EXECUTIVE SUMMARIES OF PLENARY PAPERS

DEVELOPMENT PROGERIA: MALADY AND REMEDY

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In this paper, we employed the concept 'development progeria' first proposed by Fabella and Fabella (2011) to put in perspective the sad plight of the Manufacturing sector, in particular, and of the Tradables sector, in general, in the Philippines. We showed that in the last quarter century, the Services sector share in total value added rose rapidly while those of the Industry and in particular the Manufacturing sectors retreated. While this is a normal feature of high-income mature economies, it is an anomaly for income-poor countries struggling to catch up. We call less developed economies displaying such feature development progeriacs. We showed that indeed less developed economies in a sustained rapid growth trajectory (convergent trajectory) display the opposite feature: the Services sector share retreats in the face of gains in the shares of the Industry and the Manufacturing sectors. We showed that the trajectory of the employment shares of the Industrial sectors mimics that of the value added shares: Industry and Manufacturing shares fall while that of the Services sector advance. We showed that development progeria is endemic in Latin America.

We then enquired into the wherewithal of development progeria in the Philippines. We argued that policy option, rather than fate, is at the root of development progeria. Our contention is that while there are other factors—notably weak institutions and governance—the Philippines' pursuit of a strong peso was contributive to the retreat of Tradables in general and manufacturing in particular. We revisit two policy episodes in our history in the last quarter century both related to the Philippine central bank. The first was the effort to support the appreciating peso in mid-1990s leading to the encouragement to local business and banks to source their financing requirements from abroad, which resulted in heavy dollar exposures and currency mis-matches. It created bubbles in the stock and real estate which made for artificial prosperity. The Asian Financial Crisis exposed the unsustainable and dangerous nature of the strong peso strategy which, in turn, effectively aborted the promising Ramos recovery. The second was the attempt to snatch the strong peso from needed depreciation in mid-1980s, which involved the use of the infamous *Jobo Bills* that administered

the 'interest rate cure'. This effectively shrank the real economy in order to fit the massively mis-aligned Philippine peso. What was a disaster for the economy was, however, a boon for Philippine banks which bought the Jobo bills. The interest rate cure and the strong peso effectively aborted the prospect of the Aquino recovery. In this environment, given other entrenched institutional drawbacks, there was no room for new investments in Tradables and Manufacturing.

We then reviewed the evidence on the relation between weak currencies in stimulating growth. There is now strong evidence that weak currencies (undervalued currencies) make for higher growth. The reason advanced by Rodrik (2008) is that weak currencies compensate for many institutional failures which tend to negatively affect Tradables more than they do Non-Tradables. This levels the playing field for investment in Tradables. Another market failure that undervalued currencies remedy is the public good character of forex reserve: everybody benefits (e.g., the state can borrow at a lower interest rate) with a healthy forex reserve but which mostly private forex earners cannot appropriate.

Finally, we confront the question of shifting from a strong peso stance to a weak peso stance. In the last 25 years, advocates of the weak peso policy have repeatedly been rebuffed. But the times they are a-changing. The new BSP is now less tethered to the interest of the banking sector, more receptive to ideas anathema to the old monetary orthodoxy (exemplified by the SNB's since 2011) and, in general, more flexible. The Philippines since 2002 has now become a lender to the world rather than being perennially a beggar to the world chained to IMF conditionalities. The Philippines can now say "no" not only to credit offers but also to the worldviews imbedded in them. There is now a greater awareness among the business community of the dangers of the strong peso, the vitality of the Services sector (banking, real estate and retail) now more than ever being tied to the well-being of Tradables (say, the BPO industry demand for office space) and OFW households (demand for low cost housing). There is now a greater awareness of the protective effect of the weak peso especially in deterring smuggling.

Development progeria is not in the genes unlike its physical counterpart. It can be reversed with the right policies. But even with the ideal set of policies it will heal only slowly. The fruits will be harvested by our children. Our reward is that we started the healing process. Let's get busy today.

FOOD AND WOOD MANUFACTURING: CURRENT STATUS, ISSUES AND RECOMMENDATIONS

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This paper summarizes the current status, issues, and recommendations on food and wood manufacturing in the Philippines. It aims to identify, assess, and offer solutions for the gaps in the manufacturing sector, particularly on the access and use of modern technology. We also hope to identify a technology-explicit road map for the processed food and wood products in collaboration with both the concerned private and government sectors.

The Food Manufacturing Sector

The manufacturing sector is a significant part of Philippine economy because it is the largest sector and generates the most revenue, accounts for 85 percent of all Philippine exports (NSO, 2009), and is a major employer and source of foreign exchange. Moreover, it also provides many opportunities for the processing of local raw materials into value-added products that have tremendous local and foreign markets. Philippine food manufacturing includes the production, processing and preserving of meats, fish and other marine products, fruits and vegetables; the manufacturing of vegetable and animal oils and fats, dairy products, grain mill products, bakery products, sugar and confectionery, food condiments and seasoning, snack food, food ingredients and animal feeds (PSIC).

The food manufacturing industry remains to be one of the most dominant industries in the country, with a sustained average annual growth of 8.5 percent within 2009-2012. The sector also continuously grows with local and international avenues opening up more opportunities for trade such as the ASEAN Economic Community and government efforts to invite foreign investments, enhancing local food manufacturers' capacities to be more competitive.

Issues

NAST-sponsored round table discussions on food manufacturing identified interrelated concerns which threaten the sector's competitiveness and thus inhibit it from reaching its full potential.

The first concern is ensuring an inexpensive and reliable **supply of raw materials**, especially in terms of quality, quantity and time of delivery. Importation, buying from independent growers and contract growing are among the ways the sector acquire raw materials, and each has its own concerns, but it is deemed that the best option is thru consolidation of small farm holdings. Second is the availability of appropriate **technology** to effectively produce the desired products such as improved processed products and agricultural farming practices and labor-saving machineries for automation especially for big food companies. Third is the compliance of food manufacturers to national **food safety** regulations such as Good Manufacturing Practices (AO 153). Concerned agencies are observed to be inadequate in their enforcement, while consumers are not actively asserting their rights to safe and quality food.

Recommendations

1. Improve the transfer of existing technologies to the farmers. Agricultural success of Asian neighbors (i.e. Taiwan and Japan) relies heavily on the effective movement of advanced technologies from the research institutions to the farmer, as well as famers' highly-disciplined, entrepreneurial, active participation, and the government's sincerity, support and strong political will.
2. Strong collaborations should be forged among government institutions and private business sector. Government should act as regulator, liaison and educator to the sector; it should, among other things, establish a local standard comparable to the export market; liaise with the importing government on behalf of the exporter; regularly inspect producers' facilities; continue to search for new technologies and conduct educational programs, study trips, trainings and meetings. The private sector meanwhile should comply with the standards and requirements of the importing country and local governing body; gain international accreditation; closely communicate with concerned government sectors; form organizations to negotiate, win concessions and upgrade standards; and uphold quality for cost, convenience or position and take initiative for its continuous improvement. The

government and private sector as well as other stakeholders should also go hand in hand in identifying the problem areas in which science and technology can be used to advantage.

3. Concerned regulatory agencies such as the Food and Drug Administration (FDA), Department of Health (DOH), Department of Trade and Industry (DTI), National Meat Inspection Service (NMIS), Bureau of Fisheries and Aquatic Resources (BFAR) and others should strictly enforce food safety regulations while consumers should be encouraged to be vigilant and actively participate in reporting safety and quality standards violations of food companies.
4. Industry partners should provide research and scholarship funds to supplement the meager funds allocated by government. This could serve for training of new food scientists and continuing education of both big and small players on capacity enhancement to improve the quality of products produced. They can also be tapped to develop new products/innovations to especially assist the small players who are not capable of establishing their own product development unit.

The Wood Manufacturing Sector

Philippine wood manufacturing sector is classified into upstream and downstream. Lumber, veneer and plywood are the primary products of the upstream subsector and are used directly in housing and other types of construction, as well as inputs for the downstream subsector including furniture and furnishings and manufactured articles of wood such as doors, door jambs, windows, moldings, balusters, stairs and railways, shingles and shaker, assemble parquets and shuttering for concrete construction and others (Angeles et al., 2012). Products of this subsector are internationally called secondary processed wood products or SPWP.

Current status

Whereas the food manufacturing industry grew by an annual average of 8.5 percent between 2009 and 2012, the wood manufacturing industry has continued to decline. Data from the Philippine Forestry Statistics cited by Angeles et al. (2012) and Aggangan (2012) showed a very alarming situation of the sector. According to them, in the last four decades, our local production of lumber declined by about 80 percent, veneer 55 percent and plywood 46 percent. In summary, their total production was 70 percent (from a yearly average of 2,548,999 cubic meters in the period 1973-1978 to 790,000 cubic meters, in the period 2009-2011.

Consequently, the Philippine has been forced to import them yearly. For example, from a negligible value in early 1990's, imported veneer peaked between 1994 and 2003 at an annual average of US$99 million and US$22 million, respectively. Plywood, on the other hand valued at US$99 million from 2009-2011, largely due to the influx of China-made plywood. The aggregate annual imports averaged at 355,000 cubic meters valued at US$112 million.

Moreover, the Philippine exports of these primary products declined. From an annual peak of 1,157,000 cubic meters valued at US$275 million in 1979-1983, it fell to 109,000 cubic meters valued at only US$ 18 million. In 2004-2008, there was a modest recovery.

Issues

Stakeholders involving scientists, farmers, entrepreneur, non-government workers and managers who participated in the preparation of PA 2020 agreed that the main issue besetting the upstream sector, which will affect the downstream sector, is the scarcity of materials such as timber and logs. Consequently, availability of secondary processed products for local and export markets will further decline. Contributory to this issue are: further rise of illegal logging that has now encroached into the licensed forest areas closed by EO No. 23; difficulty importing from abroad due to non-tariff restriction policies and other restrictions by exporting countries; influx of cheaper wood products, especially from China and dearth of both local and foreign investments in forest/tree plantations and mill modernization (Angeles et al., 2012 and Aggangan, 2012).

Recommendations

1. A reiteration of NAST previous resolutions to enact into law the Land Use Policy Act and the Sustainable Forest Management Act (to replace PD 705).
2. Use science and technology, and economics in promulgating investment-friendly policies to attract both local and foreign investments.
3. As in the food manufacturing sector forge strong collaboration among government institutions and business sector on all areas i.e.

science and technology, capacity development both human and facilities, upgrading of standards etc for robust development of the wood manufacturing sector.

4. Strict enforcement of forest protection i.e. illegal logging, poaching, smuggling of secondary products by the concerned government agency
5. Adopt recommendations expressed in PA 2020 such as put under supervised sustainable management one million hectares of second growth forests suitable for selective logging; establish 500,000 hectares of quality forests thru plantations both in private and public lands; establish 100,000 hectares of bamboo plantations; organize upland and forest land communities, for mobilizing investments and credit, adopting modern technologies for production and processing, assurance markets for as their produce as well as in biodiversity and ecological conservation and mobilizing and empowering of 2,182 people organizations and 496,165 households holding the stewardship contracts of CBMFA's into a more productive competitive and sustainable partnership in forest development.

PROSPECTS FOR AQUATIC HIGH VALUE PRODUCTS BIOFACTORIES IN THE PHILIPPINES

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The Philippines is reported to be the center of species diversity for many marine taxa. Marine biodiversity is a valuable national asset that provides various goods and services to our people. The primary aquatic biodiversity-based industry is fisheries. In 2010, the Philippines was the 5th highest fish producing country in the world with a total production of 5.16 million metric tons of fish, crustaceans, mollusks, and aquatic plants which constitutes 3.06 percent of the total world production of 168.4 million metric tons worth 10.8 billion US dollars. The fishery production and processing sectors also provide employment and contribute a huge percentage of the national income. Moreover, aquatic species are major sources of protein in the Filipino diet and critical for domestic food security. Aside from providing food and income, marine organisms are sources of pharmaceutical and nutraceutical products, and materials for biofuel production. This paper provides an overview of the prospects for production of high value products from finfish waste, seaweeds, and marine invertebrates.

Finfish Discards

The shortage of raw material is one of the primary problems in the fish processing industry in the country. However, there are opportunities for the development of high value products from fish wastes derived from the top cultured (e.g., bangus, tilapia) and wild (e.g., tuna) finfish species. Utilization of fish waste would also reduce the environmental costs associated with disposal. Many pelagic fishes are rich in oil such as mackerel, herring, tuna, sardines and anchovy. Although they are primary processed as food, other high-valued by-products have been derived from fish wastes such as intestines, head, gill, and bones. In general, fish wastes are nutritionally rich in valuable oils (i.e., omega 3), minerals and bioactive compounds that have many alternative uses in food, pharmaceutical, nutraceutical, agricultural, aquaculture and industrial applications (Sharp and Mariojouls, 2012). For instance, fish oil being rich in omega-3 has been

known to reduce the risk of heart-related dysfunction and improve brain development. Fish oil can also be converted into biodiesel (e.g., Pinyaphong et al., 2011) which have higher cloud point, cetane number and better stability. Chymotrypsin produced from fish discards such as tuna has many applications in the food industry, leather production, chemical and medical industry (Zhou et al., 2011). In addition, fish scales are utilized for pearl essence which is an additive for lipsticks, nail polish, ceramic glazes and other cosmetic products to make them shimmery. Bangus and tilapia scales may be potential local sources of pearl essence. In addition, fish bone has also been found to be a potential source of calcium. Other important products that can be obtained from fish waste (e.g., tilapia) by-products include collagen, gelatin.

Seaweeds

Seaweed farming is the most successful mariculture industry in the country. It is mostly a small grower industry at the production side which provides livelihood for coastal communities. The Philippines was the 3rd largest producer of seaweeds in 2010 with a total production of 1.8 million metric tons worth USD 256.7 M. This constitutes 9.5 percent of the total seaweed world production of 19 million metric tons (BFAR-Philippine Fisheries Profile 2011). The Philippines is considered one of the world's leading producers of *Kappaphycus* and *Eucheuma* . These seaweeds are of great demand because they produce carrageenan which is widely used as stabilizer, gelling agent, binder, thickener and additive for various dairy products, pet food, meat processing, beer bottling industries. It is also utilized in cosmetics and pharmaceuticals. The brown algae, *Sargassum* which is common in rocky intertidal and shallow subtidal areas of the Philippines and is often cast up in large quantity in shore and beaches has a lot of high value natural products.. It is a source of fucoidans, an anti-inflammatory and an excellent antioxidant (Thinh et al., 2013) and the pigment fucoxanthin, a slimming agent and has anti-cancer properties. Other studies also showed that *Sargassum* is an effective anti-allergen. Crude and diethyl ether extracts from *Sargassum polycistum* were found to be effective as an insecticide, a potential plant hormone and a basic emulsifier for bath soap.

There is growing interest in the potential of seaweeds as sources of biofuels and ethanol because of its high sugar content. The process also does not require pretreatment for ethanol production. Seaweeds are relatively easier to harvest than microalgae and can be harvested up to six times a year in

warm climates. Obvious advantages of seaweed biofuels include the lack of competition with arable lands and limited or no needs for the use of freshwater and external fertilizers or phytosanitary products. The higher capacity of these marine plants to absorb airborne carbon than land-based plants is also cited as an advantage of mass production of seaweeds.

Invertebrates

The Philippines is the epicenter of diversity of major invertebrate taxa (e.g., corals, molluscs, crustaceans). Shrimps, cephalopods (squid, cuttlefish, octopus); crabs and sea cucumbers are high-value export commodities. Other invertebrates gleaned from nearshore areas are the primary source of protein on poor coastal households. While the aquaculture production of the four widely cultured invertebrates (i.e., oysters, mussels, shrimps/prawns, mudcrab) in the country has steadily increased in the past decade, culture production of invertebrates is still generally low relative to the fish and seaweed production.

Several studies have shown that various invertebrate taxa are major sources of bioactive compounds with potential for drug development, clinical treatments, and nutraceuticals. In the US, powdered coral skeleton is considered as a calcium supplement. Bioactive compounds extracted from marine invertebrates have also been widely used in medicine as anti-inflammatory, anti-hypertension, anti-tumor and anti-cancer drugs (e.g., dolastatin from sea hares, bryostatin from bryozoans). Chitin and chitosan oligomers obtained from crustaceans have also been found to possess antitumor and wound healing properties. Studies on conotoxins from various species of the marine snail *Conus* led to the development of the drug Prialt which is an alternative to morphine. Another group of very diverse gastropods, the turrids, are part of a major drug discovery program (PHARMASEAS). Several bioactive compounds can be derived from a single species. Given the hundreds of species of conus and turrid shells, thousands of potential bioactive compounds can be derived just from these two groups.

Biologically active compounds isolated from echinoderms have been evaluated for their cytotoxity against tumor or cancer cells, antiviral, antifungal, or antimicrobial activity, among others. Some species also serve as experimental model for studies on tissues or organ regeneration and physiological processes have inspired engineering innovations. Recently, a nickel catalyst to capture carbon dioxide from the atmosphere was developed based on the discovery that sea urchins use nickel to convert the CO2 to

calcium carbonate for their exoskeleton (Bradbury and Siller, 2013). Sea urchin tests have been reported as potential sources of anti-oxidants. The development of high-value species culture technologies for sea urchins (*Tripneustes gratilla*) and sea cucumbers (*Holothuria scabra, Stichopus horrens*) also provides opportunities to develop non-traditional products and add economic value to current traditional fishery products. For *T. gratilla*, crude extracts of its different organs exhibit anti-microbial activity and peroxysterol was found to be effective against tumor cell lines (Liu et al., 2011). In Malaysia, extracts from different species of *Stichopus* are made into ointments to treat wounds and added to toothpaste to treat gingivitis or early stages of periodontitis. Various health supplements and cosmetic products were developed from gamodulin extracts from *Stichopus* sp. Carotenoids in *H. scabra* were also found to be a potential source of natural antibiotics (Ibrahim, 2013) aside from other medically important bioactive compounds. On the other hand, the crown of thorns starfish (*Acanthaster plancii*), is a good source of protein and was found to be non-toxic to animals, making it a potential ingredient for animal feeds. Maybe this is an opportunity to add value to conservation efforts to manage outbreaks and further degradation of coral reefs.

Within an integrated framework for sustainable development, development of pharmaceuticals nutraceuticals, and other value-added products from aquatic species can provide incentives for increased public and private investments in improving the management of fishery resources, including responsible mariculture practices which will increase production to support the development of marine biotechnology based industries.

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INCLUSIVE GROWTH THROUGH THE COCOCHEMICAL INDUSTRY: FROM COCONUT TO HIGH-VALUE PRODUCT[1]

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The Philippine Development Plan 2011-2016 boldly set for the administration of Pres. Benigno S. Aquino, III, the objective of attaining "inclusive growth" which it defined as "growth that is sustained, that massively creates jobs, and reduces poverty."

The Philippines can only reduce poverty by addressing the root of poverty, and one of the sectors that is among the poorest is the coconut sector. At the same time, the coconut sector has the potential to provide the jobs, agricultural development, and industrial growth that are sustainable.

However, a comprehensive roadmap requires a strategy that combines social, economic and political reform, together with scientific and technological savvy. Institutionally, this effort needs the leadership from the Presidency, which will coordinate all of the agencies of government, the active support from the private sector, and most importantly, the engagement of the most affected sector, the coconut farmer.

The Philippine Development Plan 2011-2016 acknowledged that inclusive growth "is an ideal which the country has perennially fallen short of, and this failure has had the most far-reaching consequences, from mass misery and marginalization, to an overseas exodus of skill and talent, to political disaffection and alienation, leading finally to threats to the constitution of the state itself." (NEDA, 2011)

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[1]This paper is based on the presentation of Norio Usui (Asian Development Bank) during the NAST roundtable discussion (RTD) "Development Progeria" held at Traders Hotel, Manila, on January 17, 2013, and the presentations by Dr. Jose Romero, Jr. (former Adminstrator, Philippine Coconut Authority); Mr. Carlos Carpio (Deputy Administrator, PCA), Mr. Dean Lao, Jr. (Managing Director, Chemrez Technologies), and Ms. Evelina Patiño (COO, United Coconut Chemicals Inc.), during the roundtable discussion "Philippine Coconut Industry's Cocochemical Sector: Quo Vadis?" held at the Hyatt Hotel, Manila, on May 28, 2013.

Norio Usui advanced the treatise that the main reason behind the low growth performance of the Philippines relative to our neighbors is our stagnant industrialization. To achieve inclusive growth, the Philippines needs to strengthen an industrial sector that creates productive job opportunities.

The Philippines today is faced with the twin challenges of attaining inclusive growth and being globally competitive. The first challenge is rooted mainly in agriculture, while the second challenge requires a competitive industry. The Coconut Sector is the most strategic sector that can address both challenges of attaining inclusive growth and global industrial competitiveness, and science and technology – if properly focused and supported – can support the drive for both inclusive growth and global competitiveness.

Any discussion of the Coconut sector will not be complete without considering the heavy yoke that weighs down on its socio-economic and political status. The coconut sector has a long history, starting from the Spanish and American rule, to the Marcos era of being subjected to iniquitous conditions. The current controversy on the use of the Coconut Levy Fund should be addressed in the light of the decrees and issuances during the Marcos rule that essentially drew wealth from the coconut farmer and transferred this to the control of private individuals.

The Coconut industry should diversify horizontally by effective intercropping and integrate vertically by improving upstream raw material production and downstream high-value products. However, at the center of these efforts of vertical integration and horizontal diversification is the coconut farmer. In addition, the copra-based industry should be phased out and replaced with technology that can effect the full value recovery of the coconut.

Achieving these measures will require coordination among several agencies of government, the private sector, the local communities, and the farmers. A number of coconut federations and industry groups have proposed that the Coco Levy Funds be used for the revitalization of the Coconut sector.

The shift away from copra towards integrated processing will enable full processing of the coconut and higher quality of product. However, this will require larger investments in processing centers which should be strategically located for cheaper transport of coconuts from the farm, as well as transport to downstream factories. The costs of transport and logistics have to be considered.

The Coconut Industry can be grouped into three major sub-sectors: cocochemicals, biofuels and food. Each sub-sector has its own needs and dynamics. Although the cocochemicals sub-sector shares some overlaps with the Biofuels sector, the external conditions which drive demand for cocochemicals and coconut biofuels are different. In particular, the demand for biofuels is driven by the Biofuels Act of 2006 which mandates the use of coconut methyl esters (CME).

The basic steps in the production process of cocochemicals include splitting (hydrolysis) of the coconut oil to yield the fatty acids and crude glycerine. The value-adding processes for fatty acids and methyl esters should be promoted to raise earnings from the coconut. (see Table 1)

Table 1. Value-adding processes for fatty acids and methyl esters and examples of chemical products.

PROCESS	PRODUCT OR APPLICATION
Fractionation	Partial separation into fatty acids or fatty methyl esters; C8 and C10 for MCT oil.
Distillation	Pure fatty acids or fatty methyl esters
Amidation	• Amides for use as non-ionic surfactant • Cocoamidopropyl betaine: special surfactant used for its foam property and solubility.
Hydrogenation	Fatty alcohols: chemical intermediates
Ethoxylation	Non-ionic surfactants, wetting agents, emulsifier, foam boosters, humectants
Sulfonation	Coconut fatty alcohol sulfate: biodegradable detergent
Saponification	Soaps
Amination	Cationic surfactants: shampoos, specialty soaps
Esterification	• Reaction with glycerol: medium chain triglycerides (MCT oil) for medical and nutritional use; monolaurin • Reaction with various alcohols: plasticizers
Quaternization	• Dispersants, corrosion inhibitors, cationic surfactants • Ester quats are a family of cationic compounds used in fabric softeners and hair conditioners.
Amidation and Sulfonation	Sodium methyl cocoyl taurate: an anionic surfactant used in specialty foaming face cleansing formulations.

Source: (Patiño, 2013; Lao, 2013).

One of the major byproducts from the splitting of coconut oil is glycerine which accounts for about 10 percent of the weight of coconut oil. New uses of glycerine must be developed.

The challenge now is how the Philippines can revive its cocochemical industry and make it globally competitive, and at the same time use it as a vehicle for inclusive growth. The strategy for the Philippine coconut industry must be comprehensive and must consider measures at various levels: the coconut farmer, the local level, the oil mills and processors, the cocochemical industry, government intervention and support, and S&T initiatives.

The Coconut Industry is probably the best opportunity for the current administration of President Benigno Aquino to attain inclusive growth that is sustained, that will massively create jobs and reduce poverty, and is globally competitive. No other administration has achieved these.

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AN INTEGRATIVE APPROACH FOR DEVELOPING OUR FLEXIBLE AND SUSTAINABLE MANUFACTURING INDUSTRY

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In many countries, manufacturing is seen to play a critical role in the economy. For example, statistics from the World Bank show that in China, value-adding manufacturing industry contributed an average of 31.67 percent of the GDP for the years 2008 to 2010. For the same time period, the average contribution of manufacturing industry to Malaysia's GDP was 24.67 percent. For Vietnam, where manufacturing GDP was seen to have striking growth specifically within the period 1994-2004; the average contribution of manufacturing to the GDP for the years 2008 to 2010 was 20 percent. Furthermore, for the Philippines, where in recent months analysts have said Japanese manufacturers are predicted to move to because of high-quality labor with lower cost and more stable growth compared to China or Vietnam (Olchondra, R. 2012), the average contribution of manufacturing to the GDP for years 2008 to 2010 was 21.67 percent. Just early in June 2013, it was reported that the growth of 7.8 percent GDP of the Philippines for the first quarter of 2013 was due largely to the growth of industry of 10.9 percent (Batungbakal, B. 2013). According to the National Statistical Coordination Board, manufacturing grew by 9.7 percent in the first quarter of 2013, an improvement to the 6 percent growth of the same quarter in 2012.

The figures above show the importance of manufacturing from the standpoint of economics, specifically as a contributor to the GDP. From the social science, science and engineering perspectives, various literatures have pointed out that the positive effect of manufacturing goes beyond the output and the employment that it creates. In addition to these direct results of manufacturing, there is an indirect impact specifically in terms of supporting the jobs in the other sectors (Ettlinger, M. and Gordon, K. 2011). As economists Stephen Cohen and John Zysman (1988) stated, the manufacturing sector does not just include the group of employees who work on

the factory floor. Instead, the manufacturing sector has "direct linkages" to high-level service jobs throughout the economy: product and process engineering, design, operations and maintenance, transportation, testing, and lab work, as well as, sector-specific payroll, accounting, and legal work. The importance of the manufacturing sector is, moreover, reflected in the finding of the Philippine Institute for Development Studies, that in the Philippines for 2009, the ratio of the productivity (i.e., real value added per worker) of the manufacturing sector was 2.5 times that of the service sector (Yap, J. 2012).

With the foregoing discussion on the importance of manufacturing from many perspectives, all with the aim of developing manufacturing for national progress and economic prosperity, the next question pertinent to explore is, "what will it take for a country to have a competitive and sustainable manufacturing industry?"

The main proposition of this research is to look at the manufacturing industry as analogue of managing its smaller counterparts of manufacturing organizations. Specifically, this research proposes:

1. To manage our country's manufacturing industry as a large chain of institutions and organizations that have the aim of providing products or component goods to the local and global market;
2. To structure the internal chain within the manufacturing industry such that the industry will possess the characteristic of flexibility to arrive at different products that will be demanded by the market at any time; and
3. To highlight that the manufacturing industry should be "self-supporting" which can be done if the profits or rewards of manufacturing at the different points of the supply chain can be re-invested for generating scientific and practical knowledge that will be the seed resource, i.e., raw material, for future manufacturing.

The composition of the institutions and organizations this research proposes is critical. This research primarily refers to the chain of institutions and organizations that will develop strategic capability of the manufacturing industry: the human resource (Prahalad, C. K.1983).

Managing the Manufacturing Industry as a Large Chain of Institutions

To manage this large chain, an analogue can be made with the Supply Chain Management (Houlihan, J. B. 1983) of business organizations. Just like the management of the supply chain of business organization, the manufacturing industry supply chain must have the following characteristics:

- A total supply chain: "In business, from purchased material to delivery to customer is treated as a single entity." The supply chain of the human resource from primary school to the secondary school to tertiary school then public and/or private training centers must be treated as a single entity. To have a competitive manufacturing industry, each point of this supply chain must work towards the common goal of producing human resource for the manufacturing industry. Each sub-entity, e.g., primary school, must add value to the human resource by making the human resource "ready" for the next sub-entity. All must contribute so that ultimately, the end product of the chain, i.e., after secondary education at least, the human resource is ready for the manufacturing industry. Furthermore, for each sub-entity to sufficiently contribute, it must be able to provide a "critical mass" of human resource that will be ready for the next sub-entity to process. This can be likened to the "critical level of inventory" to sustain production systems.
- The approach to direct and indirect logistics functions is to integrate them horizontally along the supply chain. The knowledge, i.e., both explicit and implicit (Shibazaki, Hiroshi and Steven H. Kim. 1989), to be learned at a sub-entity should build on the knowledge imparted by the previous sub-entity.
- Integrate vertically the three principal levels of management of logistics functions – the strategic, planning and operational levels. Long-term plans of the manufacturing industry must be established. Medium term plans and short-term activities must be in accordance with the longer-term plans.

The aforementioned common characteristics of good supply chain management are said to provide a good framework for balancing conflicting functional objectives in manufacturing supply chains, more so if information sharing is high among the sub-entities of the supply chain.

However, the analogy between managing the supply chain of the whole manufacturing industry with the supply chain of a single business entity is not simple. One may ask, "Which of our country's products' supply chains should we focus on?" This question actually goes back to "which products should we manufacture at this time?", for which proposals such as setting target products, e.g., nearby products (Usui, N. 2012), have been provided by other researchers.

Structuring the Chain to Possess Flexibility to Arrive at Different Products Demanded by the Global Market

The objective of this research is to provide a proposal for a sustainable manufacturing industry. Given the fast-changing local and global market, forecasting the kind of products that will be in demand in the future is a big challenge. Thus, instead of forecasting the products and producing those that will be predicted to have high demand, the proposal of this research is to develop a critical mass of human resource that will be deeply knowledgeable and skilled in basic manufacturing processes, including basic machine operation and machine maintenance, as well as the efficient use of energy that power the machines. This research recognizes that machines are resources that improve productivity in the manufacturing industry since the Industrial Revolution (Carlsson, B. 1984).

Basic or common industrial trade knowledge and skills must be developed early in education, i.e., primary, secondary, up to tertiary, and product-specific knowledge and skills must be given after that. This is analogous to the supply chain concept of postponement. In manufacturing management, the concept of postponement can reduce marketing cost, risk and uncertainty costs that are tied to the differentiation of goods. Differentiation can be postponed to the latest possible time, nearer to the time of purchase by the market. In the foregoing discussion of the supply chain for the manufacturing industry, perhaps if the human resource will be developed progressively from primary school, secondary school and the tertiary level education, to have the basic knowledge and skills pertaining to common manufacturing processes, common machine operation and maintenance (note: it will be ideal if knowledge and skills on how to make the machine will also be learned), then later the specific private or government organizations that will employ them can build on this deep but common knowledge and provide them the differentiated knowledge and skills specific to the products to be manufactured by the organization. Products can rapidly change and the dynamic nature of the market that we anticipate to characterize the future will pose a great challenge. However, the deep knowledge of the common manufacturing processes will provide flexibility to sufficiently deal with this challenge of dynamic market.

The Manufacturing Industry as Self-Supporting

The third proposal of this research is to provide mechanisms by which the industry can be self-supporting. This proposition is based on the

general business principle of reinvestment for growth. The manufacturing industry should plan for and pursue activities that do not just have making profit as objective but of reinvesting part of the profit or rewards of the industry to make the industry grow. Specifically, activities that can lead to reinvestments in making human resource knowledge and skills grow for the continued development of the manufacturing industry must be pursued. Plans should be iterative, i.e., beginning with the investment in primary education and ending in the growth of the industry per iteration. The growth of the industry, after each iteration, must feed again to a reinvestment in the primary education again with that iteration's objective of contributing to the growth of the industry. This will ensure that the growth of the industry will benefit not only the current human resource generation but also the future generations.

The aforementioned three points are the proposals of this research that advocates for an integrative approach for developing our flexible and sustainable manufacturing industry. Some case studies of countries that have the characteristics reflective of the proposals, can be cited to have manufacturing industries to have successfully contributed to their national development.

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HOW DO YOU ANALYZE THE MARKET FOR IMMEDIATE NEW PRODUCT SUCCESS?

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This paper presents survey research data and specific cases supporting the proposition that the ultimate source of immediate new product success is a function of two successive steps.

The first is the identification of unserved and underserved market segments. An unserved market segment consists of consumers who have not purchased, tried or used the product category where the new product belongs. On the other hand, the consumers making up an underserved market segment have purchased, tried or used the product category where the new product belongs but are inadequately satisfied with the experience. The paper then differentiates a new product into 3 types: a "breakthrough" product (one that is totally new to the market and the industry), a second generation product (one that is new to the industry but not the market), and a redeveloped product (one that is an improved existing product). The supporting data for this first step will come from my 3rd quarter, 2012 nationwide survey on "consumer coping behavior."

The second step follows the first and directs its analysis to uncovering the unserved need or needs of the identified unserved market segment whose satisfaction will propel the new product to an immediate market success. If the concern is with an identified underserved segment, then the analysis is to uncover the underserved need or needs whose satisfaction will lead to the new product's immediate success. Specific cases from my market research consulting experience will provide the necessary support for this step.

The paper ends with a set of specific prescriptions answering the question in the paper's title.

ARE OUR WORKPLACES SAFE AND HEALTHY?

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Department of Labor and Employment (DOLE)

Safety and Health of the Filipino workers has been a paramount policy of the Department of Labor and Employment. Upholding labor laws and occupational safety and health standards (OSHS) are non-negotiable instruments to ensure that workers rights and their welfare shall never be compromised by their work.

This paper reports on the current safety and health practices in establishments based on the results of the 2007/2010 BLES Integrated Survey (BITS). The BITS is conducted every two (2) years by the Bureau of Labor and Employment Statistics (BLES) in coordination with the DOLE Regional Offices. It aims to generate integrated data sets on employment of specific group of workers, occupational shortages and surpluses, safety and health practices, occupational injuries and diseases and labor cost of employees. It covers non-agricultural sample establishments employing 20 or more workers nationwide.

This presentation provides the latest statistics on accidents and illness in the major industrial sectors of the country. This also includes data on a key employment generator which employs more than 500,000 workers at present, the BPOs or Business Process Outsourcing establishments.

It may be worthwhile mentioning that injuries and accidents decreased in the latest 2010 BITS survey. Occupational accidents in 2009 reached 36,455, lower by 18.6% than the 44,800 accidents in 2007. Similarly, occupational injuries that resulted from these workplace accidents declined by 15.0%, from 46,570 to 39,587. The highest share in occupational injuries in 2009 was observed in manufacturing industry (59.5% or 23,548), lower than the 66.1% or 30,790 recorded in 2007.

In the documentation of occupational diseases of the 2009/2010 BITS, *occupational disease* is defined as an abnormal condition or disorder other than one resulting from an occupational injury caused by exposure over a period of time to risk factors associated with work activity such as contact with certain chemicals, inhaling coal dust, carrying out repetitive

movements, etc. In 2009, a total of 71,894 cases of occupational diseases were reported in non-agricultural establishments employing 20 or more workers. Manufacturing industry accounted for the biggest share of occupational diseases at 47.4%. Far second was real estate, renting and business activities which posted 9.9% of the total cases of occupational diseases.

The data from the business process outsourcing in the Philippines covered a total of 481 establishments with 20 or more workers as of June 30, 2010 – the bulk were engaged in computer-related activities (267) and call-center activities (180). There were 157 cases of occupational injuries reported in the business process outsourcing (BPO) industry in 2009. Dislocations, sprains and strains accounted for almost two-thirds (69.4%) of cases of occupational injuries in the BPO industry. Peptic ulcer was the most common case of occupational disease among workers in this industry wherein one out of every four workers (24.8%) suffered from this disease. Essential hypertension came second at 18.6% of the total cases.

Statistics will continue to guide policy-makers and the government in looking at effectiveness of programs or, if deficient, creation of policies to address the need for additional safety and health measures. The data generated from this survey provides a useful guide in strengthening government's efforts towards the achievement of OSH objectives.

EXECUTIVE SUMMARIES OF TECHNICAL PAPERS

STATUS OF THE CROCODILE (*Crocodylus porosus*, Schneider) INDUSTRY IN THE PHILIPPINES

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All 23 species of crocodiles in the world inhabit a restricted range of wetland habitat in rivers, lakes, marshes, mangrove swamps, and estuaries in tropical and subtropical regions of the world. Crocodilians are considered "keystone species" as they play an important ecological role in aquatic environments; they are involved in nutrient cycling and, because of their large biomass, they produce large amounts of nutrients which have been hypothesized to result in increased fishery production in wetland ecosystems. Loss of any crocodilian species in an area is expected to cause a significant loss of biodiversity and ecosystem stability that translates to economic loss.

In the Philippines, there are two species of crocodiles known to exist: the Indo-Pacific Crocodile or Estuarine Crocodile (*Crocodylus porosus*) and the endemic Philippine Crocodile (*Crocodylus mindorensis*). These species used to be widespread throughout the country but are now restricted in distribution mainly because of agricultural activities. Both species are included in the list of threatened species of the International Union for the Conservation of Nature (IUCN) and both are categorized as Appendix 1 of the Conservation on International Trade of Endangered Species of Wild Fauna and Flora (CITES) based on their present conservation status. The IUCN and the CITES ensure that utilization and international trade of crocodilian species do not threaten their survival in the future.

Legal Framework

The crocodile farming industry in the Philippines is strictly regulated by CITES for the use of *Crocodylus porosus* in closed-cycle breeding upon production of second or F2 generation, making commercial international trade of their product less regulated. With the establishment of the Department of Environment and Natural Resources (DENR) RP-Japan Crocodile Farming Institute (CFI), Palawan in 1988 (renamed "Palawan

Wildlife Rescue and Conservation Center, PWRCC), a farming technology of crocodiles in the Philippines was developed. This technology has been transferred to Philippine private entities which passed through a stringent screening process.

Thus, in 1999, the DENR issued the Department Administrative Order (DAO) 99-45 or the Rules and Regulation on the SALE AND FARMING OF SALTWATER CROCODILE. This legal framework defined the stringent selection process for choosing competent private poultry and piggery farms that would utilize their original Crocodylus porosus founder stock from the Philippine government CITES registered facility for the leather industry and direct trade for animals produced in commercial farms.

Inception of crocodile farming

In 2000, six (6) commercial farms out of nearly 80 applicants successfully passed the evaluation process conducted by the Philippine government. These six farms pioneered this non-traditional industry and participated in commercial crocodile farming to develop local capability on Saltwater Crocodile farming. This was the birth of the crocodile industry in the Philippines. There were three farms in Luzon and three farms in Mindanao.

Crocodile farmers or "Cooperators" (DAO 99-45), obtained young crocodiles from the government for grow-out until commercially available size. After 2-3 years of try out rearing, the skin quality was judged substandard by the international industry due to inappropriate rearing facility for producing quality, Class "A" skins. The "Cooperators" had no choice but to retain the stocks and convert to close system breeding in order to utilize rapidly maturing crocodiles. They became "accidental" crocodile breeding farms.

Industry development and economic contribution

In order to strengthen ties between crocodile breeding farms, the Crocodylus Porosus Philippines Inc. (CPPI), a coalition of the six (6) legitimate crocodile farms, was created. In coordination with the Philippine Government, CPPI pioneered the crocodile skin industry in the Philippines. CPPI likewise aims for conservation through sustainable use and management or value-driven conservation of the two crocodile species in the Philippines. Commercial farms were developed by integrating large scale supply of culled layer, grower chickens and unwanted mortalities

from piggeries and poultry operations as crocodile feeds, converting operational loss into cash commodity and ensuring non-competition with humans for food consumption.

After eight years of high capital expenditures on infrastructure development and painstaking husbandry consultation to resolve farm issues and some capital errors, CPPI farms have obtained the most current and "State of the Art" technology. CPPI has significantly advanced the local crocodile farming industry to the extent of bringing in new technology and research outcomes on farm designs, innovations on husbandry practices, provisions of slaughterhouses, CITES recognition, introduction of meat products, and the near perfection of leather industry, bringing it closer to the achievement of international standards for crocodile farming and conservation.

To date, CPPI associated farms have approximately 25,000 crocodiles housed in a variety of facilities depending on their needs. Crocodile breeding cycle consists of four stages: breeding, incubation and hatching, nursery, and two phases of grow-out for skin production.

Commercial utilization of Crocodylus porosus for the production of valuable skins is the primary product of the industry. Of secondary importance is the introduction of crocodile meat as protein source for humans. Philippines crocodile farms started its contribution to the world crocodilian trade in 2008. With this small developing industry of six registered farms, two of which have processing facilities, there were about 4,000 C. porosus skins that have been exported from 2008-2012 for the leather industry. At present, frozen and processed meat products are slowly contributing to the local economy, an average of almost a ton of meat per month, equivalent to 45 percent of annual meat productions are consumed for domestic use. Other by-products (such as crocodile oil and blood) are being developed for pharmaceutical purposes. It is projected that a total of 10,000 *C. porosus* salted raw skins will be exported by CPPI associated farms in the next five years.

Support for conservation

Crocodile Farming Industry in the Philippines is not mainly geared towards generating income for individual farms. CPPI is also working towards the conservation of two species of crocodile in the wild, focusing primarily in three priority sites in Mindanao: (1) Siargao Island Protected Landscape and Seascape in which 36 *juvenile Crocodylus mindorensis*

have been released back to natural habitat; (2) Agusan Marsh Wildlife Sanctuary where it aims to provide a long-term management plan that will address issues on human-crocodile coexistence; and (3) Ligawasan Marsh Game Refuge & Wildlife Sanctuary where it targets further research and the development of a conservation action plan to uphold the possible increase in the population of both species. With these efforts, CPPI recognizes that the commercial crocodile industry in the Philippines has a responsibility to the Filipino people and its future generations to help conserve these two species of crocodiles in their natural habitat.

Finally, it is recommended that the government support CPPI's attempt to access more competitive technology for skin production, increase social acceptability of crocodile meat as alternative protein source, support for the development of by-products for therapeutic use, provide the legal framework and necessary documentation for the sale of products. An increase in government support for conservation research would provide direct benefits to the Filipino people through community-based ecotourism as source of livelihoods for local communities. The increase in the wild population of crocodiles would also increase the productivity of wetlands, thus benefiting those fishing villages with crocodiles in the wild.

This highly regulated industry can be a model for commercial and conservation partnership.

STRATEGIC SOURCING OPTIONS TOWARDS ENSURING RAW MATERIAL SUPPLY FOR THE PHILIPPINE FOOD MANUFACTURING SECTOR

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Food manufacturing is the biggest component of the Philippine manufacturing sector accounting for 8 percent of the GDP and 45 percent of the total manufacturing sector's share. Although growing at an increasing rate of 12.2 percent as compared to the 9.7 percent growth of the total manufacturing in the first quarter of 2013, the food manufacturing sector is challenged with several issues relating to food safety standards, quality control, costs and more importantly raw material sourcing.

Raw Materials in the Food Manufacturing Sector

Raw materials are essential or integral components of industrial production. This is an important component of any growth strategy of a company (Tajani, 2012).

Unstable agricultural production, coupled with volatile prices of raw materials have potential detrimental effects on the operations of Philippine food manufacturing companies as they will not be able to produce finished products and meet customer demands in a timely manner.

The Philippine food manufacturing sector is beset with issues related to raw material sourcing. On the production side, the agricultural raw material base is underdeveloped which leads food manufacturing companies to rely on raw material importation (Palabyab, 2013). It is because of this low agricultural base that raw material sourcing is considered as the Achilles heel of the Philippine manufacturing sector (Dy, 2013).

There is an increasing pressure on the Philippine food manufacturing sector to secure good quality raw material supply due to tightening competition and increasing costs of sourcing. In addition to these, the drive towards environment protection and health push manufacturing companies to use ecologically safe raw materials and supplies and to strengthen ties with raw material suppliers for better raw material quality control.

Raw Material Sourcing Practices of the Food Manufacturing Sector

Contract farming has been one of the successful models adopted by the food processing industry. This is practised in the different sectors of food manufacturing such as meat, vegetables, and fruits. Contract buying or contract marketing is also one of the ways by which raw materials are sourced and is adopted by food manufacturers and fresh food exporters. Also, a common strategy to ensure raw materials by food manufacturing companies is contracting preferred suppliers and agents from different parts of the country (local multiple sourcing). There are also companies that have their own farms (intra-sourcing) to supply their raw material needs. However, many food processing enterprises are relying heavily on the importation not only of their major raw materials but also key ingredients and condiments in food processing. In any of the above cases, the food industry's sourcing depends to a great extent on the specification of raw materials required by their end customers.

Raw Material Sourcing Issues in the Philippines

The Philippine food manufacturing sector is beset with issues related to raw material sourcing. The weakness of the production sector as indicated by its lack of capability to produce the volume, price, time and quality requirements downstream prompts the food manufacturing industry to fill up the gap through importation of raw materials.

Trade or importation of raw materials is inevitable especially in cases when the processed products are for export. Importing countries are very strict in terms of what goes into the manufacturing process. The food manufacturing sector requires manufacturing grades of raw materials while many of the farmers produce table grades of agricultural produce.

Basic trade theory suggests that importation of goods, both intermediate and final, is mainly driven by their lower price relative to locally produced equivalent. This is evident in the case of the Philippine food manufacturing industry which significantly contributes to its continued dependence on imported raw materials. The lack of competitiveness of local raw materials, depicted by the higher price, can be explained by the low agricultural productivity and high production costs, inadequate and outdated post-harvest and storage facilities, lack of basic infrastructures, long and multi-layered logistics chain, and the failure to capture economies of scale especially by small-scale farms. However, equally important are other factors that force local food manufacturers to source out from other countries

such as (1) unavailability of local raw materials (wheat and some varieties of fruits, nuts and vegetables), (2) limited local production capacity to supply the necessary volume to manufacturing firms (milk, pork, beef, coffee and processed potatoes), and (3) inability of local suppliers to comply with particular specifications and needs of processing firms (tomato paste and sugar derivatives). Also, MNCs typically acquire food ingredients from established local and foreign partners to maintain control over price and quality.

Strategic Options and Directions

Strategic sourcing of raw materials should be embedded in the companies' overall strategy and should not only be considered as part of everyday operations.

The current sourcing strategies such as contract growing and contract buying are still viable for food manufacturing companies and although there are associated problems, these strategies are more likely to be practiced in the long-run.

The trend is towards sustainable sourcing which may also be considered as an important part of the corporate social responsibility (CSR) of food manufacturing organizations. For a long-time, CSR programs of food manufacturing companies focused mostly on the customers and not on the suppliers or producers of raw materials. There is an opportunity to include farmers or producers in their CSR activities as sustainable farm production would also translate to sustainable raw material supply and subsequent long-term profitability of the food industry while at the same time heeding the call for environmental consciousness. This move will also result in the inclusion of farmers in the overall growth of the economy as they take more active roles in the global food supply chain. Fair trade in-sourcing has been adopted by some foreign companies. A number of companies operating in the Philippines have already adopted this strategy by having farmers or producers as partners in their food manufacturing operation and buying from them as fair trade producers.

The challenges in the country's food manufacturing industry seem to point on the need for greater investments in the agriculture sector. Factors that drive up the price of local raw materials show lack of investments in increasing productivity and traceability, enhancing farm diversification and improving agricultural facilities and infrastructure necessary to cater for the specific needs of the different food manufacturing sectors. Development

in this area would also generate the capacity to attain the quality and volume that the food manufacturing industry requires to reduce dependence on imported raw materials. Ensuring the availability of raw material supplies can partly shield domestic food manufacturers from uncertainty of foreign exchange fluctuations and global market shocks.

Government Imperatives

More research and development efforts towards increased production and quality produce as a way of strengthening the agricultural production base should be implemented by concerned government institutions. The food manufacturing sector requires not only regular supply of specified volume of raw materials but also those that meet their quality and time specifications. More technologies in producing higher quality farm produce should be given attention.

The government should also hasten and enhance GAP certification efforts to produce quality products and meet food safety requirements. The country has been lagging behind its neighbors in GAP certification. Thailand, Malaysia and Vietnam have certified thousands of their farms while the number of farms certified in the Philippines has not even reached 20. While many of the food manufacturing companies have already been GMP certified, efforts have to be intensified in GAP certification to support GMPs in food manufacturing. A prerequisite in reversing the decline in the food manufacturing sector is to ensure growth in the production sector to increase the agriculture base.

Finally, all these efforts must be integrated in a master plan amidst a global supply chain framework. Beyond the government's drive towards looking at and addressing commodity-specific problems relative to raw material supply in a fragmented manner or merely focusing on a few crops, strides must be made in terms of rationalizing the country's farm resources to meet the demands of the downstream players in the food manufacturing industry. The government should recognize and address raw material supply issues in the context of supply chain network problems and not just as problems of one supply chain sector.

LANTHANIDE-BASED DIAGNOSTIC MEDICAL CONTRAST AGENT DEVELOPMENT

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The early diagnosis of disease is important for effective therapy. Lanthanide-based medical contrast agents have found widespread application in both in vivo diagnostic imaging and in-vitro biochemical assays. For instance, several Gd3+-based complexes, proven to be stable and non-toxic in vivo, have received FDA approval and are routinely used in the clinic for Magnetic Resonance Imaging (MRI) of the blood pool in order to detect vascular occlusion and other physiological phenomena associated with vascular disease. The strong, unparalleled paramagnetic character of the Gd3+ ion makes it ideal for the generation of MRI images with enhanced contrast, permitting the visualization of circulatory vasculature up to millimetre resolution. On the other hand, lanthanides such as Eu3+, Tb3+ and Yb3+ have been found to exhibit strong photon emission lines of red, green and near infrared, respectively, which are long-lived, ranging from micro- to millisecond lifetimes, in comparison with conventional organic fluorophores which exhibit broad emission lines with only nanosecond lifetimes. Hence, emissive lanthanide complexes are quickly gaining application in in-vitro assays for the detection of biochemical analytes associated with particular disease states, such as the over-expression of transmembrane receptors characteristic of particular cancers.

As a young faculty member of the UP Diliman Institute of Chemistry, I am currently establishing a laboratory whose primary activities are directed towards lanthanide-based contrast agent development. Current projects include:

1. The development and optimization of simple colorimetric assays for the detection of free lanthanide ions in solution. Lanthanide ions are small, hard cations which, when present in plasma, may substitute endogenous ions in their natural physiological roles, such as in signal transduction cascades or in structural roles (ex. bone). In lanthanide-based contrast agent development, simple colorimetric assays involving classical uv-vis

absorption spectroscopy are useful in monitoring the successful formation of stable complexes.

2. Ligand synthesis, structure elucidation, thermodynamic and kinetic stability studies. Macrocyclic ligands have been found to form more stable lanthanide complexes than acyclic ligands due to the rigidity of the resulting complex. We have synthesized a variety of macrocyclic ligands based on a cyclen backbone, elucidated their structures using 1-D and 2-D 1H/13C NMR techniques, used them to form complexes with different lanthanide ions, and employed the colorimetric assays described above to determine thermodynamic and kinetic complex stability under a variety of experimental conditions.

3. Synthesis of lanthanide-labelled neuroactive bacterial peptides as potential optical probes in neurophysiology. Recently, a family of bacterial peptides isolated as secondary metabolites from mollusc-associated symbiotic bacteria were found to inhibit the action of capsaicin on neuroreceptors implicated in the sensation of heat and pain. We have successfully undertaken the total synthesis of the most active of these peptides, and labelled it with lanthanides towards the development of a targeted molecule probe which will permit the direct optical visualization of the peptide-neuroreceptor binding event.

4. Synthesis of macromolecular MRI contrast agents with enhanced water solubility. Enhanced MRI contrast is achieved by increasing the molecular weight of the contrast agent, thereby increasing its rotational correlation time in plasma. To this effect, we are investigating the use of a polyamidoamine (PAMAM) dendrimer co-labeled with polyethylene glycol (PEG) as a platform for the synthesis of a multi-metallic Gd3+-based MRI contrast agent which will potentially exhibit even further MR contrast enhancement, in addition to improved pharmacokinetic properties.

CARBON DIOXIDE CAPTURE: THERMOPHYSICAL PROPERTIES AND PROCESS DESIGN (The Taiwan Experience)

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In general, the paper talks about, carbon dioxide capture research and in particular, the involvement of thermophysical properties characterization and process design simulation as the major areas to explore in this research area. The presenter used his personal research experience in Taiwan in discussing the various components of his talk.

Initially, the reasons why carbon dioxide needs to be captured both as an economic and moral issue will be discussed. Here, the story of Ex-Vice President Al Gore of USA and the Intergovernmental Panel on Climate Change (IPCC) efforts on disseminating information on global warming, which also qualified them as winners of Nobel Peace Prize in 2007 will be highlighted. With the background being set, the discussion of greenhouse gas emissions will follow with emphasis on carbon dioxide concentrations and the observed effects on a global scale. At this point, the concentration values of carbon dioxide discharge per country and per person will be compared and the top ten will be specified. Also, the predicted specific effect of global warming to Taiwan will be discussed briefly. Then, the overall carbon dioxide emissions reduction plans from short term to long term plans with specific applications to Taiwan will be discussed. The comparison of feasible process for carbon dioxide reduction is followed by concluding which of the available technologies is most likely to be applied and appreciated in the next years to come. Here, the absorption process is still the most feasible process to employ. The next part of the discussion will talk about the details of the absorption process and how the two main parameters (key components) will affect the research area of carbon dioxide capture. The key components of the absorption process are (1) the selection of absorbent and (2) the design of the absorption process. In the assessment of the best possible solvent systems for carbon dioxide capture, the presenter will discuss the guiding principles and try to compare the existing solvent systems against the alternatives. For the absorption process design, the

rationale and the overall design framework will be discussed. The important properties needed for the absorption design will be mentioned along with the possible equipment for their measurements. The talk will also feature the research components of a thermodynamics research laboratory in relation to carbon dioxide capture research. Lastly, some sample research works on property characterization and correlation development will be shown.

STEM CELL THERAPY IN THE PHILIPPINES: A CHANGING LANDSCAPE

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The Department of Health recently released guidelines on Stem Cell and Cell-based Therapy known as the Administrative Order 2013-0012, Rules and Regulations Governing the Accreditation of Health Facilities Engaging in Human Stem Cell and Cell-based or Cellular Therapies in the Philippines. This was motivated by the massive proliferation of clinics or laboratories taking advantage of vulnerable uninitiated patients. If unabated, this unregulated procedure may harm people and impact on the development of stem cell technology. Basic queries that will guide a prospective stem cell patient will be presented. To date, there are four hospitals that are recognized by the Department of Health. These hospitals are Makati Medical Center, The Medical City, National Kidney and Transplant Institute and the Lung Center of the Philippines. This communication will focus on the current laboratory safety and monitoring practices done at the Cellular Therapeutics Laboratory of Makati Medical Center. The Cellular Therapeutics Laboratory is classified as ISO 14644-1 clean room ISO 5 class facility. The presentation will also feature laboratory standards such as autologous Cell Transplant release criteria and critical quality control tests. The future of Stem Cell Therapy will be profoundly influenced by the clinicians, scientists, regulatory offices, media and society who are in a position to distinguish the difference between science and fiction. Patients who are left with limited clinical options are often entangled; wading through the investigative and controversial scientific breakthroughs is a tight walk.

ERRATA

Although we endeavored to make the **2012 NAST Transactions, Volume 34, Issue No. 1 - ABSTRACTS of PAPERS Presented during the 34th NAST Annual Scientific Meeting** with the theme *"Philippine Water 2050"*; 11-12 July 2012 as error free as possible, corrections/mistakes were still found. These were:

Page Correction

109 BS-71 - the corrected title is given below together with the original abstract:

STRUCTURAL AND ULTRASTRUCTURAL CHARACTERISTICS OF THE TESTES OF THE INVASIVE SUCKERMOUTH SAILFIN CATFISH *Pterygoplichthys* spp. Gill 1858 (SILURIFORMES:LORICARIIDAE) FROM THE MARIKINA RIVER SYSTEM, PHILIPPINES

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The structural and ultrastructural features of the testes of the highly invasive suckermouth sailfin catfish *Pterygoplichthys* spp. Gill 1858, rapidly proliferating in Marikina River, Philippines were characterized during the fish's annual reproductive season. Transmission electron micrographs show that the germinal compartment of the testes was composed of anastomosing tubules with cysts undergoing synchronous development. Spermatogenic cells were along the length of the testes indicate it to be of the unrestricted spermatogonial type. The spermatozoon is classified as type 1 ect aquasperm devoid of acrosome, has rounded nucleus, and a long flagellum—characteristics necessary for external fertilization. Male *Pterygoplichthys* was reproductively active during half of the year-long study with peak spawning during the rainy months (June to August), and has overlapping regression and recrudescence during the cold months (December to January), and prolonged recrudescence during the dry months (February to May). This is the first study to describe in detail the testicular characteristics and the dynamics of the male reproductive seasonality of this invasive species.

Keywords: loricariidae; janitor fish; reproductive biology; Marikina River

Page Correction

148 HS-02 - the title and corrected text of the abstract should be:

ASSESSMENT OF DISTAL GUT MICROBIAL DIVERSITY AMONG FILIPINO CHILDREN OF DIFFERENT NUTRITIONAL STATUS THROUGH THE rRNA GENE

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One of the millennium development goals (MDGs) is to reduce child mortality and this can be addressed by good health and nutrition programs. However, recent studies suggest that host genetics and gut microflora also affect nutritional status. Since malnutrition cannot be addressed solely by dietary interventions, it remains a perennial concern in our country and worldwide. To contribute in understanding the role of the gut microflora in malnutrition, this study determined the distal gut (colon) microbial diversity of nourished and malnourished Filipino children. The distal gut microbial profile of 2-11 year-old nourished and malnourished children was obtained through PCR and denaturing gradient gel electrophoresis (DGGE) of the ribosomal RNA gene (rDNA) of bacteria and archaea (16S rDNA) and eukarya (18S rDNA). The microbial profile was analyzed using Sorensen's index of similarity and the microbial community members separated by DGGE were identified through rDNA sequencing and phylogenetic analysis. There is high diversity in the microbial profile of nourished, moderately malnourished and severely malnourished children, which means that different microorganisms characterize different nutritional states. In terms of gut bacterial diversity, members of Phylum Bacteroidetes dominate, while Firmicutes phylotypes decrease, in the malnourished groups. In archaea and micro-eukaryae, there is greater diversity in the moderately malnourished group but this declines in the severely malnourished group due to the decrease in Euryarchaeota and Methanobacteria phylotypes, as well as micro-eukaryal enteropathogens, in severe malnutrition. These findings suggest potential microbial biomarkers that can characterize a nutritional state, as well as key players in terms of food metabolism and immune functions in different nutritional states. Moreover, these findings open up new directions in studying gut microbial community dynamics in different nutritional states.

Keywords: malnutrition, rDNA, DGGE, bacteria, archaea, micro-eukarya

This abstract was inadvertently omitted in the **2012 NAST Transactions, Volume 34, Issue No. 1 - ABSTRACTS of PAPERS Presented during the 34th Annual Scientific Meeting**

BS-73

dsRNA-MEDIATED RNA INTERFERENCE (RNAi) TO ELUCIDATE INTERACTION OF WHITE SPOT SYNDROME VIRUS (WSSV) WITH A WSSV HOMOLOG FOUND IN *Macrobrachium rosenbergii*

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The participation of White Spot Syndrome Virus (WSSV) in the high mortality rate of commercial shrimps had been extensively studied. WSSV contains a large circular double-stranded DNA (~300 kb) and encodes 181 open reading frames (ORFs); such ORFs are the subject of several studies conducted regarding the interaction of the virus to its host, usually crustaceans. However, the attempt to identify which genes in the shrimp's genome are directly involved in the interaction with WSSV infectivity is still unknown. This study focused on contig23 (c23), which was recognized to be a WSSV homolog. Utilizing dsRNA-mediated RNAi, the study examined if c23 is involved in the infectivity of WSSV in *Macrobrachium rosenbergii*. Three set-ups were prepared, two served as the controls and an experimental, each set-up consisted of twenty-two shrimps. Ten shrimps were used for the survival data while twelve shrimps were utilized for gene expression. Injection of synthesized dsRNAs (c23 and GFP), followed by WSSV challenge, showed delayed and reduced shrimp mortality in contrast with PBS-treated shrimp which showed high mortality. One hundred (100%) survival rate was observed in dsRNA-treated shrimps while PBS-treated shrimps showed only 20%. The difference between the set-ups: PBS vs. GFP-dsRNA and PBS vs. c23-dsRNA are statistically significant based on paired t-test, $p < 0.05$, except for GFP-dsRNA vs. c23-dsRNA which did not show significant difference. Three shrimps were collected on day 0, 1, 3 and 10 post-challenge for gene expression analysis using RT-PCR. Gene expression analysis showed silencing of both WSSV and c23 day 3 post-WSSV challenge. Therefore, this study showed that c23-dsRNA has a protective effect on WSSV challenged shrimps and highlights its involvement in the infectivity of WSSV in *M. rosenbergii*.

Keywords: RNAi, WSSV, homologs, dsRNA, shrimps

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BS-74

DETERMINATION OF THE GENOTOXIC EFFECTS OF *Jatropha curcas* Linn. SEED EXTRACTS USING THE STANDARD *Allium* TEST

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Tracts of land have been converted to *Jatropha* plantations in many parts of the country. The dwindling enthusiasm and apparent non-sustainability of the program created an oversupply of *Jatropha* biomass and wastage of investment. This study presents an evaluation of the biological activity of *Jatropha* seed extracts for possible alternative applications. *J. curcas* seed extracts were obtained using CO_2 supercritical fluid extraction (SFE) at 200 and 300 *atm* (atmosphere). Extracts were tested for cytotoxicity and genotoxicity at various concentrations using standard *Allium* Test, one of the methods of choice in drug screening. Mitotic Index (MI) and chromosomal aberrations were used as indicators of bioactivity. ANOVA and Scheffe Test were employed in data analysis. Significant reduction in MI was exhibited by the seed extracts obtained at two pressures, in a concentration-dependent fashion, indicating anti-mitotic activity. Chromosomal aberrations observed were concentration-dependent except in the 10^{-5}M concentration where there was no significant difference compared to control. No significant differences were observed between the extracts obtained at 200 and at 300 *atm* showing that both have similar potency. Once the significantly reduced MI in the *Allium* Test is corroborated by animal model studies and other parallel bioassays, the specific active component can then be further characterized as candidate for drug development.

Keywords: *Jatropha curcas*, genotoxicity, anti-mitotic, *Allium* Test, SFE