

Impact of Technology Transfer to the Growth and Development of Agriculture Sector in the Philippines

Marites S. Balhon¹ and Anna Liza F. Bonagua²

Background

Agriculture plays an important role in developing countries. In Philippines, agriculture is a major contributor to our economy, as it accounts for significant portion of Gross National Product – of about 22%. Agriculture provides income and livelihood to millions of farmers and fisherfolks as well as their dependents. It employs about 50 percent (50%) of the labor force, furthermore, majority of the people are in the rural agriculture sector (see Table 1). Agriculture also enables traders, retailers, processors and other groups to directly and indirectly make a living from the sector.

Majority of the poor families are in the rural areas and dependent on agriculture and agriculture-related industries for employment, livelihood and income. As such, agricultural productivity must be pursued by introducing a comprehensive development program which would impact on the socio-economic conditions of this rural poor.

To meet this challenge, the Philippines takes its banner program for agricultural development – the “Ginintuang Masaganang Ani”³ – “High Value Commercial Crops (HVCC)”. This is a transitional blueprint to operationalize *the Agriculture and Fisheries Modernization Act of 1997 (AFMA) or Republic Act 8435*.

AFMA focuses on achieving food security and poverty alleviation through modernized agricultural and diversified rural economy that is technologically advanced and globally competitive. It is envisioned that as agriculture modernized, safeguards will also have to put in place to ensure that intensified production activities do not undermine the integrity of the environment.

1 Local Government Operations Officer IV

2 Local Government Operations Officer V, (Program Manager)

E-mail: annabonagua@hotmail.com

3 Translated as golden harvest which means bountiful harvest and productivity

Agriculture and Rural Development – Status and Trends

For the past decade, the productivity and competitiveness of agriculture and fisheries sector in the Philippines generally has not improved both in broad and specific indicators in productivity. In many studies, it is shown that labor productivity has been sluggish and only is exhibiting an annual average of 0.56% from 1993-1999 (see Table 2).

In rice yields, there is an inadequate rice production and output continued to be low relative to national requirement (see Table 3). Coconut productivity is as well lagging compared to most Asian countries and remained relatively stagnant during the last decade.

Fisheries sector continue to show declining productivity as highlighted by the 1.8 % decline in freshwater aquaculture yield from 1989-1991 as shown in Table 4.

Because of this insufficiency of food supply, Philippines turn from net exporter to net importer in food and agriculture in the world market as early as 1994 particularly as major export commodities such as coconut, banana and pineapple has declined. (see Table 5).

Rural Development in the Philippines has not been broad-based whatever progress it must have attained to date. In many studies, done, rural poor have continuously increased even with the growth of agriculture Gross Value Added (GVA) has been on average (Table 6). Sad to say that for the past decades, rural welfare has not improved significantly in the country. Poverty continues to be a rural phenomenon with the rural sector accounting for three out of five poor Filipino families and majority of them are dependent on agriculture and agriculture-related industries for employment and income (Balisacan, 2003).

Relative to this condition, it has become imperative for the Philippine Government to introduce innovations and reforms in the agriculture sector in order to meet the requirements of productivity necessary to spur development in the rural areas, and impact on the lives of the rural poor.

Transforming the Agriculture and Fisheries Sector

To revitalize the situation experience by the country, the Philippines must create a modernized and socially equitably agriculture and fisheries sector. Crucial to the transformation is bringing new appropriate technologies that could overcome the agricultural productivity constraint to eventually provide an engine of growth required for the national economy.

According to Timmer (1998), only a dynamic, rapidly growing agriculture can generate the sustained surpluses necessary to drive the economic transformation. Whilst, it must be noted that not all countries that went on or are successful agricultural revolutions became industrialized and grow rapidly. This maybe because, as agricultural growth is necessary during the early stages of transformation it is but not sufficient to promote industrialization. For the country like the Philippines, one of the late-blooming countries, agricultural growth is important in supporting broad-based economic transformation.

The passing of *Republic Act 8435* otherwise known as the “**Agriculture and Fisheries Modernization Act (AFMA)**” paved the way for the transformation necessary. *AFMA* espouses policies that promote environment-friendly technologies and sustainable farming practices that conserve natural resources.

AFMA introduces key strategies that are required to support the perceived growth such as:

1. **Reforms** and reorientation in the provision of public production and marketing services.
2. **Human Resource Development** – Strengthening of the agriculture and fisheries education sector that offers high quality education.
3. **Research and development** – Rationalize and accessible research and development system on agriculture.
4. **Extension** – Integration and strengthening extension system built on strong partnership among the government agencies, local governments, private sector and civil society.
5. **Rural non-farm employment** – policies and programs to employ rural workers efficiently and promote rural industrialization.
6. **Trade and fiscal incentives** – exemption of all agriculture and fisheries enterprises from tariffs and duties in the importation of certain inputs.
7. **Budgetary appropriation provision** – providing for the needed steady stream of public investment support to agriculture and fisheries modernization.

It is the overall goal of *AFMA* to attain security and competitive self-sufficiency in food to enhance the country’s capability in producing most of its food requirement and protecting them from the vagaries and uncertainties of the world market, which is plague by decreasing food supply. Increasing incomes and profits of the farmers and fisherfolks also is an implicit goal of the *AFMA*.

To carry out the plan of modernizing the Agriculture and Fisheries sector towards meeting the goal of improving the lives of farmers and fisherfolks as well address the problem of poverty, the “Ginintuang Masaganang Ani” – “High Value Commercial Crops (HVCC)” was introduced. HVCC is seen to provide alternative profitable opportunities to smallholders and lend well to value adding activities, marketing agreements and joint ventures with users or processors. This program likewise, provides the national direction and framework for harmonizing local initiatives.

Introducing GMA – High Value Commercial Crop

The “Ginintuang Masaganang Ani (GMA)” – High Value Commercial Crops program adopts a major shift towards market-oriented production systems by introducing the Commodity Producers Linkages with Users Scheme (Commodity-PLUS) as the basic reference in addressing the gaps in the commodity marketing systems. The implementation of the program requires the availability of market information and consumer trends, transfer of technology and information, proper channels to adequately ensure that information and technology reach the users.

The cross cutting effects of policy, legislation, institutional linkages and technology and markets defines the critical importance of creating an environment for market linkages to occur profitably.

- a. Agribusiness System Participants – The consumer is the ultimate end user and the producer is the point of origin of food products. Program activities include understanding consumer trends, commodity flows and characteristics, marketing systems and practices to ensure the acceptance and unimpeded delivery of farmers produce to consumers. Knowing the buyers’ specifications and price will guide producers on what production adjustments to be done.
- b. Commodity-PLUS – identifying and matching with users or buyers require information about both parties to ensure that negotiations will take place.
- c. Commodity Action Team – a core of specialists in different fields must be able to understand the commodity system and about industry trends to determine the critical gaps to be addressed. This will cover market intelligence and technology packaging to address the users requirements, and, provision of necessary support services for the parties to engage in commercial operations under appropriate business relationship.

Implementation strategies

GMA-HVCC requires the identification and matching with users and buyers requires information major program strategies include the nationwide development and promotion of high quality planting materials, development of harmonized product standards, cold chain systems and other appropriate modern post-harvest technology.

- a. Market Driven – based production system for high value crops that are technologically cost efficient and competitive in local and export markets.
- b. Commercial Testing and Technology – demos of integrated systems are established primarily for agro-based oriented enterprises, post harvest and processing technologies which later can be transferred to private sector or cooperatives under various privatization modalities.
- c. Home Consumption Led Strategies – promotion of strategies that would enhance indigenous, nutritious crops that require minimal technology, labor and inputs. This is to improve the nutritional adequacy of Filipinos particularly those most vulnerable and nutritionally at risk due to poverty.

Implementation Components – Role of Technology Transfer

Agricultural and rural development is the key to poverty reduction and food security. This necessitates for a comprehensive strategy which require policy changes, public expenditure programs and the establishment or strengthening of national and local institutions which were facilitated by presence of appropriate technology.

1. Policy reform, market development and promotion

Leveling the playing field provides opportunities for new entrants to the industries as well as diversification into other industries or agribusiness functions in both forward and backward linkages. Competition is expected to drive industry players to find the best investment areas and is cost efficient and quality-oriented in view of a more stringent market requirements.

2. Human resource development and capacity development

A technology-driven growth in agriculture is possible only when the rural populace has the tools and skills necessary for modernization. Furthermore, investment in education has reinforcing effects in poverty through health, nutrition and higher productivity.

Extension systems provide venues for human development and generate externalities to the sector. These could be achieved through the dissemination of new technologies

coming out of the research and development activities. Demonstration farms as prescribed under *AFMA* have been used to integrate the research and extension processes.

3. Infrastructure support

Increased public investment in rural infrastructure accompanied by reforms on land transport, inter-shipping and tele-communications, will bring down production and marketing cost. Opening of the Roll-On-Roll-Off (RORO) transport system enables the farmers and producers to directly bring their produce to the consumers.

Private sector investment in post harvest, processing, bulk handling and cold chain facilities are encouraged through a sound policy environment supported by technical and financial packages and other appropriate incentives.

4. Investment and financing

Under this component, the program focuses investment and financial packages that are referenced on commodity requirements and market specifications. Investment analysis and profitability levels as well as commodity market information and technology will be made available to lending institutions. Private sector resources will be matched with government resources on a cost-sharing scheme for developmental activities.

The government will provide public goods and services, guarantee and insurance to loans and extend loan grants to private sector supporting the HVCC program.

On the other hand, the private sector provide land, labor and capital and management skills for agribusiness enterprises.

5. Technology development, training, extension and communication support

This component focuses on the acquisition and/or development and promotion of mature and appropriate technologies for pre-production to production, post-harvest handling and marketing to include processing.

The delivery of extension services now devolved to LGUs, it decentralizes decisions on matters pertaining to technology dissemination and, identification of appropriate development projects. With localized decision making, needs of the community are better identified, thus, appropriate technologies, and projects, have better chances of being adopted.

6. Program advocacy, information networking and dissemination

A continuing advocacy and consultation with industry players is an integral part of the program.

The establishment of the Open Academy for Philippine Agriculture (OPAPA) is a major stride in promoting agriculture on a scale never seen before in the country. The agriculture knowledge generators, learning centers, and agricultural training institutes can now converge and link up with any network backbone to provide on-line information services, knowledge databases, diagnostic tools and interactive forum.

Through this network, individuals and organizations can collaborate in an open environment where technicians and farmers can seamlessly draw knowledge and information services related to agriculture, using PC or cell phone. This shall give options, a basket of technologies, information that shall empower farmers to make better decisions, increase their productivity and livelihood. "This is a victory for the farmers, especially rice farmers whom the program initially supports, diversifying into rice-based systems, livestock, and other small holder systems (Dar, 2003)."

7. Institutional linkages and stakeholders participation

To attain and achieve food sufficiency and make the *AFMA* work, it is important that stakeholders participate totally in the program.

Issues on technology and information exchange can fall on the ambit of government and government-private cooperation.

Local Government Units, being in the forefront of rural development in a decentralized system of government, lead in developing local plans and programs that are suitable to their peculiar localities. Other stakeholders in the community are also encourage to participate in this undertaking to further define the priority areas where balanced agro-industrial enterprises which gives opportunities for backward-forward and vertical-horizontal integration can be harnessed.

Non-government organizations have been quite effective in community organizing and capability building for rural communities.

Conclusion – What happens then?

The shift to appropriate technology-based, labor employing, value added-driven agriculture and fisheries is hopeful to create a modernized and socially equitable agriculture and fisheries sector. The present administration does not accept the increasing poverty and inequality as the necessary cost and results of development. Therefore, the most vulnerable comprising that of the rural poor must be sheltered from the pains of adjustments and effects of macro-economic policies.

It is targeted that agricultural crops sub-sector is expected to grow annually by an average from 2.4 to 3.6 %. Traditional crops such as rice, corn, coconut, and sugarcane will show moderate growth and that the growth in crops sub-sector will be led by high value and export crops (tropical fruits and vegetables) are expected to register average growth rates from 3.4 to 5.7 %.

In the overall, the transformation of the agriculture and fisheries sector through the introduction of High Value Commercial Crops under the “Ginintuang Masaganang Ani” Program of the present administration is something that has yet to be seen in the coming years. Whether the Philippines have introduced the appropriate technology to spur rural development is left for the Filipinos to see in the coming months. Cororaton (PIDS, 2002) may argue that the country may find it hard to attain a productivity-based sustainable growth through technological innovation-based strategy due to the low investment in research and development.

It must however be understood that sustainable agricultural technologies are generally concerned with the need for agricultural practices that are economically viable and enable the rural people to meet their needs for food. Thereby, these should be environmentally sound and concerned with quality of life. Therefore, since these can be achieved in various ways, it is argued that sustainable agricultural development may not necessarily be linked with any particular technological practices. Rather, the technologies necessary for agriculture-based economies have to be adaptable and flexible over time to respond to the demands for food and fiber, demands for the efficient use of natural resources for production and be able to protect the soil and the resources (Sustainable Agriculture and Rural Development Concept). The perceived gains and improvement in labor productivity, as shown in Table 2, may have been due to technological innovations, and policy reforms and strategies adopted by the *AFMA*.

The Ginintuang Masaganang Ani (GMA) program under the *Agriculture and Fisheries Modernization Act (AFMA)* of 1997 is hoped to eventually meet the challenge for the Philippines to find an appropriate mix of policies and institutions necessary to exploit the benefits of globalization while taking stock and ever watchful of its downside risk.

THE AGRICULTURE AND FISHERIES MODERNIZATION ACT OF 1997

The Agriculture and Fisheries Modernization Act (AFMA) of 1997 is a comprehensive legislation that provides for the country’s blueprint for the sector’s modernization and rural development. It defines the necessary policy environment and deliberate public investment stream that will transform the rural economy into one that is modern, science and

technology-based, more integrated into the national and antinational markets, and thus highly productive and competitive. *AFMA's* major provisions include:

1. Reforms and reorientation in the provision of public production and marketing services.
 - Focus and concentration of public investments on identified Strategic Agriculture and Fisheries Development Zones (SAFDZs), which are defined geographical areas of competitiveness and comparative advantage based on biophysical and socioeconomic endowments;
 - Crafting and execution of medium- and long-term Agriculture and Fisheries Modernization Plans (AFMPs), in full consultation with all stakedolders and based on the SAFDZs;
 - Phase-out and consolidation of directed credit into the Agro-industry Modernization Credit and Financing Program (AMCFP);
 - Specific principles and guidelines for irrigation and watershed development, providing for economic cost recovery, and the devolution of communal systems to LGUs, promotion of private sector-led development of minor systems;
 - Establishment of the National Marketing Assistance Program (NMAP) and National Information Network (NIN);
 - DA-DPWH-LGU coordination in the formulation and implementation of the Agriculture and Fisheries Infrastructure Plan; and
 - Product standardization and consumer safety, through the establishment of the Bureau of Agriculture and Fisheries Products Standards (BAFPS).
2. Human resource development. Rationalized and strengthened National Agriculture and Fisheries Education System (NAFES) the offers high quality agriculture and fisheries education at all levels.
3. Research and development. A dynamic, client-responsive, rationalized National Research and Development System in Agriculture and Fisheries (NARDSAF) under the coordination of the Department of Agriculture.
4. Extension. Integrated, strengthened and rationalized system of National Extension System in Agriculture and Fisheries (NESAF) built on strong partnership among the NGAs, LGUS, civil society and the private sector that is fully responsive the needs of the fishing and farming communities.
5. Rural nonfarm employment. Policies and programs designed to employ workers efficiently in the rural areas through a basic needs approach, promotion of rural industrialization.
6. Trade and fiscal incentives. Exemption of all agriculture and fisheries enterprises from tariffs and duties in the importation of specific types of inputs.

7. Budgetary appropriation provisions. Provides for an initial year P20 billion funding for AFMA and P17 billion annually for the next 6 years. For period 2001-2004, an annual budget of P20 billion will be allocated to implement AFMA, providing for the needed steady stream of public investment support to agriculture and fisheries modernization, as follows:

- Irrigation P6 billion
- Capability building P1 billion
- Post-harvest facilities P2 billion
- NAFES P1 billion
- Credit and financing P2 billion
- NIN P800 million
- Other infrastructure P2 billion
- Rural nonfarm
- R&D P2 billion employment training P350 million
- Marketing assistance P1.6 billion
- Identification of SAFDZs P50 million
- Salary supplement of extension workers P1.2 billion

Table 1. Total labor force and employment in agriculture, 1981-2000 (level in millions)

Year	Total labor force	Total employed		Level	Employed in agriculture		G.R. (% share)
		Level	% to labor force		Growth rate (%)	% to total employment	
1981	18.2	16.7	91.3	8.5	-0.6	51.1	-4.7
1982	18.5	16.7	90.6	8.7	2.8	51.9	1.5
1983	20.1	18.5	92.1	9.1	4.6	51.3	-1.2
1984	20.8	18.6	89.4	9.3	1.9	50.8	-1.9
1985	21.3	19	88.9	8.6	-7.3	47.5	-6.5
1986	22.1	19.6	88.9	9.9	15.3	52.7	11
1987	22.9	20.8	90.9	9.6	-3.2	48	-9
1988	23.5	21.5	91.7	10	3.7	47	-2
1989	23.9	21.9	91.6	9.9	-0.7	45.2	-3.9
1990	24.5	22.5	91.9	10.4	4.8	46.7	3.4
1991	25.3	23	91	10.3	-0.9	44.9	-3.9
1992	26.2	23.9	91.4	10.7	4.2	45.3	0.8
1993	26.8	24.4	91.1	11.1	3.9	45.7	0.9
1994	27.5	25.2	91.6	11.3	1.3	45.1	-1.3
1995	28	25.7	91.7	11.1	-1.2	43.4	-3.7
1996	29.6	27.4	92.6	11.6	4.5	42.8	-1.3
1997	30.3	27.9	92.2	11.3	-2.8	40.8	-4.7
1998	31.3	28.3	90.4	10.9	-3.4	39.2	-4
1999	32	29	90.6	11.6	6.3	40.1	2.4
2000 a/	31.1	27.5	88.3	10.2	-5.5	38.1	-5

a/ Based on 1995 Census-based population projections; previous series were based on 1980 Census-based population projections

Source: NSCB

Table 2. Labor productivity indicators, 1993-1999 (growth in percent)

Indicator	1993	1994	1995	1996	1997	1998	1999	1993-1999 Average
Real labor productivity	-0.8	1.7	2.1	0	3.2	-1.2	-0.7	0.6
Agriculture	-1.7	1.3	2.1	-0.6	6	-3.4	0.2	0.6
Industry	2.2	1.9	1.8	-0.6	1.6	-0.9	1.6	1.1
Services	-0.7	0.4	-1	-0.5	-0.4	-1.7	0.5	-0.5

Sources: NSCB and National Statistics Office (NSO)

Table 3. Rice production and use, Philippines, 1978-2000

Year	Beginning stocks ('000MT)	Production ('000 MT)	Imports ('000 MT)	Exports ('000 MT)	Total supply (a) ('000 MT)	Total usage (b) ('000 MT)	Ending stocks (a-b) ('000 MT)	Per capita (Kg/Year)	Production-usage gap ('000 MT)
1978	1,308	4,615	0	48	5,875	4,281	1,594	83.2	334
1979	1,594	4,957	0	166	6,385	4,500	1,885	85.2	457
1980	1,885	4,970	0	263	6,592	4,945	1,647	92.2	25
1981	1,647	5,142	0	95	6,694	5,082	1,612	92.5	60
1982	1,611	5,417	0	1	7,027	5,161	1,866	91.5	256
1983	1,866	4,756	0	40	6,582	5,091	1,491	89.0	-335
1984	1,491	5,120	190	2	6,799	5,652	1,147	96.8	-532
1985	1,147	5,759	538	0	7,444	5,689	1,755	94.3	70
1986	1,755	6,047	2	0	7,804	5,787	2,017	93.3	260
1987	2,017	5,585	0	111	7,491	5,916	1,575	94.0	-331
1988	1,575	5,867	181	0	7,623	6,106	1,517	94.7	-239
1989	1,517	6,186	220	16	7,907	6,218	1,689	93.9	-32
1990	1,689	6,095	593	0	8,377	6,478	1,899	97.2	-383
1991	1,899	6,326	0	10	8,215	6,098	2,117	88.5	228
1992	2,117	5,970	0	35	8,052	6,361	1,691	91.2	-391
1993	1,691	6,132	202	0	8,025	6,584	1,441	92.3	-452
1994	1,441	6,850	0	0	8,291	6,792	1,499	91.5	58
1995	1,499	6,851	263	0	8,613	7,191	1,422	94.3	-340
1996	1,422	7,334	862	0	9,618	7,821	1,797	99.9	-487
1997	1,797	7,325	722	0	9,844	7,868	1,976	97.8	-543
1998	1,976	5,560	2,171	0	9,707	7,423	2,284	91.7	-1,863
1999	2,284	7,662	834	0	10,780	8,425	2,355	99.1	-763
2000	2,355	8,053	617	0	11,025	8,837	2,188	103	-784

Source: BAS

Table 4. Freshwater fish production, Philippines and selected Asian countries, average for 1989-1991 and 1996-1998 (in metric tons)

Country	Average production		Rank	Average production	
	1989-91			1996-98	Rank
Thailand	228,982		3	476,194	1
Japan	394,875		1	464,852	2
Viet Nam	227,922		4	414,833	3
Philippines	373,291		2	302,977	4
Myanmar	154,318		5	242,288	5
Malaysia	24,281		8	52,109	6
Korea, Rep.of	47,970		6	42,451	7
Laos	28,333		7	40,083	8

Source: FAO

Table 5. Philippine merchandise trade profile, 1992-2000 (US \$ million)

Year	Exports			Imports			Trade Balance	
	Agri Products	Total	% Share	Agri Products	Total	% Share	Agri Products	Total
1992	1,854	9,826	18.9	1,560	14,522	10.7	294	-4,696
1993	1,918	11,378	16.9	1,626	17,600	9.2	292	-6,222
1994	2,072	13,483	15.4	2,114	21,333	9.9	-42	-7,850
1995	2,499	17,447	14.3	2,649	26,538	10	-150	-9,090
1996	2,307	20,543	11.2	3,096	32,427	9.6	-789	-11,884
1997	2,338	25,216	9.3	3,102	35,942	8.6	-764	-10,726
1998	2,225	27,878	8	2,895	38,853	7.5	-670	-10,975
1999	1,760	35,032	5	2,878	30,742	9.4	-1,118	4,290
2000*	1,906	38,078	5	2,386	31,386	7.6	-481	6,692

* Preliminary estimate

Source: NSO

REFERENCES

1. Agriculture Thematic Reminders – Agriculture in Household Economy.
2. Balisacan, Arsenio. 2003. – A paper presented during the Training Workshop on Deepening Poverty Analysis and Development of Policy Responses for Poverty Reduction.
3. Cororaton, Caesar B. 2002. – Research and Development and Technology in the Philippines Philippine Institute of Development Studies, Publication – Technological Innovations In Japan and S&T Experienced in Philippines: Drawing Policy Lessons for the Philippines Philippine Institute of Development Studies, Publication.
4. “Ginintuang Masanang Ani” Program – Department of Agriculture, Philippines (web site: [//www.da.gov.ph](http://www.da.gov.ph)).
5. National Economic Development Authority – Medium Term Philippine Development Plan 2001-2004 – Chapter 7 and 8 (Web site: [//www.neda.gov.ph](http://www.neda.gov.ph)).
6. Republic Act 8435 – Agriculture and Fisheries Modernization Act (AFMA).
7. Transforming the Rural Asian Economy “Importance of Agriculture in Promoting Transformation”.