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Comparative advantages of pork production around the world

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Looking at the global market, pork production remains vibrant and robust across the globe. Many factors influence the shape of each local pork industry – but central to all is the customer. The customer has witnessed, influenced and experienced many notable events during the past few decades.

Overall pork output kept pace with total meat growth of 18% from 1998 to 2005 – growing 16% respectively in metric tons. Poultry meat output increased 30% over the seven years, while beef production lagged at 9% for the period. Pork consumption per capita remained strong at 15.6 kg in 2003 – second only to seafood consumption at 16.1 kg. The pork supply is largely produced in twenty countries that differ in market infrastructure, business inputs, production efficiency and customer value. These relative differences are leading new countries to emerge on the global scene, fueled by the customer and socioeconomic influences.

Many papers fill the literature on global pig production. This address focuses upon the leading countries that produce pork, highlighting comparative advantages in structure, inputs, production and customer value. In addition, key challenges are offered to strengthen the category, as

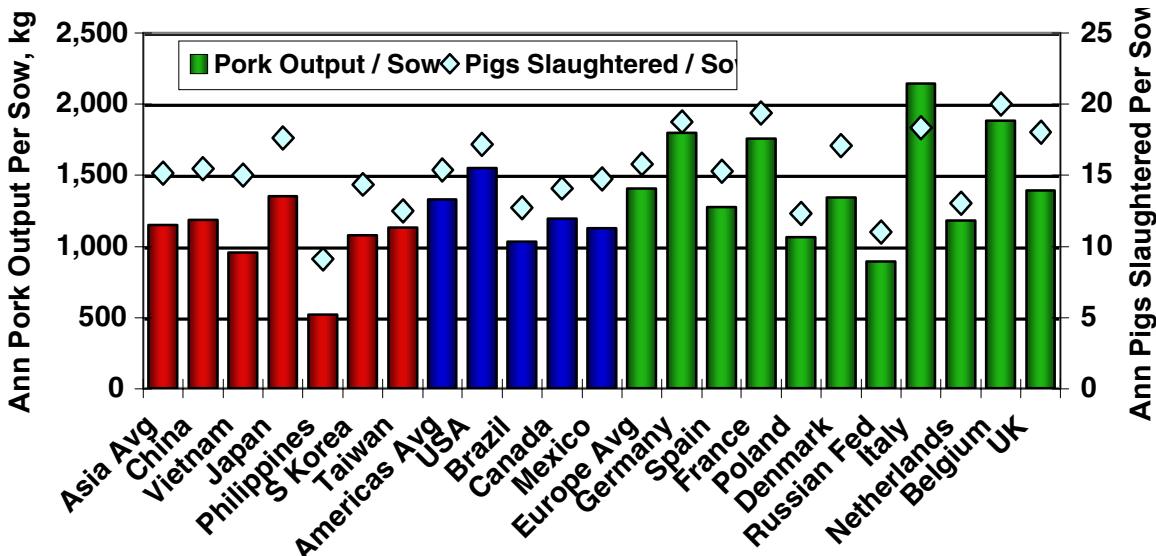
the world evolves the value measures to year 2015.

Category

Globally, pig meat output increased 2.2% annually during the past seven years. More pigs and larger carcasses led to 102.523 million metric tons of pork in 2005 (Food and Agriculture Organization of the United Nations, 2006). Over 80 percent of the world's pork is produced in 12 countries – led by *China, the USA and Germany*. The large influence of China on global pork production – producing over 48% of the total pig meat (metric tons) – can mask fundamental changes. Excluding China, global pig meat grew at 1.1% annually from 1998 to 2005. Twenty countries produced over 80% of the remaining 52% of the pig meat production, when China is not considered (**Figure 1**).

Considering the top 20 countries, the largest pig meat production increases were observed in China, Vietnam, the United States, Brazil and Germany. In contrast, the United Kingdom, Netherlands, Poland, France and Japan had the largest declines in pig meat tons (**Table 1**). Other countries with notable losses included Romania (down 6.9% annually), Ukraine (down 3.8%) and the Czech Republic (down 4.3%). The losses in eastern European

Figure 1: Annual output per sow of the leading markets. (Source data is **Table 1 & 3**. Graph plots an average for Asia, Americas and Europe of the listed countries, respectively.)



countries were due in part to the production and processing structural changes required by new members to join the European Union. These changes, although currently difficult and challenging, are encouraging for the long-term support of the changing consumer lifestyle and production demands. The 25 member countries of the European Union reported the total pork production sector to be unchanged (0.1% annual growth) from 1998 to 2005, due in part to regulations of nutrient inputs, nutrient outputs (nitrogen and phosphorus), animal welfare and meat processing.

Globally, pork production continued to *expand in developing countries* with tropical environments located in the southern hemisphere. Consumers are changing their dietary demands as they experience increased income levels and move to urban centers. This change supports the industrialization of local pork production, along with the local government and cultural support. The shift in pork production underscores our need to understand more about pig metabolism, nutrient supplies, disease challenge, genetic selection and other areas relative to the demanding environmental conditions. (Table 2)

Pork consumption per capita remained strong at 15.6 kg per year in 2003 (**Figure 2**). European countries led global

per capita pork consumption at 35.2 kg per year (2003) followed by North America at 29.8 kg. Consumption patterns have been stable for both geographies during the past 18 years. In contrast, Asia and Latin America have sharply increased their 2003 per capita consumption to 14.7 kg and 9.9 kg, respectively. Of all countries, Austria, Spain and Denmark led per capita pork consumption with 74.4, 66.5 and 63.3 kg annually, respectively. Consumption trends in pig meat are largely influenced by changes in income levels, lifestyle, local culture, consumer confidence and government policy. Pig meat consumption followed seafood as the preferred protein category – given seafood consumption at 16.1 kg per capita per year.

Consumer confidence is the hallmark of the pork category. Consistent pathogen control – from live animal to food borne – is critical to support local consumption or global trade policy. This was evident with the Streptococcus suis outbreak on China's local consumption, whereas Foot-and-mouth Disease (FMD) in Korea (e.g. trade with Japan) and Aujeszky's Disease in Brazil (e.g. trade with Russia) affected trade, to name a few. This also applies to other meats, including Avian Influenza on poultry consumption and Bovine Spongiform Encephalopathy (BSE) on beef trade policy. These difficult situations

Table 1: Leading countries in pork production (ranked on 2005 pig meat produced)

Location	World Rank	2005 Sow Inventory (head)	2005 Pigs Slaughtered (head ann.)	2005 Pigmeat, metric tons	Pig meat Change 1998 to 2005, Total M Ton % Ann
<i>Asia</i>					
China	1	42,200,000	651,653,532	50,094,700	+ 11,648,054 3.3%
Vietnam	7	2,200,000	33,000,000	2,100,000	872,000 8.0%
Japan	14	925,000	16,300,000	1,250,000	-40,800 -0.4%
Philippines	15	2,110,000	19,200,000	1,100,000	167,190 2.4%
Korea, Repub.	18	975,000	14,000,000	1,050,000	110,644 3.0%
Taiwan	19	811,909	10,140,000	920,000	28,000 0.4%
<i>Americas</i>			202,992,390	17,123,135	+ 2,445,503 2.2%
USA	2	6,060,000	104,000,000	9,401,600	778,600 1.2%
Brazil	5	3,020,000	38,400,000	3,110,000	710,000 3.7%
Canada	8	1,643,000	23,150,000	1,960,000	568,040 5.0%
Mexico	17	940,000	13,867,200	1,058,205	97,516 1.4%
<i>Europe</i>			291,382,602	25,626,817	-159,015 -0.1%
Germany	3	2,504,000	47,000,004	4,505,000	670,900 2.3%
Spain	4	2,593,000	39,596,000	3,310,243	565,881 2.7%
France	6	1,284,000	24,885,000	2,257,000	-71,000 -0.4%
Poland	9	1,808,000	22,230,000	1,923,484	-102,716 -0.7%
Denmark	10	1,340,000	22,899,998	1,800,000	170,700 1.4%
Russian Fed.	11	1,800,000	19,800,000	1,610,000	104,905 1.0%
Italy	12	722,000	13,247,000	1,550,000	137,811 1.3%
Netherlands	13	1,100,000	14,341,000	1,299,000	-426,000 -4.0%
Belgium	16	584,000	11,677,000	1,100,000	27,300 0.3%
Un. Kingdom	20	505,000	9,103,000	704,000	-431,000 -6.6%
<i>Africa</i>			16,399,014	808,962	+ 124,382 2.4%
Nigeria	37	NA	4,627,350	208,231	64,231 5.4%
South Africa	46	NA	1,861,700	140,000	21,000 2.3%
<i>World</i>			1,307,928,700	102,523,358	+ 14,090,068 2.2%

(Source: FAO, 2006, EuroStat 2005, Cargill 2006, USDA-FAS GAIN Reports)

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generally lead to non-tariff trade barriers, tighter border controls and government actions that reduce trade and weaken consumer confidence. Strong relationships between private

and public sector leaders can ensure good science leads to swift action.

Market infrastructure

Markets evolve at different rates. This evolution ranges from *backyard husbandry* to *land-based diversified production* to *industrial pork production to the food retail sector*. The speed at which this evolution occurs differs by region and by influence. Influences of structural change generally include investment capital, nutrient supplies, pathogen control, productivity gains, consistent profitability, available pigs, government regulations, pork demand, food retail and customer value – to name just a few factors.

The market structure dramatically alters how the pork products are marketed to consumers, evolving from an informal traditional approach (i.e. “wet” market) to a formal supply chain (i.e. processed market) to a retail sector (i.e. consumer brands). These changes impact the local market’s socioeconomics – from how to raise pigs to who makes decisions to what distribution systems to who processes the pig.

The leading markets of China, the United States and Germany largely differ in their market structure. China’s pig production is primarily among many small producers with production in their backyard. Over

Table 2: Pig meat per capita supply per year from year 1965 to 2003

Location	Supply per capita per year, kg				
	1965	1975	1985	1995	2003
Asia	3.8	4.5	7.8	11.7	14.7
China	7.4	8.5	16.1	26.8	35.3
Vietnam	7.2	5.1	9.4	13.7	22.0
Japan	4.0	10.3	14.1	17.1	19.0
Philippines	9.2	7.7	7.3	11.8	17.8
Korea, Republic	2.7	2.6	10.6	18.6	27.1
North America	25.9	24.3	29.5	29.8	29.8
USA	26	24.1	29.2	29.8	30.1
Canada	25.1	26.3	31.8	29.1	27.4
Latin America	6.7	7.6	7.8	10.7	9.9
Brazil	7	6.9	5.7	17.2	13.6
Mexico	9.9	13.7	17.2	10.7	12.8
Europe	26.6	34.2	39.3	33.1	35.2
Germany	40.6	53.5	63.0	52.3	54.1
Spain	9.2	18.9	36.6	52.9	66.5
France	28.6	33.3	35.3	35.7	38.2
Poland	34.7	49.5	37	48.2	50.1
Denmark	32.1	39.1	56.9	64.5	63.3
Russian Fed.	NA	NA	NA	16.6	16.2
Italy	9.5	18.2	28	32.7	43.6
Netherlands	25.6	34.1	43.3	49.8	36.1
Belgium	28.5	36.4	48.2	39.1	35.6
United Kingdom	29.2	24.1	25.4	24.1	26
Africa	0.7	0.7	0.8	1.0	1.0
Nigeria	0.6	0.6	0.8	1.4	1.6
South Africa	3.2	3.3	3.2	3.4	3.2
World	9.2	10.2	12.3	14	15.6

(Source: FAO, 2006)

Figure 2: Pig meat per capita supply per year from year 1965 to 2003 (FAO)

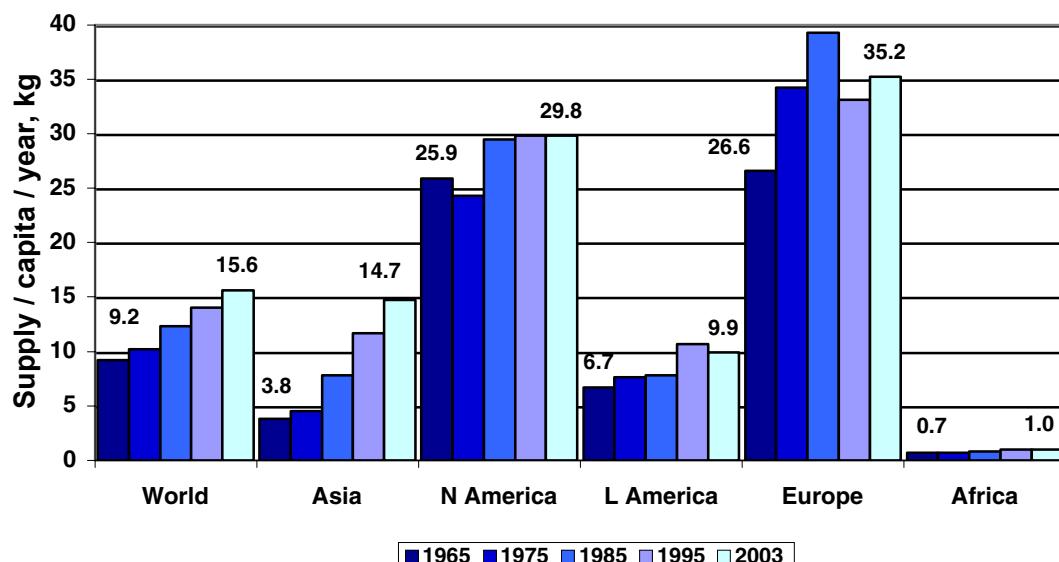


Table 3: Production measures of leading pork production markets^A

Location	2005 Market Pigs / Sow Ann	2005 Pig meat (kg) per Sow Ann	2005 Production Cost, \$ / kg	2005 Avg Market Weight, kg
<i>Asia</i>				
China	15.4	1,187	\$ 0.91	103.9
Vietnam	15.0	955	\$ 1.12	86.0
Japan	17.6	1,351	\$ 2.27	103.6
Philippines	9.1	521	\$ 1.23	77.4
Korea, Republic	14.4	1,077		101.4
Taiwan	12.5	1,133		122.6
<i>Americas</i>				
USA	17.2	1,551	\$ 0.83	122.2
Brazil	12.7	1,030	\$ 0.72	109.4
Canada	14.1	1,193	\$ 1.00	114.4
Mexico	14.8	1,126	\$ 1.12	103.1
<i>Europe</i>				
Germany	18.8	1,799	\$ 1.29	129.5
Spain	15.3	1,277	\$ 1.19	113.0
France	19.4	1,758	\$ 1.21	122.6
Poland	12.3	1,064	\$ 1.17	116.9
Denmark	17.1	1,343		106.2
Russian Fed.	11.0	894		109.9
Italy	18.3	2,147		158.1
Netherlands	13.0	1,181		122.4
Belgium	20.0	1,884		127.3
United Kingdom	18.0	1,394		104.5
<i>Africa</i>				
Nigeria				60.8
South Africa			\$ 1.29	101.6
<i>World</i>	15.3	1,294	\$ 1.18	108.8

^AAverages for Asia, Americas, Europe and Africa are of countries listed
(Source: FAO, 2006, EuroStat 2005, Cargill 2006, USDA-FAS GAIN Reports)

73% of the pigs are produced on farms with 50 to 99 pigs on inventory, although larger production firms are emerging. This contrasts the current USA pig production. Over 3.5% of the 67.3 thousand pork producers inventoried over 5,000 pigs, which accounted for over 77% of the slaughter in 2005. Germany's pig production involves 95.7 thousand producers with 3.7% of farms that inventory more than 1,000 pigs producing 37% of the pigs (Eurostat, 2006). The contrasting market structures also impact the supply chains to deliver customer value.

Today's live production *models vary in business intent and number of production sites*. The business intent or purpose of producing pigs generally includes genetic improvement (e.g. nucleus, multiplier, etc), land-based integration, pig coordination, food integration and retail sector. These businesses vary in size and sophistication. Similarly, the production sites often include one-site production (e.g. farrow-to-finish), two-site production (e.g. sows & wean-to-finish or sows-nursery & finish) and three-site production (e.g. sows, nursery pigs & finishing hogs), although boars housed for artificial insemination can confuse the

traditional number of production sites.

New influences of market structure continue to emerge and differ by geography. In Asia, pathogen prevalence (e.g. Circovirus) and pork processing are key influences, whereas consumer brands, transparency and regulations (e.g. environmental and animal welfare) top the list in Europe and the Americas. Likewise, the biofuels industry is beginning to exert more influence on pork production throughout the Americas and Europe, including ingredient costs, production efficiency and pig meat attributes.

Business inputs

What does a business do best? This question is often simple in concept, but difficult to apply. *People, processes, nutrient supplies and social capital* underscore key advantages of pork production businesses.

Market expansions have resulted from courageous, visionary leaders accepting risk and understanding customer value. Leaders in government, universities and the private

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sector need to continue asking the difficult questions, so development pipelines are filled and value realized from investments. There cannot be enough emphasis placed on developing leaders throughout a firm – from business to technical to production to other areas.

Defined processes separate production firms on their effectiveness. Today, production firms adopt technology to simplify complex business decisions of animal metabolism so that better, faster and valued decisions can be made. Clear processes allow a firm to execute a task, remove personal preferences and sustain an advantage. This is especially critical as data is transformed into know-how and then into actionable steps to realize value.

Nutrients from ingredients forge a core input to pork production. Traditionally, these inputs were sourced from locally grown grains and fed to pigs so as to capture more value. Today, pork producers continue to survey nutrient supplies because of cost pressures, nutrient demands and competing industries for ingredients (i.e. food, biofuels, etc). This has led pork producers to enrich their nutrient vocabulary (i.e. net energy, ideal carbohydrate? balance, digestible amino acids etc) that is used to assess ingredients of nutrient supplies, so that animal nutrient demands are met through a proven process (e.g. Cargill AutoCalc? system to value ingredients) – across different geographies, genetics and production systems.

A final input not readily considered is social capital. Social capital can be developed through informal networks, internal know-how, common understandings and deep trust in a firm. When present, *social capital strengthens decision-making*, conflict resolution and transparency to

lessen bureaucracy and improve agility as a business or market evolves.

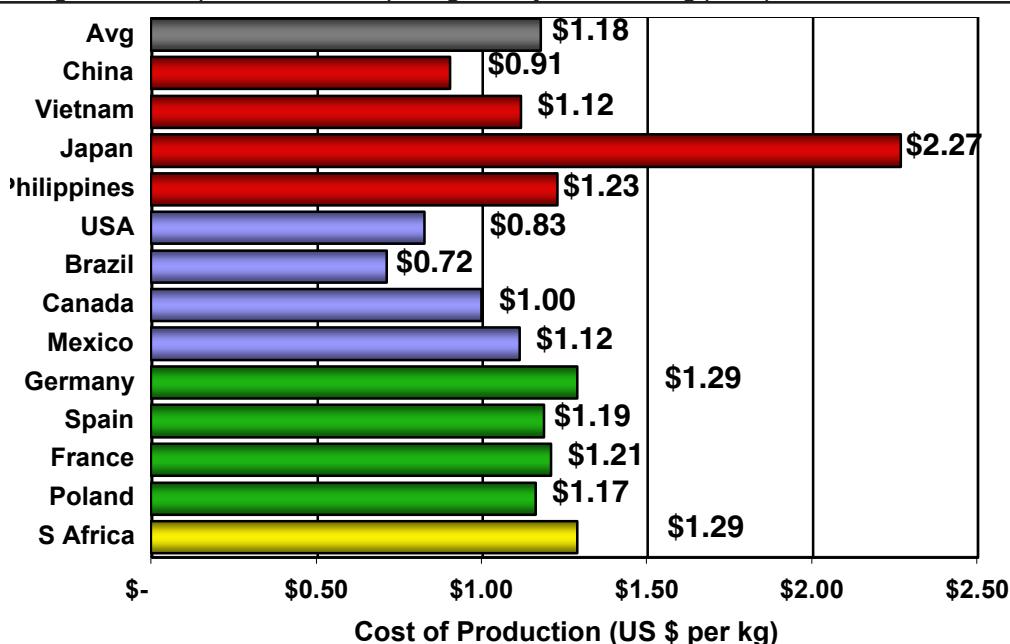
Production efficiency

Pork producers continue to *improve sow productivity, pig growth efficiency, livability and production costs*. Firms continuing to expand in pig production generally have evolved a strong culture, disciplined management, proven processes, pathogen control, brand value and engaged leaders. Productivity and cost remain the cornerstones to efficient pig production along with rigorous pathogen controls.

Interest to differentiate pork production frequently leads to new requirements. Various sectors have initiated new requirements of production, including the government (e.g. environmental regulations), food retailers (e.g. genetic line, animal welfare, traceability etc), influencers (e.g. social responsibility, Hazard Analysis and Critical Control Points, etc) and consumers (e.g. “natural foods etc). The key is to ensure these requirements align with delivering customer value, so that a region’s long-term competitiveness remains viable to deliver value recognized and relative to the customer. The Cargill Feed for Food? system supports unique production requirements like these so that the customer realizes the value and remains confident in the process.

Country comparisons are often made of live production costs and efficiency. Variation across countries can be as striking as within a country, regardless of market structure. **Figure 3** lists the cost of production from the leading countries in pig meat production (US \$ per kg live weight).

Figure 3: Live production cost per kg surveyed in leading pork production countries



(Source: Personal communication with Cargill and PIC staff, 2006)

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Local contacts and data were used to estimate the average production costs, given currency exchange during late 2005 to early 2006. Cost of production averaged \$ 1.18 per kg across the 13 leading pork production countries.

Rigorous pathogen controls continue to be a priority in live production. Pig morbidity and/or mortality quickly change a business or market after an infection. Continued investment to develop veterinary leaders, diagnostic facilities, control processes and research programs is essential to maintain a viable industry with practical intervention. This has been an advantage in North America, specifically the USA, although continued funding and support must be expanded given recent projections. The veterinary infrastructure including diagnostic laboratories, sampling and detection for certain pathogens is lacking in many developing countries. This becomes a critical element, especially when there is no government or local veterinarian support to determine a pathogen's prevalence. Pathogen control continues to be a critical strategic advantage.

Other advantages exist in pig growth and reproductive efficiency, when comparing current production results against expected optimums. Although much progress has been made, research efforts focused upon metabolism and immune responses are critical to support incremental or break-through innovations. In addition, there is much opportunity to further innovate or refine electronic systems that capture production measures to mine data, so as to support business decisions and processes. Countries or businesses that consistently deliver value through efficient, quality, low-cost pork production will remain competitive for the long-term.

Customer value

Production of pigs has been refined over many years. Traditional supply-side production models are being adjusted to address emerging demand-side requirements. Tomorrow's standard will involve specialized streams of pigs produced to demanding customer requirements with limited variation. This contrasts the traditional commodity pork of the past. With this change, effective marketing and branding will become an even more critical advantage to this business.

This transition occurred with poultry meat. Poultry products have evolved from commodity whole birds to unique products marketed to support the consumer's lifestyle, convenience, taste attributes, packaging preference, price point, social attitude and fun elements. Production capabilities are aligned to support the consumer's value requirements. Many papers and case studies have highlighted this transition. Today, pig meat is marketed under many brands throughout the world. Which brands are most valued in a sector or country depends on the consumer's relationship. Brands provide an indelible mark of quality that provides choice for consumers. In simple

terms, a brand represents promises made and kept over a long period of time to support a trusted and respected relationship with the consumer.

Pork businesses commonly focus on features or attributes in building brands, rather than focusing on basic brand fundamentals or value. Brands set the course through a brandmark, promise, style, evidence, value and desired experience. And when the consumer experiences this promise, the relationship prospers – just like any relationship. Unique valued brands are an opportunity for long-term strategic advantage.

Vision 2015

The pork category can become the distinctive leader in delivering value to customers, consumers and other stakeholders. Distinctive value can be realized in many form. As year 2015 approaches, I offer the following questions to center the discussion on value. Consider the following.

- Leaders ... What activities or programs are in place to develop tomorrow's leaders for the pork business from general manager to veterinary medicine to production?
- Innovations ... How can break-through innovations in metabolism, nutrients, genetics, health and information systems be advanced?
- Nutrient supplies ... How can a deep understanding of nutrients be used to consider non-traditional ingredients use given the bio-fuel industry growth?
- Processes ... What processes are needed to ensure task consistency, reduce time to application, improve product quality and strengthen consumer confidence?
- Know-how ... How are networks and know-how developed to improve decision-making and transparency in firms?
- New markets ... How will the markets of China, Brazil, Russia, India and Africa evolve their market structures, supply chains and consumers, as well as your local market?
- Customer ... How can consumer confidence be developed through clarifying, understanding, supporting and delivering the recognized value, given the consumer's lifestyle and desired experience?

The world continues to change the value measures. Instant communication, social responsibility and food retailers will provide new attributes or requirements for tomorrow's pork production. Visionary leaders will need to leverage their unique advantages as they carefully consider today's needs and tomorrow's requirements for long-term effectiveness.

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