chain and in the computation of the net margins per different marketing levels.

Table 1: Price Transmission Analyses and Net Margins Case Study Coverage

Crop	Price Transmission Coverage	Net Margins Case Study
Durian	Region XI and Davao City, 1990-2009	Case 1: Farmer and Wholesaler (Davao City) Case 2: Farmer/Wholesaler/Retailer (Manila) Case 3: Farmer/Wholesaler/Retailer (Davao) Case 4: Wholesaler-Retailer (Divisoria, Manila)
Mango	Farm: Philippines and Davao del Sur, 1990-2007 annually	Case 1: Davao City growers, wholesalers, and retailers
	Wholesale: Philippines, 1990-2007 annually	Case 2: Digos City growers, wholesalers, and retailers
	Retail: Philippines and NCR, 1990-2007 annually	Case 3: Wholesaler-Retailer (Divisoria)
Papaya	Farm: Philippines, January 2006 – December 2007	Case 1: Farmer - Tupi, South Cotabato; Wholesaler-Retailer - Davao City
		Case 2: Farmer - Tupi, South Cotabato; Viajero via Gen.Santos City - Wholesaler-Retailer (Manila- Mega Q Mart and Balintawak)
		Case 3: Contract Grower - DOLE
		Case 4: Farmer - Tupi, South Cotabato; Wholesaler-Retailer in Tupi, South Cotabato; Wholesaler-Retailer in Manila (Good Harvest Market in Cubao)
Potato	Farm-Retail: Bukidnon, 2005-2007 monthly	Farmer: Lantapan, Malaybalay, Impasug-ong in Bukidnon
	Farm-wholesale: Philippines, 1990-2007 annually	Wholesaler: Lantapan, Malaybalay in Bukidnon
	Wholesale-Retail: Philippines, 1990-2007 annually	Retailer: Valencia, Malaybalay in Bukidnon; Agora and Cogon Market in Cagayan de Oro City
	Farm-Retail: Philippines, 1990-2007 annually	
Tomato	Farm-Wholesale-Retail: Region XI, 1999-2007 monthly	Farmer: Kapatagan, Davao del Sur
		Wholesaler and Retailer: Bankerohan Public Market, Davao City and Manila (Divisoria and Balintawak).

The price spread analysis, on the other hand, used secondary data of farm, wholesale and retail prices in the Philippines, Northern Mindanao and Southern Mindanao areas. In the market integration analysis, the data used are sourced from the Bureau of Agricultural Statistics. The period covered for each crop is dependent on the availability of data as shown in Table 2.

Table 2: Data series used in the Market Integration Analysis

Crop	Period	Farmgate (F)	Wholesale (W)	Retail (R)
Cabbage	annual 1990-2009	Manila, Region X, Region XI	Manila, Region X, Region XI	Manila, Region X, Region XI
Potato	monthly 1999-2009	Manila, Region X, Region XI	Manila, Region X, Region XI	Manila, Region X, Region XI
Eggplant	monthly 1999-2009	National, Region X, Region XI	National, Region X, Region XI	National, Region X, Region XI
Tomato	monthly 1990-2009	National, Davao del Sur,	National , Region XI, Region X	National , Davao City, Bukidnon,
Durian	annual 1990-2008	Region XI	Region XI	Region XI
Mango	monthly 1992-2009	National, Davao del Sur, Bukidnon	National	National, NCR

There are a total of 53 key informants used in the net margin analysis of fruits (Table 3). Key informants ranged from farmers to different business units and government institutions. However, only farm cases to different marketing nodes in different value chains are included in the net margin analysis. Some fruits like durian and papaya also have unique actors like viajeros and contract growers. On the other hand, Table 2 shows the total number of respondents included in the analysis of vegetables. More respondents were actually interviewed by the researchers, however, some of the informants especially the farmers gave answers that were irrational or inconsistent with the answers of other farmers and secondary data reviews. Moreover, some of them can hardly remember the inputs used in production as well as the exact amount and prices for each input since most farmers do not keep records of their financial expenses. Thus, only 80 respondents were included in the net margins analysis.

Table 3. Summary of key informants for the net margins analysis of fruits

Actors	**Number of Key Informants for Fruits**				
	Durian	Jackfruit	Mango	Papaya	**Total**
Farmer	3	5	5	3	16
Wholesaler	1	4	5		10

Retailer	3	1	3		7
Farmer/Wholesaler/Retailer	1				1
Wholesaler-Retailer	1		2	5	8
Middleman	6				6
Contract Grower				1	1
Viajero		1		1	2
Business Units			1		1
Government Institutions			1		1
Total	15	11	17	10	**53**

Table 4. Summary of key informants for the net margins analysis of vegetables

Actors	**Number of Key Informants for Vegetables**				
	Cabbage	Eggplant	Potato	Tomato	**Total**
Farmer	4	6	5	7	22
Wholesaler	4	4	4	7	19
Retailer	8	8	10	9	35
Producer Organizations			1		1
Government Institutions			2		2
Resource Person				1	1
Total	16	18	22	24	**80**

3.0. Findings

The findings are summarized based on how they affect profit. Theoretically, the profitability of a farmer heavily relies on three factors—price, quantity and costs. The pricing mechanism, the amount of quantity sold and the costs incurred by the farmers are the major factors affecting profitability of farmers. The key findings detailed in this section are narrowed versions of several research papers conducted under the Mega Project funded by the Australian Centre for International Agricultural Research (ACIAR). These findings were trimmed down to come up with a more comprehensive understanding of the key issues and opportunities in selected horticulture crops in southern Mindanao, Philippines.

3.1 Declining farm price relative to wholesale and retail prices. The average growth rate of farm price for fruits and vegetables is -28.01% (Table 5). The farm price is generally decreasing faster than the wholesale and retail prices. A number of factors explain the declining farm price. The costs of marketing are increasing faster than

production costs thus increasing wholesale and retail prices. Transportation costs also increase faster due to increase in fuel costs and poor infrastructure facilities. Wage rates for non-agricultural jobs increase faster than agricultural jobs especially for non-plantation agriculture thus increasing wholesale and retail prices. There is also an increased proportion sold to modern outlets which charge relatively higher price due to higher costs. Farmers also have very limited access to high value markets, thus farm price is lower.

Table 5. Average Prices at Each Node, 1990-2009

Crops	**Average Farm Price (%)**	*Growth Rate, 1990-2009 (%)*	**Average Wholesale Price (%)**	*Growth Rate, 1990-2009 (%)*	**Average Retail Price (%)**	*Growth Rate, 1990-2009 (%)*
Durian	30.59	*-42.80*	-	-	-	-
Mango	35.06	*-42.65*	54.64	*-42.53*	75.61	*-43.00*
Jackfruit	14.02	*-1.38*	21.24	*6.20*	-	-
Papaya	14.1	*-46.36*	38.60	*-70.84*	40.1	*-41.73*
Cabbage	15.36	*-50.24*	25.14	*-42.98*	45.18	*-41.08*
Eggplant	16.98	*-26.09*	22.02	*-16.75*	34.84	*-11.74*
Potato	21.79	*17.84*	34.10	*-7.91*	51.62	*-15.78*
Tomato	14.14	*-32.41*	23.78	*-4.54*	38.52	*-12.14*
Average growth rate for fruits and vegetables		**-28.01**		**-25.62**		**-27.58**

3.2 The share of farm price to retail price is generally decreasing over time for most crops. The annual average growth rate of farm share from 1990-2009 is -2.15%, compared to 21.04% and -0.80% for the wholesale and retail shares, respectively. One of the reasons why the share of farm price to retail price is declining, is that farm price is declining faster than wholesale and retail prices. Note that in the analysis of price spreads, Real prices were used.

Production is not flexible (inelastic supply due to fixed assets such as land) compared to wholesaling and retailing when input costs change hence absorbing the effects in the change of marketing costs. One of the factors that could explain the behavior of prices spreads is that, production is not flexible (inelastic supply due to fixed as assets such as land) compared to wholesaling and retailing when input costs change hence absorbing the effects in the change of marketing costs.

Table 6. Average Shares at Each Node, 1990-2009

Crops	**Average Farm share (%)**	*Growth Rate, 1990-2009 (%)*	**Average Wholesale share (%)**	*Growth Rate, 1990-2009 (%)*	**Average Retail share (%)**	*Growth Rate, 1990-2009 (%)*
Mango	46.49	*0.60*	25.92	*1.39*	27.59	*-1.63*
Papaya	27.64	*1.49*	49.53	*2.60*	22.83	*9.56*
Cabbage	33.38	*-15.54*	21.94	*17.67*	44.68	*5.01*
Eggplant	48.69	-16.26	14.46	*39.76*	36.85	*12.16*
Potato	42.20	*39.92*	23.79	*-28.53*	34.01	*-16.07*
Tomato	36.28	*-23.08*	25.40	*93.37*	38.32	*-13.81*
Average growth rate for fruits and vegetables		**-2.15**		**21.04**		**-0.80**

3.3 Changes in buying prices are generally reflected in the selling prices, 70% on the average. Ideally, the changes in the costs at the farm level should be efficiently transmitted to the wholesale and retail levels. If such is not the case, inefficiency along the chain exists and some players are placed in a disadvantage position. In the case of fruits and vegetables in this study, an average of 70% of the buying price is reflected in the selling prices. This implies that the buying price is a key variable in setting the selling price. Although the price is not perfectly transmitted to the downstream side of the chain, at least more than half of the costs (which constitute the price of each commodity) are transmitted.

The longer the node, the lower is the Price Transmission Elasticity, 0.57 from the farm-to-retail node (Table 7). This is lower compared to the farm-to-wholesale and wholesale-to-retail elasticities at 0.68 and 0.86, respectively. The lower price transmission elasticity of the farm-to-retail node is caused by poor infrastructure and poor market information. Wholesalers and retailers are usually located in one market, thus, price signals are easily transmitted than the farm-to-retail node.

Table 7. Elasticities of Price Transmission

		Elasticities of Price Transmission					**Average**
	Coverage	**Potato**	**Tomato**	**Papaya**	**Mango**	**Durian**	
Farm to Wholesale							**0.68**
	Davao City					0.531**	
	Region XI		0.44*		0.92*	0.8*	
	National	0.72*					

Wholesale to Retail						**0.86**
	Davao City				0.903*	
	Region XI		0.847*		1.062*	
	National	0.84*		NS		
Farm to Retail						**0.57**
	Davao City				0.476***	
	Davao del Sur Farm Price to NCR Retail Price				0.778*	

*significant at 1% **significant at 5% ***significant at 10% NS Not Significant

3.4 There has been no long-run relationship between prices of two markets being considered in the study. Using the Ravallion model, Davao City was considered the reference market due to high volume of production while Northern Mindanao and NCR were considered local markets. Results suggest that Davao farm gate prices were transmitted in Northern Mindanao and NCR markets within a 3-month period, thus considered to be integrated in the long run. On the other hand, Davao wholesale pricing does not influence the retail pricing in Northern Mindanao and NCR implying market segmentation. In conclusion, extent of market integration, in the case of cabbage, decreases as it moves farther from the production area, i.e., farm gate to wholesale to retail market.

Table 8. Market Integration Results

Market Integration	**Node**	**Ravallion Model**			**Remarks**
		Market Segmentation	**Short-run Integration**	**Long-run Integration**	
Davao Northern Mindano	- W -> R	Accepted	Rejected	Rejected	Retail price formation process in Northern Mindanao is independent of the Wholesale price condition in Davao region.
Davao – NCR	W -> R	Accepted	Rejected	Rejected	Retail price formation process in NCR is independent of the Wholesale price condition in Davao region.

Davao Northern Mindano	- F -> W	Rejected	Rejected	Accepted	Farm gate price shocks in Davao region are transmitted in Northen Mindanao Wholesale market in the long run, i.e., within a quarter.
Davao – NCR	F -> W	Rejected	Rejected	Accepted	Farm gate price shocks in Davao region are transmitted in NCR Wholesale market in the long run, i.e., within a quarter.

3.5 Importance of Grading. The importance of grading is highlighted in the case of papaya wherein Dole Stanfilco sources produce from the contract growers. To meet the standards set by the company, the growers need to follow a certain formula for fertilizer and pesticide application. However, even if the price of ammosul, which represents fertilizer, in general is transmitted to the farmgate price of papaya, the grower cannot lower the dosage. Since this type of formula cannot be replicated by non Dole-contract growers especially the small-scale farmers, organic farming is an alternative option. This type of farming is also applicable to durian wherein the growers incur high cost for this type of input.

Because grading is not strictly practiced, naturally, there will be variation in the acquisition cost of the same crop at the same node in the same area. Varying acquisition cost was observed for mango, tomato, potato, and papaya at the wholesale or retail level but the difference does not go beyond PhP 10. Durian, on the other hand, has almost the same buying price at the farm gate level. While higher acquisition cost means lower net margin for tomato at the wholesale level, this cost translates to a higher net margin for mango wholesalers when they practice proper grading of mango. Wholesalers, which do not practice this specifically for mango, fail to achieve a higher margin.

Tomato, on the other hand, is not graded but classified only according to its size (Table 9). In addition, the farmer node should be able to match the grading practice of the downstream nodes to realize this margin. There are cases where a farmer receives a fixed price for all sizes of produce but when the produce reaches the wholesaler or retailer, they will classify (by size) or grade the produce in order to receive higher margins. If all the marketing nodes practice classification by size as in the case of tomato, the upstream levels must give greater importance on delivering the crop of the required size to maximize margin.

Table 9. Farmers' Costs and Net Margins: The Case of Tomato

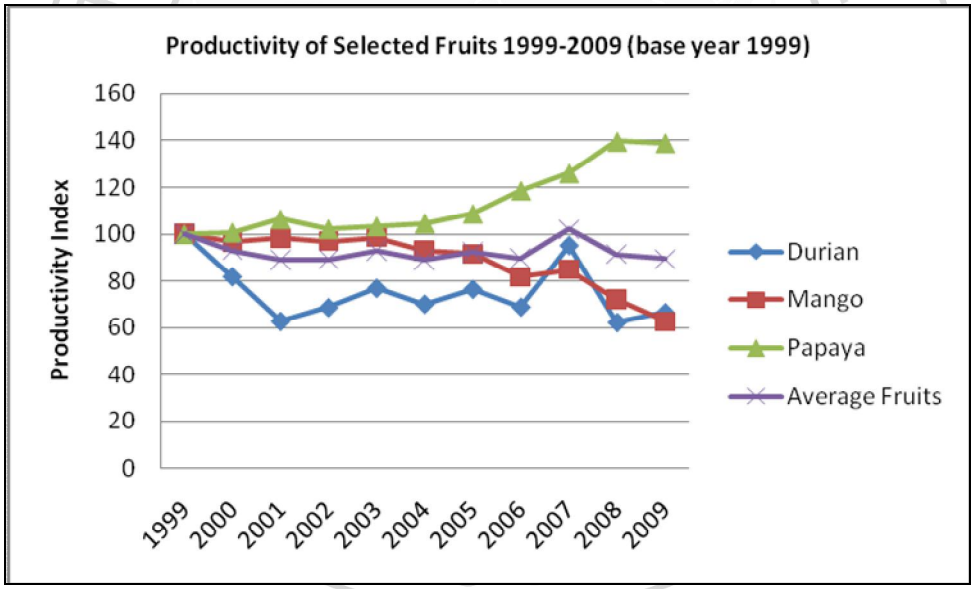
Farmer 1	**Farmer 2**	**Farmer 3**

	Cost/Kg (PhP)	Net Margin/kg (PhP)	Cost/Kg (PhP)	Net Margin/kg (PhP)	Cost/Kg (PhP)	Net Margin/kg (PhP)
big	1.12	14.95	18.38	-7.67	1.31	14.76
medium	0.45	14.90	3.54	6.46	1.04	14.31
S1	0.70	12.63	-	-	0.70	12.63
-S	0.93	5.75	-	-	0.27	6.39

Some farmers do not do not grade their products despite the benefits of receiving higher prices. One of the reasons is the inadequacy in the quality grading system. In effect, the basis of grading is quite arbitrary, thus application of standards or attributes to determine grades may not be consistent (Digal, 2005).

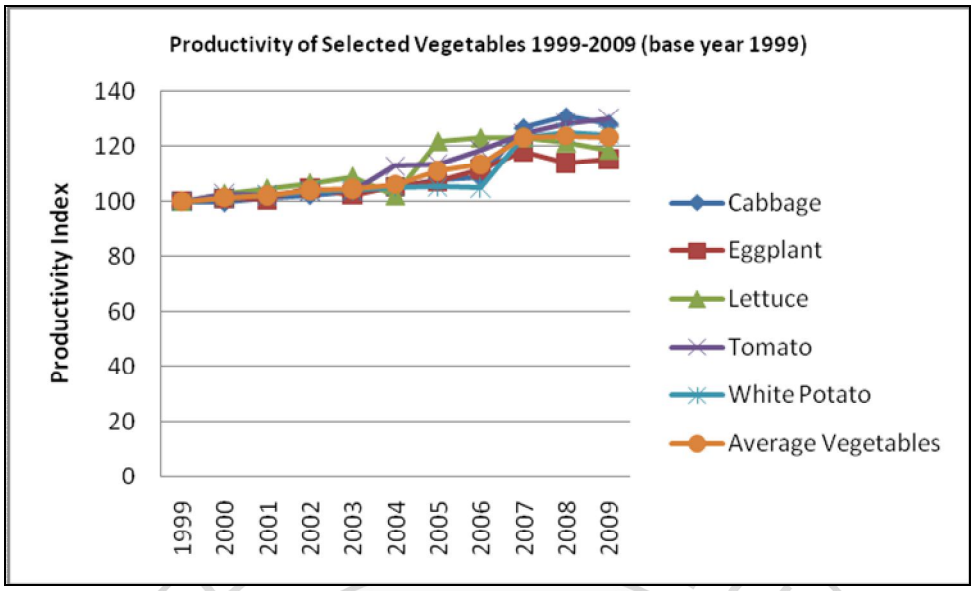
3.6 Increasing productivity of selected fruits and vegetables. The productivity of fruits and vegetables has been fluctuating, however, generally increasing on the average (5% and 10% productivity, for fruits and vegetables respectively).

Figure 1. Productivity of Selected Fruits



Source: BAS

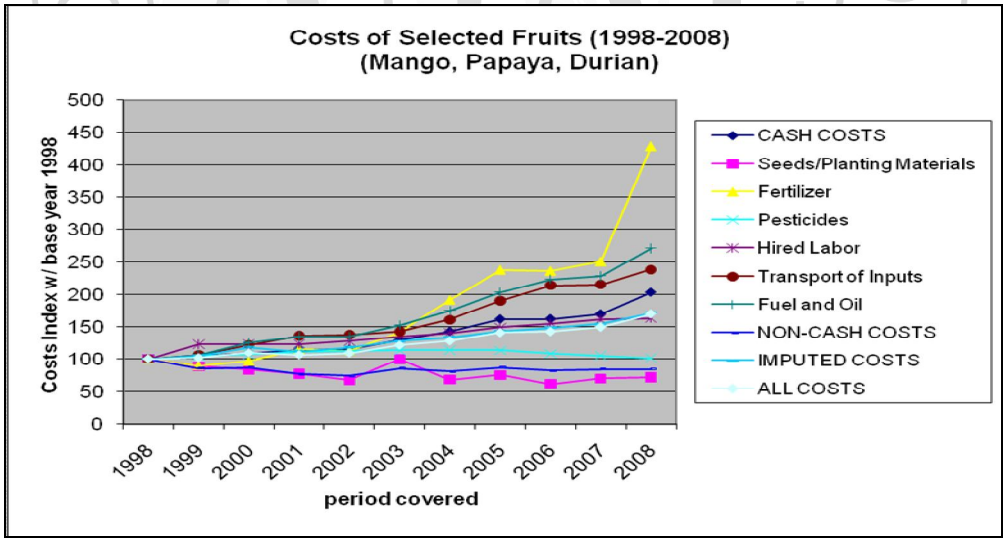
Figure 2. Productivity of Selected Vegetables



Source: BAS

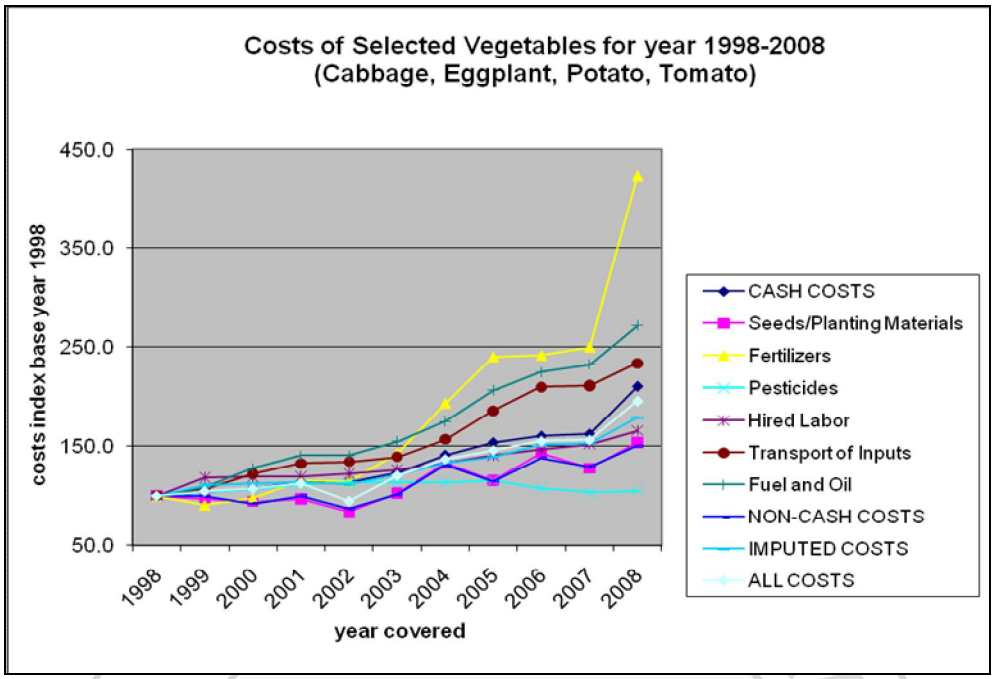
3.7 Production and marketing costs are increasing. Despite the increasing productivity of selected fruits and vegetables, production and marketing costs also have an increasing trend (126% and 130% for fruits and vegetables, respectively). Fertilizer and fuel costs are among the highest costs which were also validated by the net margins results (Figure 3).

Figure 3. Average Costs of Selected Fruits, 1998-2008



Source: BAS

Figure 4. Average Costs of Selected Vegetables, 1998-2008



Source: BAS

The two relevant cost items per fruit and across marketing levels that recorded the highest contribution to total cost are presented in Table 10. Different cost items for different crops were recorded to have highest contribution to total cost at the farm level. For durian and mango, cost of fertilizer contributes 32.11% and 34.64% respectively, to total production costs. Application of fertilizers on these types of fruits is really necessary to obtain higher yield. The use of farm chemicals for pest control is also necessary in mango and papaya production since it makes up 57.10% to total production cost for mango and 24.44% for papaya. Labor cost for mango is also high (21.85%) since harvesting mango is not an easy job and it may require certain skills and experience for a laborer to do the job. The case of jackfruit is different from the others in such a way that it has transportation cost recorded at the farm level. The cases of jackfruit were mostly farmer-wholesaler and farmer-retailer cases wherein actors incur both production and marketing costs. Some farmer cases in jackfruit also shouldered the cost of transportation since they were the ones who brought the produce to the buyers.

Table 10. Relevant cost items with highest contribution to total cost for fruits

Fruits	Level Farm	Wholesale	Retail
Durian	Fertilizer (32.11%) Materials (25.78%)	Material Inputs (70%) Transportation (10%)	Transportation (45.60%) Losses (19.13%)
Jackfruit	Transportation	Acquisition Cost	Losses

	(64.60%) Material Inputs (15.63%)	(55.89%) Labor Cost (6.89%)	(44.16%) Acquisition Cost (33.55%)
Mango	Pest Control (57.10%) Labor Cost (21.85%)	Material Inputs (47.25%) Transportation (21.13%)	Labor Cost (39.36%) Losses (35.62%)
Papaya	Fertilizer (34.64%) Farm Chemicals (24.44%)	Transportation (60.57%) Labor Cost (15.14%)	No Retail Cases No Retail Cases

At the wholesale level, cost of transportation has always been significant especially for papaya (60.57%) and mango (21.31%) since fuel price has continued to increase. Surprisingly, cost of material inputs for durian (70%) and mango (47.25%) recorded the cost to total marketing cost. Material inputs such as carton boxes, newspapers and tie box were necessary for big wholesalers of durian and mango since they are marketing these fruits as far as Manila, for example. In the case of jackfruit, the computation of cost distributions included acquisition cost so it basically recorded the highest percentage to total cost.

At the retail level, losses or wastage cost is one of the relevant costs to examine since it accounts 19.13% for durian, 44.16% in jackfruit and 35.62% in Mango. Jackfruit has a remarkably high cost in wastage since most of the retail cases involved the sale of shredded jackfruit and not exactly the whole fruit. Other significant retail costs include transportation (45.60%) for durian since there are retail cases of durian from Davao to Manila and labor cost (39.36%) associated to hauling and storekeeping for mango.

3.8 High wastage rate at the retail level. Majority of the crops studied are posted with very high wastage rates at the retail levels. The rate is particularly high in potato at the retail level. Wastage rate could be higher at worst-case scenarios. Durian has a lower rate due to its physical property. It could be transported with minimum care because of its hard shell. The fruit could also be processed at the end of the day if it is not sold at its ripe stage. Similarly, tomato and mango can also be processed but there is an absence of processing facilities for these crops within the community of the actors. Durian, however, could be recorded with a high wastage rate during oversupply when there is an excess supply of ripe fruit. The wastage rates are set at the conservative level and could vary depending on the practices of several actors. Wastage rates could also not be fully accounted on a per-node basis since the crop such as tomato is bought all-in by another marketing level.

Table 11. Average post harvest losses for fruits across marketing levels

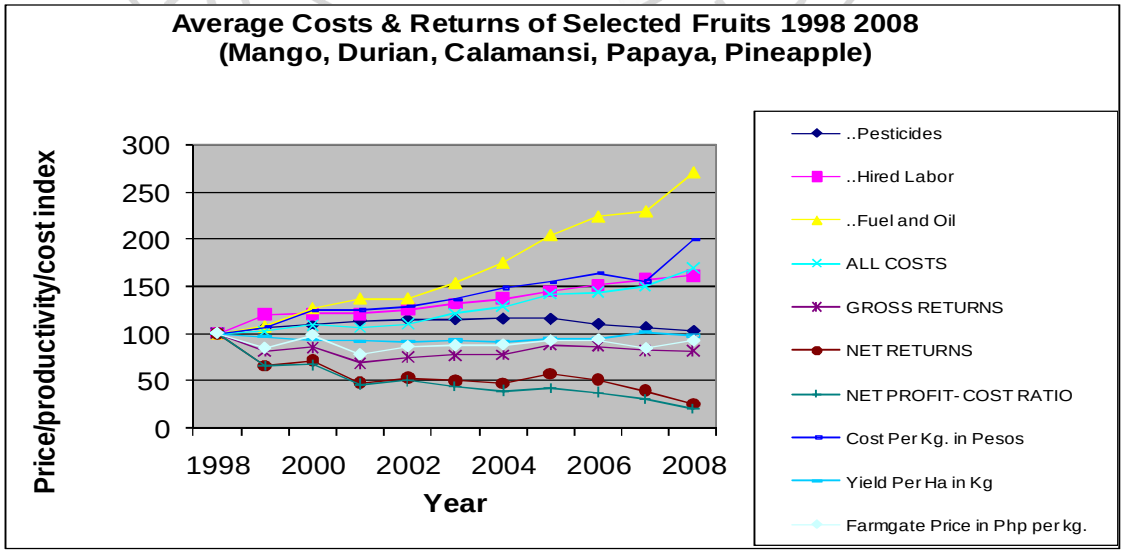
Fruits	Level		
	Farm	**Wholesale**	**Retail**
Durian	-	1.00%	6.50% (Davao to Manila)
Jackfruit	-	11.65%	16.65% (Davao)
Mango	-	-	4.13% (Davao) 5.00% (Manila)
Papaya	1.33% (Cotabato)	10.00%	No cases (Davao)

Table 12. Average post harvest losses for vegetables across marketing levels

Vegetables	Level		
	Farm	**Wholesale**	**Retail**
Cabbage	(carried by wholesalers)	10%	5.04% (Bukidnon) 4.52% (Davao)
Eggplant	(carried by retailer)	(carried by retailer)	2.06% (Bukidnon) 1.79% (Davao)
Potato	(carried by retailer)	(carried by retailer)	6.99% (Bukidnon) 0.83% (Davao)
Tomato	5.01% (Digos)	(carried by retailer)	7.78% (Bukidnon)

3.9 Declining profit. With the increasing production and marketing costs and a relatively small variation in the movement of prices over time, profitability of the players in the chain remains low, with a decreasing rate at -10% for fruits and -15% for vegetables (Figure 5).

Figure 5. Average Costs and Returns of Selected Fruits, 1998-2008



Source: BAS

3.10 Clustering increases farmer's profit. One of the opportunities for farmers is the formation of clusters. Cluster farming means grouping farmers together to consolidate their produce to deliver in bulk, thus saving transportation and transaction costs' (Montiflor et al., 2008, p. 39). Farmers learn new skills, access new information, had greater access to production inputs, greater access to working capital, higher income, adopt innovative methods to be able to identify and respond to market demands and opportunities (Lamban et.al., 2010).

3.11 Degree of risk. This covers the risk of wastage and low demand. The higher the risks are, the higher the net margin goes to the actors which carry the burden of such risks. Wastage incidence is very high at the marketing node for every supply chain. This is the reason why the net margin of all retailers for tomato, potato, papaya, and mango is high compared to the corresponding wholesalers. The highest net margin on average for all retailer respondents is observed in the case of tomato which has the shortest shelf life. In addition, the farther the crop is transported, the higher the net margin accrues to the actor responsible for the transfer of crop to that particular. This is reflected in the case of papaya which was transported to Manila. On the other hand, the case of durian shows that some actors assume risk by marketing durian to areas with low demand such as Metro Manila. This could further be worsened if there is an abundance of supply. However, only few are capable of marketing durian to Manila.

3.12. Producers are more profitable when marketing layers are lean. The most lean value chain is observed in durian wherein the farmer in Davao City also acts as a wholesaler/retailer in Davao City and Manila. He has, in fact, reaped the highest net margin not only for durian but as well as relative to other crops at PhP58.95 per kg. This is PhP 8.95 per kg higher compared with the case wherein wholesaling in Davao City and retailing in Metro Manila are done by different actors. This is, however, descriptive only during sufficient supply and not applicable when there is an oversupply. The general sequence through which the crop passes through is the farmer-wholesaler-retailer chain. This is applicable to potato, tomato, and papaya. Often, this chain is, however, made more complex with the presence of other actors such as the viajeros or consolidators. In other cases, particularly in mango, other actors such as sprayer-traders are involved in the transfer of crop from the farm to the market. This could also be the reason why the price transmission analysis does not capture the whole gamut of interrelationship among the actors. It is important to note that this analysis assumes that the crop follows the farmer-wholesale-retail chain in consideration of the available secondary data. This does not fully depict the more intricate pattern of transfer of a crop from one node to another.

4.0 Conclusions and Development Opportunities

The changing agri-food system has brought changes in the supply chain. High value markets have expanded and consumer tastes and preferences have changed due to changing lifestyle.

Along with the changes in the supply chain, smallholder farmers are faced with several issues and challenges. Farmers receive lower price compared to wholesalers and retailers. The share of farm price to retail price has been generally decreasing over time. Because of a number of marketing layers along the chain, prices are inefficiently transmitted from the upstream to the downstream side of the chain. Prices are not integrated from one market to the other. This inefficient transmission of prices is an indication of distortion/market power along the chain.

In terms of costs, marketing and production costs have been increasing over time. Despite the increasing productivity of farmers, production and marketing costs are increasing faster than the increase in price. This is due to inadequate logistics and infrastructure facilities and increasing fertilizer, pesticide and fuel costs. Hence, farmer's net earnings remain low.

Increasing productivity and expansion of high value markets are some opportunities for smallholder farmers. High value markets offer a competitive price; however, they have stringent quality requirements. Another option for farmers to consider is quality grading of produce because it offers a differentiated price. While a number of market opportunities are available for smallholder farmers, their limited resources to respond to these opportunities remain a major concern.

An integrated package of service is needed to address challenges and exploit opportunities faced by farmers. These include quality improvement to fetch better prices, increasing productivity and lowering costs through improved production technologies. Consolidation through clustering may also be pursued to meet market requirements through better production programming and meeting volume, frequency and quality requirements of the market. These will help increase income alleviate poverty of small farmers.

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