

The Poultry Industry in the 21st Century – Challenges and Opportunities

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Predicting the future is at once both an opportunity and a challenge. Predicting what changes will take place in the poultry industry over the next century is certainly an opportunity to review the past and use this as a means of predicting the future. As the poultry industry became commercialized only during the last 50 to 60 years, the developments that will take place in the next 50 years will no doubt be phenomenal. Technology improvements in all areas such as nutrition, breeding, animal health, production and management have all played an important role in the development of this industry and will continue to do so.

If we look at poultry consumption, we will see that there has been a tremendous increase in many countries, particularly in China and India, which between them make up about one-third of all the earth's population (Table 1). While it can be argued that they started with very little consumption, it does point out

the opportunity for growth in these regions as well as others. Even among countries with fairly established patterns of poultry consumption, such as the US and the European Union, poultry consumption continues to grow.

Another way of looking at poultry consumption is to examine total consumption. As we see in Table 2, actual consumption gives a different outlook. With the exception of China, the highest total consumption is among more developed countries. One of the keys to being successful in any industry is of course to "target" the market. For many years, the poultry industry concentrated on producing chickens and assumed that someone would buy them. In the last few decades of the 20th century, we learned that we also had to concentrate on market-

Table 1. Increase in poultry consumption in selected countries from 1988 to 1998

Country	% Increase
PR China	383
India	171
Brazil	128
Mexico	105
Argentina	98
Thailand	88
South Africa	79
Taiwan	68
Canada	45
United States	44
Saudi Arabia	39
European Union	33

Table 2. Total pounds of poultry consumed in various countries

Country	1,000 tons
PR China	12,920
United States	12,805
European Union	7,657
Brazil	4,012
Mexico	1,962
Russia	1,896
Japan	1,730
Canada	1,021
South Africa	1,015
Thailand	778
Argentina	739
Taiwan	699
Saudi Arabia	650
India	600
Turkey	585
Others	3,897

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ing them as well. In order to be successful in the 21st century, we are going to have to focus upon market sources and market demands.

The 6 billion people who currently reside on our planet can be divided into five groups of approximately 1.2 billion each based on income. Each of these groups, or quintiles, shares much in common in terms of poultry consumption. Examination of the purchasing power and demands of each quintile helps to determine what markets will exist and what type of poultry will be in demand (Table 3).

The fifth quintile lives on an average income of less than \$1 per day and eats less than 1 kg of chicken per year. They are chronically undernourished and live in misery and poverty. They may go through their entire lives without riding in a car or using a telephone. The largest portion of this group lives in Sub-Saharan Africa. Marketing poultry to this group is almost impossible due to minimal income, lack of refrigeration, and minimal cooking facilities. Most consumption has been and will continue to be in the form of low-value products such as necks, backs, etc. through international relief organizations. This is not and will not be a significant market for poultry in this century.

The fourth quintile averages about \$2 per day. Although not facing chronic malnutrition they live in grinding chronic poverty. They live in poor shelters throughout Latin America, Asia, and Africa. They are too rich to qualify for food aid but too poor to afford much beyond basic calories. Their participation to poultry consumption is small, usually limited to special occasions such as holidays, and is characterized by the purchase of a small chicken on the live or "wet" market to be consumed quickly. Much of this will come from small or backyard flocks and not likely to be imported. Total poultry

consumption in this group will remain small.

The third quintile is one of the most likely areas for future development. This group has a significant jump in income to about \$8 per day, and includes a significant number of Chinese, Indians, Middle Easterners, and many Africans. As noted in Table 1, many of these countries are among the greatest in percentage increase in consumption. They consume quite a bit of chicken with good opportunity for increased consumption. Purchase of chicken in this group comes mostly from live or wet markets. The sale of fresh or frozen chicken is limited due to lack of refrigeration at home or in the market. Development and acceptance of irradiation processes for chicken may open a large potential market for this segment of the world's population.

The second quintile is probably the greatest opportunity for increased poultry consumption with an income of about \$19 per day. This includes much of Russia, Eastern Europe, Latin America, China, India, the Middle East, and some areas of the United States. They are able to purchase fresh or frozen chicken for later consumption. Their greatest interest will be in purchasing low cost products such as leg quarters or small whole chickens.

The first quintile has an average annual income of almost \$70 per day, and is concentrated in the United States, Western Europe, and Japan, but includes high-income families in almost every country. This 20 % of the earth's population has 80% of the income. Much of the past marketing efforts have focused on this group. Although their poultry consumption is not much greater than that of the second quintile, the value of the product is much greater. There is great competition from beef, pork, and fish as well as a growing population of vegetarians. The demand for poultry is primarily for high-cost further processed items. This will remain an intensely competitive poultry market with opportunities in specialized areas such as organic or "natural" products.

In order to effectively produce and market poultry in the next century, we should examine the various segments of the poultry industry to determine what challenges and opportunities we will face in each. These include areas such as nutrition, genetics, disease, processing and products, marketing, and management and welfare.

Nutritional constraints will be many, led by reduction or

Table 3. The five income quintiles and their consumption of poultry

Income quintile	Yearly income \$/person	Per capita chicken (kg)
1	25,000	22
2	7,000	17
3	3,000	8
4	750	3
5	365	<1

elimination of growth-promoting antibiotics, an elimination of all animal byproducts, demands by consumers for feed labeling, concerns over the use of Genetically Modified Organisms (GMO's) in animal feeds, demands for chicken produced using "organic" grains and proteins in limited supply, and a demand for reduced excretion of N and P.

The growing concern regarding disease transfer from animals to man will probably eliminate the use of animal byproducts in poultry feed. This will drive us almost totally towards diets limited to corn(maize) and soybean meal with a few locally produced byproducts. In some locales even the use of supplemental amino acids is in question especially related to "natural" production. Unfortunately, an increasing percentage of the crops grown in the world are of GMO origin.

Because of the high demand by the first quintile, nutrition will focus on carcass content and quality. This will include manipulation of carcass and egg yolk fat to produce products that are perceived by the consumer to be healthier, including Omega-3 eggs and meat, vitaminenriched eggs, low cholesterol eggs, and other types of products. Reduction or elimination of antibiotics will lead to the use of various probiotics, natural spices, and other products to reduce or eliminate salmonella and other bacteria on processed carcasses.

Enzymes will be developed that will effectively enhance the digestion and utilization of corn and soybean meal. Products that effectively inactivate mycotoxins will be needed to spur poultry production in tropical and semitropical areas of the world.

Computer models will be developed that will enable more accurate prediction of nutrient requirements of the bird under varying conditions. Technology will be developed that will enable the production of feed to exactly match the needs of the bird with minimal waste. Programmed or "meal-time" systems will produce birds with better growth rate, less abdominal fat, and better carcass quality.

Genetic improvements in the nutritional value of crops will aid the poultry industry. Increased production of high-oil corn varieties will help countries such as Korea where feed grade fats are limited and expensive. Improved protein and amino acid concentration in grains that can be grown under more severe environmental conditions will reduce the need for higher cost protein supplements. Modification of the phytate-bound pho-

sphorus in grains and oilseeds will reduce some of the environmental issues the industry is facing.

In genetics, one of the problems is sustaining a wide genetic base for the future in the face of declining number of breeders. In the U.S. for example, two breeding companies provide about 90 % of the total production. There must be diversity in the breeding programs, as some of the future needs will be related to the whole-bird market and also on the more lucrative deboned, further-processed market. Breeders may have to include factors such as animal welfare, disease resistance, and environmental impact in their selection processes.

Disease control will be one of the biggest challenges of the 21st century for the poultry industry. Poultry is typically grown intensively with concentrated number of animals. It is increasingly difficult to get new drug control products approved by federal agencies, and there are increasing consumer demands, especially in the first quintile, for drug-free and antibiotic-free production of animals. Diseases that have long been controlled, such as coccidiosis, will be especially hampered by the lack of development of new products and restriction on the use of older products.

Diseases such as avian influenza and exotic Newcastle, usually transferred from wild bird or game fowl, have wreaked havoc on commercial poultry production in many areas. Necrotic enteritis, hampered by restriction of the use of growth-promoting anti-biotics, has been a continual problem in many areas.

In order to effectively control diseases, we will need the development of vaccines or embryonic inoculation to help control coccidiosis. Improved enzyme supplements to aid in digestion of nonstarch polysaccharides may aid in control of necrotic enteritis. We will need strict biosecurity and improved management practices to control disease outbreaks. This is an area where contributions from the biotechnology community are sorely needed.

In the area of processing and products, we will need to develop specific types of products for each income quartile. Much of this will continue to focus on the first quintile due to the high monetary value of the product. This quintile will demand more environmentally friendly products such as organic or "natural" products. The second quintile will continue to consume primarily whole small chickens or low-cost parts with

some upward demand for specialty products.

The third quintile will need products with longer shelf life and will be an area where irradiation to prolong shelf life will be valuable. If the poultry industry is to serve this segment, we must use technology to reduce bacterial loads on processed carcasses as well as overcoming consumer concerns about irradiation processes. Although irradiation has been approved or endorsed by almost every major health-regulating authority in the world, there is still a great deal of concern among consumers regarding the safety of the irradiated product.

Because the first quintile of consumers has such great purchasing power and the product value is so great, they will significantly influence the way in which most of the birds in the world are grown. There is a growing demand for birds grown under "natural" conditions that are not necessarily related to bird comfort and welfare. These conditions are being imposed on producers in Europe and also on producers in other areas that export products to Europe. In the U.S., major fast-food chains such as McDonalds are imposing strict animal welfare guidelines on producers who supply their product.

With this background in mind, allow me the chance to make some predictions about the poultry industry for the 21st century. Firstly, poultry production will continue to grow on an annual basis, but at a pace less than the 5 % annual growth over the last 25 years. Broilers will continue to grow in average live weight at marketing. Some of this will be the result of genetic selection but the driving factor will be market demand for deboned meat for further-processed, value-added poultry products. Broilers will become more efficient, not just in terms of feed conversion or days to reach market weight, but also because there will be significant breakthroughs in biotechnology related both to the bird and to the feed used.

Preventing and controlling disease will be one of the greatest challenges in the 21st century. It will become one of the most

important factors that separate producers who are "survivors" and those that fail. Biotechnology advances are desperately needed in this area. Growout houses will increase in both size and capacity and will require greater investment. The farms will become larger in terms of houses per farm and number of broilers per house. As a result, disease management and pathogen levels in broilers will continue to increase in importance.

Processing plants will operate at higher speeds with fewer people. Greater emphasis will be placed on new products. The ability to find and market new products will be an important factor giving competitive companies the edge to stay in industry. There will be an increase in the number of companies supplying specialized products that have traditionally been done by small producers such as free-range, organic or natural chicken, and similar products. These markets will be modest in comparison to traditional production but will be high in dollar returns invested.

Per capita consumption of poultry will increase, but at a reduced rate. The key to increased poultry consumption will be the development of products suitable for the lower income population. There will be a more globalized production and marketing of poultry products. To be successful in the 21st century, producers must be able to adapt rapidly to changes in consumer demands. They must be constantly aware of and be ready to accept improvements in new technology that may come from biotechnology or other sources. They must be capable of making rapid decisions, and be imaginative in the development of products that fit the needs of specific consumers. The poultry industry has been a great success story over the last 50 years. It remains to be seen how it will fare in the 21st century, but I predict that it will continue to be a challenging and rewarding industry for those who work in it.