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EMERGING SWINE PRODUCTION TECHNOLOGIES TO KEEP PACE WITH INCREASING POPULATION

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Abstract

This paper presents some analyses and recommendations on how the swine subsector, as it continues to dominate the livestock sector and hence make up a significant proportion of the agricultural landscape, can become a logical and potent springboard in addressing the demographic crisis in the country. It also provides a framework showing the vital link between population, poverty and food security, with the contention that unless poverty is significantly reduced, the goal to attain food security remains a distant reality. This paper further presents a comprehensive discussion and vital recommendations on the role of emerging swine production technologies in meeting the protein requirements of the present and future generations of Filipinos, as well as in providing livelihood opportunities to empower the poor and the disadvantaged sector of the society.

Swine is the largest source of meat in the country's livestock industry, constituting about three-quarters of Philippine livestock production. Together with the poultry subsector, swine dominates the Philippine livestock sector in terms of volume, value of production, and contribution to the animal protein diet of the Filipino people. During the last 10 years, R&D programs and initiatives were able to generate scientific and technological breakthroughs, which have significantly contributed to the improvement of swine production in the country. These include, among others, genetic and reproduction improvement through artificial insemination (AI), nutrition and feeding management, and animal health care. However, much still needs to be done to maximize the potential of these technologies, particularly for the backyard raisers.

With a projected population of 111 million by year 2025, the swine industry in the next 22 years must triple its pork production (2.8 million MT by 2025) to meet the projected demand (2.3 million MT by 2025). The ultimate task

ahead is for all industry players to be able to encourage and empower hog farmers and farmer organizations to attain increased productivity and production efficiency, improved product quality, and reduced production cost toward an efficient, viable, and sustainable swine industry. The interventions required from the industry players include: policy interventions; R&D/S&T interventions; technology/information delivery services; and market and input support services.

Key words: livestock, swine production

Introduction

In the year 2020, structural shifts in world agriculture are expected to pose enormous impact on the developing countries' demand for animal food products. Dubbed as the "livestock revolution," this demand will come from changes in the diets of billions of people worldwide, which in turn is expected to provide income growth opportunities for the rural poor and the disadvantaged sectors.

Securing the country's domestic food needs amid this "livestock revolution" and faced with the rigor of global competition brought about by a liberalized trade regime, remains one of the biggest challenges in Philippine agriculture – a challenge that we in the livestock sector must proactively respond to.

Scientific and technological advancements toward increased productivity and global competitiveness of the livestock sector are vital to cope with the expected structural shifts in animal production and consumption. With the country's rapid demographic changes and rising poverty incidence particularly in the rural areas, we must seek to provide our marginal farmers with technology options to enable them to make better decisions on how to increase the quality and quantity of their produce, and at the same time attain a more decent livelihood.

The role of the animal industry in national development now becomes even more crucial. In recent years, the significant gains that the Philippine livestock and poultry sub-sectors have posted are responsible for the positive growth of the whole agriculture sector. To sustain these gains, the Philippine government and the livestock industry must be ready with long-term policies and investments to satisfy consumer demand, improve people's nutrition, and direct income growth to those most in need.

Our scientific and technological initiatives must denote preferential option for the poor, focused on revitalizing the livestock industry to address various challenges and concerns such as poverty alleviation and social equity, food security, rational use of resources, global competitiveness, sustainable development, people empowerment, and protection from unfair competition.

The conditions necessary for the nation to attain broad-based, poverty reducing agri-industrial development in view of emerging global and domestic chal-

lenges are increasingly being understood. Faced with a rapid population growth, poverty and hunger need to be eradicated, and scientific and technological advancement has to be achieved to enable Philippine agriculture, particularly the livestock sector, to fuel the nation's economy and ensure the social well-being of all Filipinos.

This paper presents some analyses and recommendations on how the swine subsector, as it continues to dominate the livestock sector and hence make up a significant proportion of the agricultural landscape, can become a logical and potent springboard in addressing the demographic crisis in the country. This paper also provides a framework showing the vital link between population, poverty and food security, with the contention that unless poverty is significantly reduced, the goal to attain food security remains a distant reality.

Most importantly, this paper presents a comprehensive discussion and vital recommendations on the role of emerging swine production technologies in meeting the food requirements of the present and future generations of Filipinos, as well as in providing livelihood opportunities to empower the poor and the disadvantaged sector of the society.

Population and Poverty

The relationship between demographic changes and poverty is an old issue that has gained currency and is once again at the center stage of national development concerns. However, despite the fact that poverty alleviation has been the centerpiece program of past and present administrations, gains in this aspect has been modest. Uneven economic growth performance could be one of the reasons, but demographic factors also play an important role in terms of poverty alleviation and economic growth.

The Philippine population has almost quadrupled in 52 years, rising from 19.2 million in 1948 to a staggering 76.3 million in 2000 (Orbeta, 2002). The growth rate was about 3% in the 1960s slowing down to 2.3% in 1990-2000. This growth rate is very high compared with that of our ASEAN neighbors. Thailand and Indonesia, for instance, have reduced their growth rates to 1.4 and 1.6%, respectively. Hence, in comparison to Thailand that almost had the same population size in 1965, the country now has about 14 million more people in 2000.

Surely, no one can doubt that this unrelenting increase in population represents the greatest single threat to the stability of our environment, the security of our food supplies, and the peace and prosperity of the nation. Yet population growth in this country is projected to rise overwhelmingly in the next 25 years (Table 1) (NSO, 2002), unless measures are taken to stabilize it.

There is a vital link between population and the different dimensions of development, one of which is poverty. The description of this link is described in the Population and Sustainable Development Framework (PSDF) presented in the 2001-2004 Philippine Population Management Program Directional Plan (Figure 1) (Orbeta, 2002).

Table 1. Projected population growth, 2000-2025

Year	Population	Increase	%
2000	76,320,126	-	-
2005	84,214,747	7,894,621	10.34
2010	91,851,256	7,636,509	9.07
2015	99,007,576	7,156,320	7.79
2020	105,503,141	6,495,565	6.66
2025	111,472,586	5,969,445	5.66

Source: National Statistics Office (NSO), 2002.

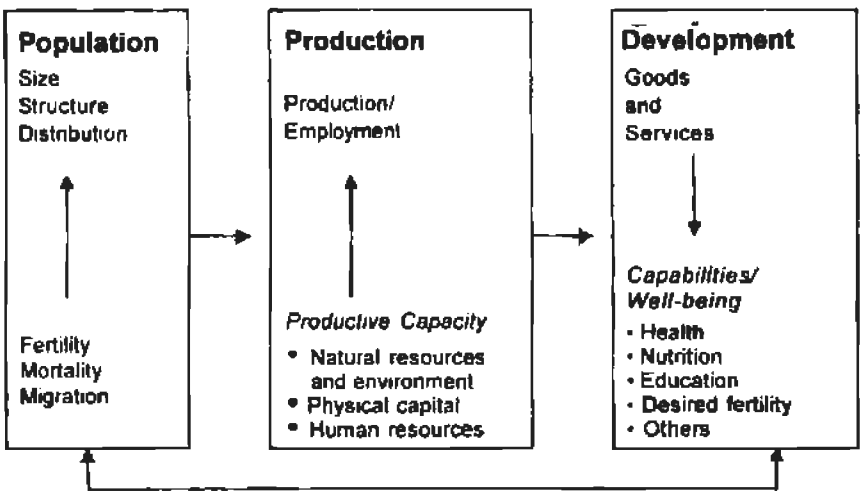

Figure 1. Population and sustainable development framework.

Essentially, the framework shows that demographic processes (fertility, mortality, and migration) and outcomes (size, structure, and distribution) affect productive capacities (natural resources and environment, physical capital, human resources) and outcomes (goods and services provision and consumption), which are translated into measures of well-being (health, nutrition, education, desired fertility, etc.). This framework illustrates that the dimensions of the

population issue are part of the demographic factors that should be incorporated in the process of demographic transmission and the analysis of the dynamics of population – resources – sustainable development.

One of the most pressing, if not the most important issue confronting us today in the analysis of the dynamics of population – resources – sustainable development, is food security. Since the food problem is already critical today, will the nation's 84 million people in year 2005 be adequately fed?

Poverty and Food Security

The World Food Summit (WFS) declaration of 1996 reaffirmed "the right of everyone to have access to safe and nutritious food, consistent with the right to adequate food and the fundamental right of everyone to be free from hunger." In that Summit almost seven years ago, heads of state and government gathered to pledge their political will and their common and national commitment to achieve food security for all and to eradicate hunger in all countries.

It is intolerable that more than 800 million people throughout the world, particularly in the developing countries, do not have enough food to meet their basic nutritional requirements (FAO, 1996). Optimistic forecasts see this number declining to some 700 million ten years from now, but this offers scant relief to the one out of eight persons in the world's poorest countries who will remain chronically hungry.

Poverty is a major cause of food insecurity, and sustainable progress in poverty eradication is critical to improve access to food. According to the Food and Agriculture Organization (FAO), "food security is becoming less a problem of global supplies, overall stability, and global stock levels as such, but more a problem of inadequate access to food supplies for vulnerable groups resulting from lack of purchasing power" (Montemayor, 2001).

Here in the Philippines, the imagery of food insecurity may not be an attack on the senses, but it clearly resonates in the levels of poverty and vulnerability that continue to exist especially in the rural areas (Lara, 1999). Poverty incidence in the country or the proportion of families with per capita incomes below the poverty threshold was placed at 28.1 percent in 1997 and 28.4% in 2000 (NSCB, 2000). This means that in 2000, 4.3 million families or 26.5 million Filipinos, more than one-third of the country's population were living below the poverty line, or a poverty incidence of 34%. These figures indicate an increase over the 1997 levels of 4.0 million families or 24.0 million Filipinos striving to make ends meet.

The annual per capita threshold or the amount required to satisfy food and non-food basic needs reached ₱11,605 in 2000, an 18% increase over the 1997 threshold of ₱9,843. Thus, a family of five members should have a monthly income of ₱4,835 to meet their food and non-food basic needs.

In the urban areas, poverty incidence stood still at 15.0% 1997 and 2000.

However, in the rural areas where people are mostly dependent on agricultural activities for their livelihood, poverty worsened by 1.5 percentage point from 39.9 to 41.4%.

Considering the vital link between poverty and food security, the threat that 34% of the country's population could be suffering from chronic hunger is very alarming. The task at hand is for every sector of the society -- public and private alike – to spare no effort in ensuring decent livelihood for the 26.5 million Filipino poor, particularly those who live in the rural areas, and a renewed hope of food accessible, available and affordable to all.

We have seen in the past how modern agricultural technology has somehow multiplied food production and eased the burden of hunger worldwide. However, the last two decades also showed that there is a growing imbalance between food and people.

Here in the Philippines, the challenge is enormous. With a projected 10.34% growth in population in year 2005 (Table 1), two considerations must be met -- we have to triple our food production and at the same time ensure that resources are more equitably distributed.

The Impact of Agriculture

A World Bank study that explored the interactions between population and agriculture concluded that "population growth is unlikely to come down unless agriculture, and the economies dependent on it, grow more vigorously. Agricultural growth will be increasingly constrained by rapid population growth" (Tribe, 1994).

This link between population growth and agriculture is increasingly being emphasized in the developing world. Most people in poor countries live in the rural areas and their best, and often only, prospect of livelihood and a regular income lies in agriculture-related activities.

The importance of the role of agricultural development in relation to national economic progress is hard to overemphasize. Because the change from subsistence farming to commercial smallholder agriculture increases rural employment, income, and level of nutrition, it inevitably helps to provide the social and economic conditions in which individuals prefer to limit the size of their families (Tribe, 1994). Agricultural development, it has been said, is the engine, which drives economic progress in the developing world.

The Swine Industry Performance

The Philippines achieved a sound economic and policy outcome in 2002 under difficult circumstances, with an annual GDP growth rate of 4.5% (NSCB, 2002). Reducing poverty was reinforced as a national priority in the 2001-2004 Medium-Term Philippine Development Plan (MTPDP).

The prospects for poverty reduction depend critically on the attainment of the MTPDP's targeted real economic growth of 5.0% per year, on a sustained basis, combined with complementary programs to improve equity. Without the needed resources for targeted poverty-focused programs, inequality will increase, and poverty levels will continue to rise.

To extend the opportunities of the new economy to the rural countryside, a modernized and socially equitable agriculture sector must be in place. Crucial to agricultural modernization is the attainment of stability of productivity growth, and with the sector accounting for half of the population and two-thirds of the poor, broadening the base of rural development MTPDP (2001-2004).

In 2002, agriculture posted a 3.69% growth, with the gross value of agricultural production estimated at ₱617.9 billion at current prices, representing a 7.38% increase over the past year. The livestock sector produced 14.35% of the total agricultural output. The uptrend in livestock production was sustained, with a 4.39% increase in output in 2002. Livestock grossed ₱110.8 billion at current prices, up by 4.21%. Hog production was 5.25% higher in 2002, as evidenced by the increase in the number of stocks of fatteners and the number of animals slaughtered in abattoir (BAS, 2002).

The focus of this paper is swine, the largest source of meat in the country's livestock industry, constituting about three-quarters of Philippine livestock production. As it continues to dominate the livestock sector and hence, make up a significant proportion of the agricultural landscape, the swine subsector becomes a logical and potent springboard in addressing the demographic crisis in the country.

Together with the poultry subsector, swine dominates the Philippine livestock sector in terms of volume, value of production, and contribution to the animal protein diet of the Filipino people (Faylon, 2002). Compared with poultry, however, the swine industry is more organized and provides business opportunities not only to medium and commercial corporations, but also to smallholder farmers or backyard producers in the rural areas where a significantly large proportion of hog population is raised.

Swine Population

Backyard farms have the largest share (about 77%) of hog inventory in 2002; the rest (23%) came from commercial farms (Table 2). In 2002, the Philippines recorded a population of 12.69 million heads where about 9.72 million were raised by smallholder or backyard raisers.

Table 2. Backyard and commercial farm hog inventory, 1990-2002

Year	Backyard	Commercial	Total
1990	6,775,770	1,224,220	7,999,990
1991	6,620,864	1,458,477	8,079,341
1992	6,717,185	1,304,712	8,021,897
1993	6,663,229	1,290,441	7,953,670
1994	6,766,064	1,460,465	8,226,529
1995	7,181,340	1,759,860	8,941,200
1996	7,238,980	1,786,970	9,025,950
1997	7,788,170	1,964,010	9,752,180
1998	8,030,580	2,179,890	10,210,470
1999	8,179,130	2,217,870	10,397,000
2000	8,327,290	2,385,630	10,712,920
2001	8,541,800	2,521,340	11,063,140
2002	9,718,590	2,974,290	12,692,880

Source: Bureau of Agricultural Statistics (BAS), 2002

In 2002, hog farms are concentrated in Southern Tagalog (16%), Central Luzon (15%), Western Visayas (8%), Southern Mindanao (7%), and Central Visayas (6%) (Figure 2). For backyard farms, Western Visayas ranked first, followed by Central Luzon. Many commercial farms, on the other hand, are located in Central Luzon and Southern Tagalog (Appendix Table 1). The location of farms in or near large human population concentration is common (DA and NAFC, 2002).

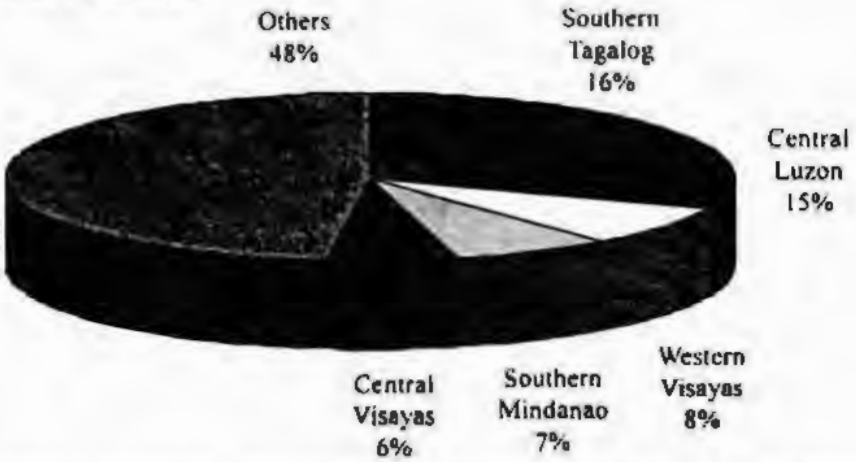

Figure 2. Total hog inventory by region, 2002 (12.6 M Heads) (DA and NAFC, 2002)

Figures 3 and 4, clearly show the positive growth rates in hog population both in backyard and commercial farms and consequently in the overall total population. Even during difficult economic times, hog raising is still the most popular livelihood among rural household, regarded as a family's source of savings and/or immediate cash to pay for important financial obligations (Faylon, 2002).

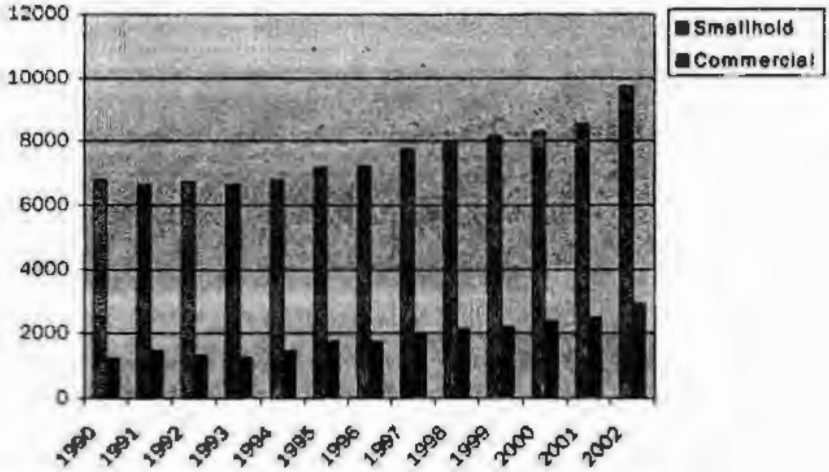

Figure 3. Swine population by farm size, 1990-2002 ('000 hd).
Source: BAS 2002

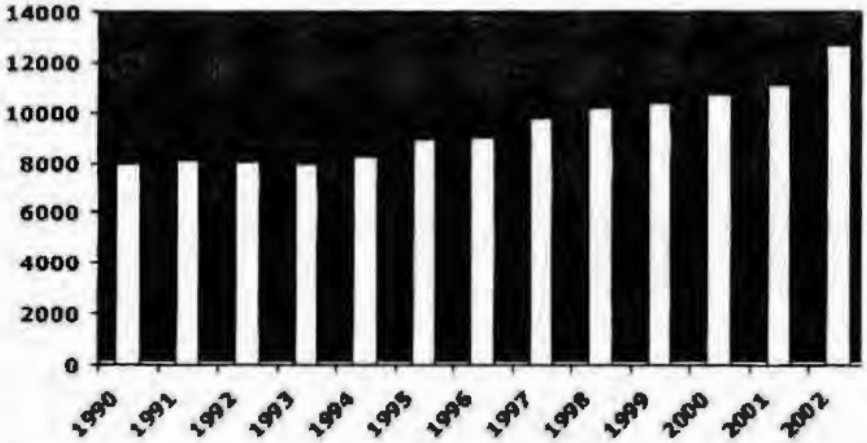

Figure 4. Swine population, 1990-2002.
Source: BAS, 2003

Supply and Demand

Volume and Value of Production. During the last decade, the volume of pork produced by the hog industry continued to increase positively in response to the animal population growth. In 2002, 1.6 million metric tons of pork was produced at a current price of P86.72 million (Table 3). The value of production at current and constant prices is shown in Figure 5.

Total Supply of Pork. Table 4 shows the gross supply of pork in 2001 out of local production and imports (1.28 million metric tons). A very dramatic increase in pork imports was recorded starting 1999 amounting to 31,651 metric tons. Practically the MAV allocations were used in 1999 and 2000, with the volume imported in 2000 shown to increase further compared with the previous year. However, pork import declined considerably in 2001.

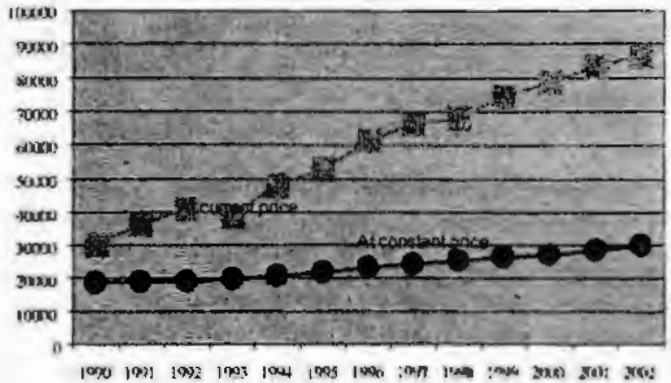

Figure 5. Value of production, 1990-2002 (million pesos).
Source: BAS, 2003

Table 3. Swine: volume and value of production, 1990-2002

Year	Volume ('000 MT)	Value (in million pesos) At Constant Price	At Current Price
1990	1,031	18,570	30,480
1991	1,057	19,035	36,242
1992	1,057	19,036	40,916
1993	1,102	19,838	38,961
1994	1,153	20,760	47,998
1995	1,213	21,848	52,964
1996	1,296	23,349	61,530
1997	1,358	24,454	66,273
1998	1,406	25,333	68,206
1999	1,467	26,415	74,727
2000	1,518	27,335	78,682
2001	1,584	28,537	83,393
2002	1,668	30,036	86,723

Source: BAS, 2002

Per Capita Consumption of Pork. The per capita consumption of pork is continuously increasing (Table 4), and considering the increase in population, the demand for pork is on the upward trend. Eleven years ago, the per capita consumption for pork was 13.26 kg, however, in 2001, it rose 16.33 kg or an average increase of 283 grams (1.95% annual growth rate) per year (Figure 6). While Filipinos are basically pork eaters, the Philippines' pork consumption is still way below that of our neighboring countries, i.e., Thailand and Taiwan.

Table 4. Pork: supply and utilization accounts, 1990-2001 (in '000 MT)

Year	Production	Imports	Gross Supply	Carcass Total	Per capita (kg/yr)	Offals Total	Per Capita (kg/yr)
1990	824,545	1,177	825,772	677,031	11.01	138,432	2.25
1991	845,189	741	845,930	693,303	11.03	142,177	2.26
1992	845,256	793	846,050	693,613	10.79	142,286	2.21
1993	880,945	418	881,363	722,490	11.04	148,280	2.27
1994	921,761	695	922,456	756,185	11.02	155,210	2.26
1995	969,862	2,183	972,046	796,390	11.65	163,995	2.40
1996	1,035,808	6,073	1,041,881	853,763	12.21	175,689	2.51
1997	1,085,544	10,369	1,095,914	897,304	12.54	185,581	2.59
1998	1,123,748	12,593	1,136,341	928,427	12.69	194,428	2.66
1999	1,171,759	31,651	1,203,409	979,095	13.10	210,253	2.81
2000	1,212,536	41,338	1,253,874	1,010,202	13.35	220,121	2.88
2001	1,265,887	22,022	1,287,909	1,047,991	13.45	224,728	2.88

Source: BAS
*Net Food Disposal

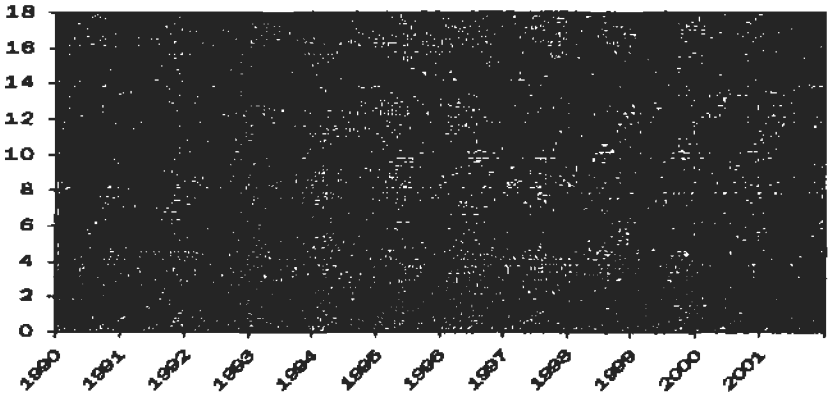

Figure 6. Per capita consumption, 1990-2001 (kg/yr).
Source: BAS, 2002

The preference of the Filipino consumers for fresh warm chilled pork over frozen meat gives the local industry market assurance of its products. The outbreak of bovine spongiform encephalopathy (BSE or mad cow disease) in Europe and Japan and chicken flu in Hongkong, has given the swine industry continued dominance in the local market (Faylon, 2002).

Large scale (1,000 and above sow-level) pig farms integrated with commercial feedmills are being established by foreign investors in the free port zone using their own technology, breeder stocks, and other production inputs. This is an indirect importation of pork into the country with minimal tariff cost, if any. Hence, the local swine industry has to be modernized to withstand any form of competition.

Population Growth and Swine Supply-Demand Projection: Challenges and Implications

A modernized swine farming whose ultimate beneficiaries are the smallholder hog producers or backyard raisers in the rural areas, which account for 77% of the total hog inventory in 2002, will surely lay the foundation for an efficient, viable, and sustainable swine industry in the country. This, in effect, will significantly contribute to the attainment of the twin goals of poverty reduction and food security.

Under globalization and trade liberalization, however, all pork-producing countries are practically under pressure to become competitive in the world market. While emerging pork producers in the country today may find it difficult to compete globally, in effect, the domestic market's absorption of locally produced pork will redound to improved health and well-being of the people, considering that most Filipinos are protein-deficient in their diet.

The urgent task ahead is for all stakeholders in the swine industry – both public and private – to empower our backyard raisers toward increased productivity and efficiency, and to achieve comparable product quality with imports. In the face of emerging challenges confronting the industry, as well as the pressing concern to meet the protein requirements of present and future generations of Filipinos, we must be able to:

- Narrow the gap between the per capita nutritional requirement and actual per capita consumption of pork;
- Make pork available, accessible, and affordable to all through increases in the overall production and improvement in production coefficients;
- Provide hog farmers with access to technologies and information, resources, support services, and infrastructure, particularly those whose income largely depends on swine farming;
- Transform the swine industry from a resource-based to a technology-

based industry; and

- Enhance the competitiveness of the swine industry in both the domestic and global markets.

Supply and Demand Projection, 2002-2025

Table 5 presents the country's pork supply projection for the next 23 years. The projected volume of carcass has been based on a 4.18% expected average increase per year (computed based on the average increase for the last five years, 1997-2002). The equivalent fattener and sow level are likewise indicated.

Table 5. Pork supply projection, 2002-2025

Year Level	Carcass[1] (MT)	Equivalent Fattener[2]	Sow Equivalent[3]
2002	1,091,280	18,443,918	1,152,745
2003	1,137,608	19,216.351	1,201,022
2004	1,185,251	20,021,131	1,251,321
2005	1,234,890	20,859,628	1,303,726
2010	1,516,061	25,609,138	1,600,571
2015	1,861,252	31,440,067	1,965,004
2020	2,285,040	38,598,648	2,412,415
2025	2,805,319	47,387,145	2,961,696

[1] Projected volume based on 4.18% expected average increase.
[2] Assumed 74% dressing percentage and 80 kg per fattener.
[3] Assumed 16 fatteners produced per sow.
Source: NSO

In terms of demand for pork in the next 23 years, an assumed 1.95% weighted average increase in per capita consumption (based on the average increase for the last five years, 1997-2002) was extrapolated with the projected population growth. Table 6 shows that in 2005, the projected demand for carcass will reach 1.22 million MT, and is expected to double at 2.38 million MT by 2025 given the corresponding increase in population.

Meanwhile, the projected supply and demand as presented in Table 7 depicts an estimation of adequacy/surplus, that is, provided that all the conditions necessary to intensify production in order to meet the projected supply are met.

Table 8 presents the incremental demand for pork for 2002-2025, which is consistent with our earlier contention that we have to triple our food production and ensure that resources are more equitably distributed, if we are to survive the demographic crisis ahead.

Table 6. Pork demand projection, 2002-2025

Year	Projected population[1] (Million)	Projected per capita[2] (kg/yr)	Projected carcass volume[3] (Metric ton)
2002	79.47	13.71	1,089,533
2003	81.05	13.97	1,132,268
2004	82.63	14.25	1,177,477
2005	84.21	14.53	1,223,571
2010	91.85	16.00	1,469,600
2015	99.01	17.62	1,744,556
2020	105.50	19.41	2,047,755
2025	111.47	21.38	2,383,228

[1] Source: National Statistics Office (NSO)
[2] Assumed 1.95% weighted average increase per year.
[3] Projected populations multiplied by projected per capita consumption

Table 7. Pork supply and demand (MT), 2002-2025

Year	Supply	Demand	Supply-demand
2002	1,091,280	1,089,533	2,347
2003	1,137,608	1,132,268	5,340
2004	1,185,251	1,177,477	7,774
2005	1,234,890	1,223,571	11,315
2010	1,516,061	1,469,600	46,461
2015	1,861,252	1,744,556	116,696
2020	2,285,040	2,047,755	237,285
2025	2,805,319	2,383,228	422,091

Source: Mateo, 2003

Table 8. Projected incremental demand for pork, 2002-2025

Year	Carcass[1] (MT)	Equivalent fattener[2] (Thousand heads)	Sow level equivalent[2] (Thousand heads)
2002-2005	134,038	2,264	141
2010	246,029	4,156	260
2015	274,956	4,644	290
2020	303,199	5,122	320
2025	335,473	5,667	354

Source. Mateo, 2003
[1] Assumed 74% dressing percentage and 80 kg per fattener.
[2] Assumed 16 fatteners produced per sow.

Challenges and Implications

The ultimate challenge that the above supply-demand projections have presented to us is to meet the goals we have set toward an efficient, viable, and sustainable swine industry in the country.

Tripling the country's pork production in the next 20 years is a tall order. Yet another challenge that we should not lose focus on is the need for "empowerment of the poor", as a strategy against the rural phenomenon called poverty. With most backyard raisers located in the rural areas, government must now forge a stronger partnership with the private sector in providing all the necessary technical and logistic support to help them attain their production target.

Some of the competitive advantages of swine production in the country, on which we can draw positive prospects for the industry, are the following (PCARRD, 2002):

1. Continuously increasing domestic demand for pork.
2. Sustained good prices of pork in the local market (P55-65/kg liveweight) for the past three years.
3. Eradication of the foot-and-mouth disease, with Mindanao now declared FMD -free zone (efforts are ongoing to make Visayas and Luzon FMD-free).
4. Availability of technologies, facilities, and other inputs for increased pig productivity and efficiency such as private artificial insemination (AI) facilities to cater to smallholder raisers.
5. Improvement in production performance of local swine:

a. Average daily gain (ADG) increased from 467 g in 1992 to 485 g in 2000;
b. Farm efficiency improved from 3.93 in 1992 to 3.63 in 2000;
c. Pigs produced per sow per year increased from 15.99 in 1992 to 16.11 heads in 1999;
d. Improved pre-weaning mortality from 10.03 percent in 1992 to 9.24 percent in 2000.

Meanwhile, some of the major challenges that the public and private sectors must address hand in hand are the following:

1. Unabated spread of economically devastating diseases;
2. High marketing and transaction costs, especially for smallholder or backyard enterprises;
3. High cost and erratic supply of/dependence on imported feed ingredients (e.g., corn, soybean meal) and feed supplements and biologics; and
4. Limited availability of genetically superior breeding stocks in the local market.

Swine Production Technologies and R&D Gaps

The total government investment on R&D in the swine commodity during the last 10 years (1990-1999) was about ₱47.73 million (Table 9), or an average of ₱4.80 million per year. However, in 2000, the total investment was only ₱4.51 million. Considering the value of the peso or the total earnings of the industry, the abovementioned investment was way below what is recommended. Practically, the technologies used by the local industry were based on foreign works and sources. Major R&D activities in the industry are largely private sector initiated.

Public investment in swine R&D was 15.54% of the total for the livestock industry during the last 10 years (1990-1999). In 2000, the investment in swine R&D was 10.25% of the total for livestock and poultry, equivalent to only 0.05% of GVA.

Table 9. R&D investment in livestock and poultry, in PhP, 1990-2000

Period	Swine	Ruminants	Poultry	Total	% Investment in Swine
1990-1994	18,960,669	105,231,614	13,762,143	137,954,417	13.74
1995-1999	28,769,937	119,852,543	20,619,383	169,241,862	17.00
1990-1999	47,730,606	225,084,156	34,381,517	307,196,270	15.54
2000	4,526,605	18,429,326	21,196,919	44,152,850	10.25

Source: PCARRD, 2001.

Technology Milestones

During the last 10 years, the outputs of swine R&D particularly from advance countries have been enormous. Filipino scientists and farmers were able to adapt these technologies under our conditions. For example, computer programs to formulate least cost rations become so handy under the regime of very volatile prices of feed ingredients. In minutes, commercial feedmills and even medium size farm operations could formulate excellent rations and mix the same with very competitive prices or costs. Today, less than 3 kg feeds are needed to produce 1 kg live weight gain.

The use of fresh boar semen in artificial insemination (AI) becomes so practical and economically viable because of the development of cheap extenders. These technologies facilitated the distribution of superior genetic materials to large areas and to more pig raisers. Today, superior boars could serve more sows (at least 15 sows per week) without overusing the boar, which causes short productive life of an expensive animal.

With available technology, input and relatively cheap labor, the performance of our piggery farms is now considerably high. Table 10 shows that the average number of weanlings (about 30 days old) per sow per year under Philippine conditions is 18.89 piglets, with a targeted increase of up to 20.08 piglets.

Table 10. Swine industry performance standard, 2002

Parameters	2002	Target
Pigs weaned/sow/year	18.89	20.08
Pigs produced/sow/year	15.27	—
Farrowing index	2.29	2.35

Source: Argañosa et al., 2003

Philippine commercial farms now produce 15 slaughter pigs per sow per year. The sows in Philippine farms give birth 2.29 times per year, with a targeted farrowing index of 2.35.

The production of triple-cross pigs (Landrace x Large White x Duroc) was shown to be feasible even under backyard conditions. Table 11 presents the performance of backyard farms in the production of triple-cross pigs. Based on various trials in the Philippines and performance records of well-managed commercial farms, there is an advantage of two slaughter pigs equivalent per liter of triple-cross pigs produced and raised to market weight.

Table 11. Productive performance of triple-cross pigs in backyard farms

Parameters	Average (40 animals)
Birth weight, kg	1.52
Weaning weight, kg	7.61
Age at weaning, days	29.90
Market weight, kg	82.93
Age at market, days	149.05
Ave. daily gain, g	558
Adjusted 180-day weight, kg	100.44
Feed consumption, kg	206.81
Feed efficiency	2.51

Source: PCARRD, 1996.

R&D Gaps

Genetic improvement. While smallholder swine raisers comprised 81.86% of the country's total swine inventory in the last two decades, most of them still maintain mongrel/nondescript breeds. Hence, unfair assessment of animals as poorly finished and of delayed market age due to poor genetics result to difficulty in marketing.

Since most hogs are raised by smallholder farmers, programs to improve the genetic quality of animals raised by backyard raisers will significantly improve the productivity of the industry. The promotion of the use of purebred boars among "boar-for-hire" farms and the accreditation of organized commercial breeding farms are appropriate strategies for consideration by the government and the private sector. The production and sale of triple-cross pigs will result in significant benefits both for farms selling the piglets and for growers of slaughter pigs.

Toward increased productivity and efficiency, there is an urgent need for a smallhold genetic resources improvement program among backyard raisers. This can be achieved through the simultaneous improvement of both male and female breeders. by improving the male (boar) line only, and by improving the female line only. Conservation and selection of available native pigs are also necessary in support of improvement efforts.

Artificial insemination (AI) is by far the cheapest and most practical modality for breeding and genetic improvement in smallholder swine farms. However, problems in semen quality, semen processing, and determination of timing of heat which affect low reproduction rate must be further investigated upon through R&D.

Improvement of the genetic quality of local pigs through modern biotechnology approaches is another emerging area that must be explored.

Animal nutrition. While swine nutrition has advanced over the years, the cost of feeds has remained high. The country still imports most feed ingredients like corn, soybean, fishmeal, and feed additives, making feed prices vulnerable to changes in stocks and prices in the foreign market. Tariff remains high on importation of these feed ingredients.

High prices of feeds are likewise attributed to the predominantly corn-based rations of commercial feedmillers. Hence, promotion of locally available feedstuff, as well feed ration formulations, which are not corn-based, must be intensified.

Health management. Disease outbreak occurs in many backyard farms mainly as a result of poor disease monitoring and surveillance, inadequate veterinary facilities, insufficient diagnostic laboratories, and lack of field veterinarians. Disease prevention and control, especially in farms located in areas far from urban centers, pose a vital problem due to limited availability and high costs of imported biologics and other medicaments.

Biotechnology for the production of vaccines against economically devastating diseases is an emerging concern that could provide the key toward effective disease prevention and control in swine.

The integrated community-based approach in disease prevention and control, on the other hand, should be implemented and further refined.

Product development and quality. With the current demand for quality pork and pork products, the development of low-cost products and products with long shelf-life through R&D could result to value addition. These include the development of meat processing technologies and standardization of pork cuts and live hog standards.

Recommendations

With a projected population of 111 million by year 2025, the swine industry in the next 22 years must triple its pork production (2.8 million MT by 2025) to meet the projected demand (2.3 million MT by 2025). Increased productivity and efficiency and a nurturing policy environment must be able to lay the foundation for an efficient, viable, and sustainable swine industry, in order to meet the nutrient needs of the country's growing population, as well as contribute significantly to the attainment of poverty reduction and food security.

The ultimate task ahead is for all industry players to be able to encourage and empower hog farmers and farmer organizations to attain increased productivity and production efficiency, improved product quality, and reduced production cost toward an efficient, viable, and sustainable swine industry. Vital to this goal is the political will of each and every player – government and private sectors alike – to participate in a concerted effort to uplift the plight of backyard

raisers in the rural areas who account for 77% of the current livestock inventory.

The interventions required from the industry players include: policy interventions; R&D/S&T interventions; technology/information delivery services; and market and input support services. Figure 7 summarizes the interventions necessary to attain our goals.

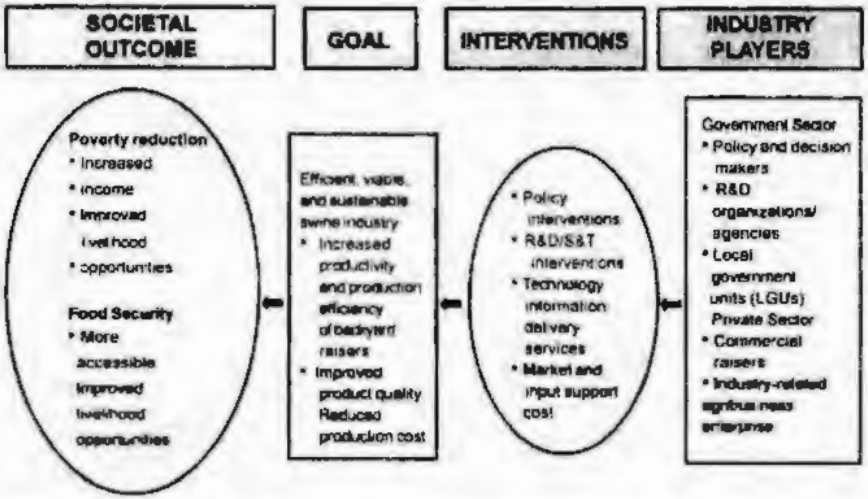

Figure 7. Framework of interventions toward an efficient, viable, and sustainable swine industry.

Policy Interventions

Through the years, the swine industry has been subjected to various policy interventions in response to the demand of the consuming public, government rules and regulations and lately, to the globalization of trade. Taking into consideration the production analysis of the industry, the following policy issues should be addressed:

1. The provisions of the Agriculture and Fisheries Modernization Act (AFMA) (RA 8435) designed to improve the production environment should be implemented as programmed. The establishment and/or building of infrastructure, i.e., breeding farms, animal health and quarantine including post-production facilities should be pushed through using the Agricultural Competitive Enhancement Fund (ACEF).
2. Availability of affordable credit programs for swine raisers' cooperative and non-government organization's (NGO) livelihood programs must be ensured to increase production particularly of small and medium

piggery farms. What is needed is to upscale the viable credit schemes in various strategic areas, such as, the Soro-soro Production Project in Batangas. The expansion of very limited credit program for pig production could increase the interest of people to engage in piggery business, thereby, create livelihood/jobs and increase pork production to meet the consumers' and processors' demands.

3. Tariff rationalization should be revisited and implemented in favor of the local industry, i.e., 0-3% level tariff for production inputs. Feeds, particularly the energy feed ingredient, constitute the bulk of production costs. The local production of corn and cassava with selling price competitive to the world market is still the best option for the country and the livestock and poultry industry. Local production will benefit the farmers and would eliminate the outflow of foreign currency. However, in the short term, a calendared importation is essential. The provisions of AFMA (corn as input to pork production) on tariff levels and that of MAV with regard to volume and schedule of importation should be strictly observed.
4. There should be clear policy on importation of pork and by-products for the information and compliance of all stakeholders, particularly the processors. The local processing industry is a very important sector of the meat industry and partner of pig producers and, therefore, should be working together for the survival of both rather than as competitors. The participation of swine associations and private sector groups in the negotiations under the GATT-WTO regime is essential. Likewise, the inputs of the scientific community are essential in the preparation of the missions particularly on the provisions of the various agreements. The government should implement focused safety net projects funded by the ACEF to cushion the impact of global trading to our pork industry.
5. The implementation of various issuances, i.e., mandatory vaccination, FMD eradication, inter-island and import quarantine procedures, etc. must be implemented and supported with financial resources, if needed.

R&D/ S&T Interventions

Improved productivity and production efficiency are dictated by the level of technology and quality of inputs used. Toward this end, R&D on swine must be problem-based, harmonized, and coordinated among all concerned government agencies in order to utilize available resources effectively. Likewise, the active participation of the private sector in pursuing R&D must be encouraged to augment limited public investment and to better serve the needs of the industry.

The generation and dissemination of improved technology and production/management systems must be focused on shifting production costs downward and product quality upward. These include, among others, use of genetically improved breeds and reproduction techniques and waste management and utilization. Major recommendations are discussed under this section, while some technological/R&D gaps that need to be addressed have been discussed earlier (part IV, section B of this paper).

Artificial Insemination (AI). The cost to establish and operate a swine AI breeding unit is higher compared to that of natural mating. However, with AI, more economic benefits can be realized in terms of lower breeding costs in an in-house breeding unit and higher profit in a commercial swine operation.

The strength of AI is generally dependent on the genetic superiority of the boar and the possibility of spreading its qualities to more females to produce offspring of better genetic quality. By using AI, one ejaculate can be used to breed 10 sows on the average compared to only one when natural mating is practiced. Other advantages of AI in pigs are as follows:

1. Minimizes if not totally controls the spread of reproductive diseases.
2. Allows the use of physically handicapped or crippled, yet genetically superior boars that cannot normally perform natural mating.
3. Avoids possible injuries on either the boar or the sow/gilt that may happen during mating.
4. Infertile boars are immediately detected.
5. Allows breeding of females from distant places with less transport costs and inconvenience, and without causing travel-related stress on the boar.
6. Allows small-scale raisers to keep a few sows without maintaining a boar.
7. Eliminates the problems of mating boars and sows of different sizes.
8. Increases the number of sows bred by a boar and the possibility of extending the boar's productive life.
9. Reduces breeding cost.

To take optimum advantage of the potentials of AI, raisers have suggested that the government should establish more AI breeding centers nationwide, and encourage establishment of more such breeding farms by the private sector (i.e., commercial raisers and industry-related agribusiness enterprises) for the benefit of the backyard raisers in particular, and the whole industry in general.

The establishment of more AI breeding farms would strengthen business presence of more backyard and small-scale hog raisers, whose usual problem is the source of good quality breed. Proper monitoring and accreditation of these breeding farms should also be undertaken regularly.

Triple-Cross Pig Production under Smallhold Conditions. A triple-cross pig is a three-way cross of Large White, Landrace, and Duroc. The first cross is that of the Landrace sow and Large White boar. The F1 sow is then crossed with the Duroc boar.

Under smallholder conditions, the average daily gain (ADG) of a triple-cross pig was about 558 g, feed efficiency was 2.61, and average market weight was about 82.9 kg at the age of 149 days. Triple-cross pig produced in smallholder farms had bigger litter size at birth by at least two piglets and at weaning by at least one piglet/litter. Moreover, there was a significant improvement in slaughter pig performance (growth rate and feed efficiency) by about 20%. This implies that the technology has the potential to increase income derived from backyard swine production.

The possible intervention that government and private sectors can pursue toward enhancing farm productivity and efficiency of backyard raising is to aggressively promote the use of triple-cross pigs in smallhold production. Critical to this goal is to make the technology available and accessible to pig producers in the country.

R&D efforts are currently concentrated in producing and maintaining quality breeds. It is therefore recommended that an R&D pool among private sector breeders be established to share the development cost, and thereby allow even backyard raisers to have access to the technology. This calls for the establishment of more breeding farms and breeding centers to provide continuous supply of good quality breeds.

Swine waste management. Swine production poses tremendous environmental impacts particularly on water, air and land, as well as exposes humans to health hazards. Swine waste management is a complex problem needing immediate technological, economic, social, environmental, and policy-related solutions.

To address the issue, some measures have already been undertaken by the government and the private sectors. In the past decades, several swine management technologies were developed locally. In addition, swine waste management technologies from abroad have also been adopted in some private farms. However, these technologies entail huge overhead investments and are therefore beyond the means small backyard raisers.

It has to be emphasized that waste management is a requisite to sustainable swine production enterprise. Moreover, both local and international requirements for food security and environmental safety, as advocated in the Hazard Analysis Critical Control Point (HACCP), call for effective and efficient waste management.

Efforts should be focused on developing waste management structures and strategies for backyard level swine raising, with focus on minimizing labor and water consumption while ensuring high animal performance and environmental safety. There are locally available/developed technologies but

these are underutilized because of lack of proper assessment and dissemination among the industry players.

Aside from technological interventions on waste management, government policies and regulations should be reviewed and properly implemented and monitored. Coordination between and among institutions involved in swine production and waste management is necessary, as well as joint efforts among stakeholders directly and indirectly involved and affected by the industry.

Technology and Information Delivery Services

In the Philippines, AFMA and the Local Government Code of 1991 are two policy instruments that have affected governance in agricultural extension.

AFMA emphasizes the role of the private sector by encouraging the participation of farmers and fisherfolk cooperatives and associations, as well as other private groups, in certain extension services like community organizing, skills training in agribusiness and management, popularization of training materials, promotion of regenerative agricultural technologies, and the use of participatory approaches. Government agencies such as the Department of Agriculture (DA) and the state colleges and universities (SCUs) are mandated to assist in the LGUs' extension system by improving its effectiveness and efficiency through capability-building and complementary extension activities in the forms of technical assistance, training of LGU extension personnel, improvement of physical facilities, extension cum research, and information support services (Cardenas and Cardenas, 2002).

The extension functions of the DA are to be delegated to the Regional Field Units (RFUs) and the Agricultural Training Institute (ATI) training centers, in collaboration with the LGUs and SCUs. The training centers are tasked to design and implement agricultural training programs that are consistent and functionally integrated with regional agriculture and fisheries development strategy.

On the other hand, the Local Government Code of 1991 decentralized the management of extension programs in the country, which affected the devolution of agricultural extension function to the LGUs. It provided for the devolution of power to administer extension services and to access resources from the central agencies to the provincial, municipal, and barangay (village) authorities (Figure 8).

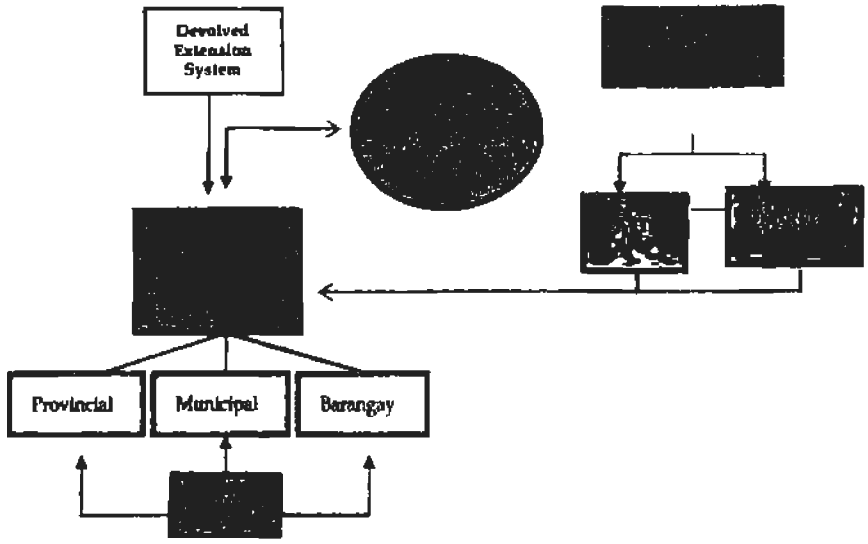

Figure 8. Agricultural extension management in the Philippines under the devolved extension system (Cardenas and Cardenas, 2002).

Assessments of the performance of the devolved extension system in specific cases revealed the system's shortcomings. Changes in the organizational structure resulted in problems in linkage between extension and research, in the drafting of clear-cut objectives and mission of LGUs, and in accessing financial and communication support, to name a few. The limited number of extension workers especially in less endowed municipalities created heavier workloads. After the devolution, budgetary appropriations for extension became inadequate, lesser technical assistance was made available to farmers, farm visits became occasional, mobility to the rural areas became sluggish, and financial support grew unstable (Cardenas and Cardenas, 2002).

Given the above scenario prevailing in the country's agricultural research-extension system, it is not surprising that technologies and science-based information resulting from years of R&D and millions of public investment on research to improve hog production in the country do not trickle down to the clients, particularly to backyard raisers. What needs to be given attention is the empowerment of the LGUs to assume primary responsibility for food security programs such as swine production improvement.

The role of the LGUs in providing technology and information delivery services must now be revitalized, and one way to do this is to provide technical support to our extension workers in keeping abreast with cutting-edge

technologies to improve productivity and production efficiency of hog farmers, particularly the backyard raisers.

Technology transfer through the LGUs could be further enhanced with the establishment of livestock on-farm technology. Other technology and delivery systems that need to be instituted by the government and other industry players, in close complementation with the LGUs through the agricultural extension system, are: access to information such as price indices/market prices for hog; provision of training programs on swine farm management (i.e., production, feed and nutrition, marketing strategies, slaughtering, carcass evaluation and grading) particularly for backyard raisers; information, education, and communication (IEC) campaign on swine farm management using appropriate and cost-effective media channels; and promotion of information technology for market intelligence.

Market and Input Support Services

Marketing and logistics. Transport is a major cost in marketing of produce. As contained in the DA and NAFC (2002) Hog Industry Master Plan, hog producers in the Visayas and Mindanao are hampered by the limited access in transporting animals to Manila and the increasing cost of freight. Transporting live hogs from Visayas to Manila entails an added cost of ₱8.00/kg. Meanwhile, hog raisers from Davao claim a ₱15.00/kg price difference in Davao vs. Manila, attributed to transport cost.

Some industry players believe that one solution to this problem is the strengthening of the retail market in the provinces. This will be supported by an increase in the number of accredited slaughterhouses and the provision of area-based processing and storage facilities. In effect, this would cut down considerably the cost of transporting live animals between provinces, especially in the Luzon area, and at the same time combat the spread of diseases such as FMD, hog cholera, and pseudorabies.

Hog raisers from the Visayas and Mindanao advocate the classification of hogs, being an important agricultural product, as a prime commodity similar to grains. This, in effect, will allow them the same priority access by shipping lines.

Improving Access to Inputs. Feed is the largest component of hog production. Corn is a major feed input, which comprises about 50 percent of the total feed cost. Improvement in corn production will bring about better corn prices for the hog raiser. With the current price of about ₱7.00-8.00/kg of corn, it is not possible for the industry to produce $1.00/kg of carcass. To achieve this, the price of corn has to go down to P6.50/kg or below. Hence, industry players are advocating for the lowering of tariffs on corn importation.

Another potential option unfolding is the use of the Bt corn technology. Multi-location field trials of Bt corn are now ongoing across different sites in

the country. According to Gonzales (2002), as cited in the DA/NAFC Hog Industry Master Plan, results of field trials in six locations indicated cost of production at P2.75/kg, in contrast with that produced in the farmers' fields which ranged from P3.22 to P4.58/kg. The likely positive transcendental impact of the Bt corn technology on hog production cost could be a welcome development, provided that rules in regulating genetically modified organisms (GMOs) in the country has been defined.

Conclusion

We have ushered in the new millennium with a growing consensus that our major national development goal is the elimination of poverty. We have seen how demographic crisis breeds poverty, and why poverty is a major cause of food insecurity.

We recognize the commitment of the government to extend the opportunities of the new economy to the rural countryside by working toward a modernized and socially equitable agriculture sector. Crucial to agricultural modernization is the attainment of stability of productivity growth.

Toward this end, the swine subsector, a major contributor to the growth of Philippine agriculture and which is dominated by backyard raisers, could be a most potent force in broadening the base of rural development in the country.

As shown in the framework, critical to the attainment of our goal is the political will of each and every industry player to provide the necessary interventions toward an efficient, viable, and sustainable swine industry.

With poverty and food insecurity, there is no national strength; there is no political stability; there is no economic growth and progress. That makes poverty reduction and food security not the sole responsibility of the government, but the responsibility of all sectors of the society who want to have a stake on their own future.

Before it becomes irreversible, we in the livestock sector must not waste time in marshalling our political will to achieve our vision of a progressive nation, where protein sources are accessible, available, and affordable to the present as well as the future generations.

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Appendix Table 1. Total hog farm inventory by region, 1990-2002 (in thousand heads)

Region	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Philippines	8,000	8,079	8,022	7,954	8,227	8,941	9,026	9,752	10,210	10,397	10,713	11,063	12,693
CAR	211	205	202	200	217	252	252	248	258	250	252	294	329
I Ilocos	510	464	483	482	448	402	433	506	510	480	413	457	520
II Cagayan Valley	394	396	454	475	463	477	446	509	590	565	538	643	775
III Central Luzon	1,068	1,222	1,045	1,067	1,145	1,259	1,350	1,416	1,620	1,524	1,618	1,632	1,983
IV Southern Tagalog	1,089	1,146	1,120	1,167	1,203	1,331	1,355	1,452	1,483	1,539	1,612	1,671	2,036
V Bicol	540	559	569	569	558	519	473	581	568	617	632	636	687
VI Western Visayas	631	586	582	590	655	686	770	770	778	844	920	983	1,036
VII Central Visayas	739	769	750	707	722	772	708	747	790	789	793	818	852
VIII Eastern Visayas	628	571	574	554	585	698	693	737	697	731	738	683	732
IX Western Mindanao	352	415	416	368	405	466	491	556	599	602	649	695	886
X Northern Mindanao	520	475	493	437	464	491	525	546	572	706	706	712	820
XI Southern Mindanao	560	582	573	599	604	645	666	772	767	760	805	772	903
XII Central Mindanao	425	385	465	451	464	580	479	510	552	575	660	680	658
CARAGA	274	257	253	255	257	323	354	367	388	382	338	349	416
ARMM	61	45	43	32	36	42	50	35	37	32	37	39	58

Source: BAS
*Preliminary estimates (as of October 2002).