

## Prospects for India's Poultry Sector

As identified earlier in this report, several key factors are driving the recent growth of the Indian poultry sector. First, consumer demand for poultry is rising, driven by both income growth and changes in prices of poultry meat relative to other goods. Second, the structure of India's poultry market is changing. In particular, vertical integration of poultry production and marketing has lowered costs of production, marketing margins, and consumer prices of poultry meat. The future pace of vertical integration in the industry will likely affect the pace at which consumers shift from a preference for live birds to a processed (chilled or frozen) products, a shift that will enable poultry integrators to expand their market reach and scale of operations. Finally, feed availability and prices have a central role in determining costs of production and consumer prices. Addressing this factor entails assessing the potential for competitive domestic production of feeds, the impact of other sources of domestic demand for feeds, and policies affecting trade in feed ingredients.

Using a simple economic model, this section evaluates the likely role of each of these factors in the future growth in supply and demand for poultry and feeds in India. Many issues, including poor data, the uncertain dynamics of industry restructuring, and uncertain domestic and trade policies, prevent projecting the prospects for India's poultry and feed sectors with certainty. However, the analysis of the role of these major factors is intended to help identify key technical, economic, and policy variables affecting poultry sector development (table 14).

### Income Growth

Income growth is a principal force in the expansion of India's poultry industry. To isolate the impact of rising per capita incomes, supply and demand for poultry and feeds are projected under the assumption that incomes are the only driver of poultry demand. Market structure and technical efficiency in production remain as they were in 2001, and the current TRQ regime (with the quota rising to 500,000 tons in 2003 and remaining fixed thereafter) remains in place. The results, summarized in table 15 and figures 15-20 (more details in appendix 2.4), indicate that, with 4.0 percent annual growth in per capita incomes, poultry production and consumption increase 66 percent to 2.3 million tons by 2010. But with no change in market structure or technical efficiency, and with corn imports constrained by the TRQ, poultry costs of production and retail prices rise in real terms. Egg production and consumption expand more slowly than poultry, and with a sharp increase in real prices. Increased costs and prices for poultry and eggs are due to sharply higher real domestic prices for corn. Although corn output increases, imports are constrained at the 0.5-million-ton quota toward the end of the projection period, leading to higher domestic prices and slowed growth of production and consumption of poultry meat and, particularly, eggs. Growth in soybean meal exports is initially slowed by gains in domestic use, but then accelerates when constraints on corn imports begin to slow growth in poultry and egg output.

Income growth boosts demand and supply of poultry and eggs, but the analysis also suggests that higher costs associated with constraints on feed trade can lead

**Table 14—Major Indian poultry sector issues and analytical assumptions**

Issue/assumption	PCGDP growth	Industry structure		Trade policy for corn	Soybean growth
		Integration <sup>1</sup>	Efficiency (FCR)		
	Percent				Percent
Income growth	4.00	No change	No change	TRQ	2.70
Integration	4.00	75% integrated	1.79 <sup>2</sup>	TRQ	2.70
Free corn trade	4.00	No change	No change	Unrestricted	2.70
Integration & free corn trade	4.00	75% integrated	1.79 <sup>2</sup>	Unrestricted	2.70

PCGDP = Per capita gross domestic product.

<sup>1</sup>Integration includes changes in technical efficiency (FCR) and margins for inputs and products.

<sup>2</sup>FCR for poultry decreases from 1.88 in 2001 to 1.79 in 2010.

Source: ERS, USDA.

## Framework for Analyzing India's Poultry and Feed Sectors

The analytical framework incorporates supply and demand relationships for poultry meat and the two major feed ingredients, corn and soybean meal. Supply and demand relationships for eggs are also included because eggs are the other principal source of feed demand for corn and soybean meal. Poultry and egg demand are specified as functions of income and own prices. It is assumed that trade in poultry and eggs will remain negligible in the analysis, so production of each is made equal to demand. Poultry meat prices are related to costs and efficiencies in production and marketing, including costs of feed, day-old-chicks (DOC), and other costs, the profit margins for feed and DOCs, and farmer and farm-to-retail price margins. Egg prices are specified more simply as a function of feed and other costs, plus a farm-to-retail margin.

Area and yield of corn and soybeans are explained by trends and lagged own prices. Corn demand consists of food demand, still the largest segment of corn use, starch demand, and feed demand. In the absence of reliable income and price parameters, corn food and starch demand are each projected using historical trends. Corn feed use is based on levels of poultry and egg production and fixed-ration shares. Soybean

meal supply is derived from soybean production using fixed crush and extraction rates. Soybean meal demand consists of feed use based on levels of poultry and egg output and fixed-ration shares.

A key feature of the model is that the specification of corn trade and prices is flexible, depending on the trade regime and relationship between domestic and world prices. When domestic prices remain below import prices (world price plus transport and tariff), trade is zero and domestic corn prices equilibrate domestic supply and demand. When domestic prices move above import prices, corn is imported subject to tariff and quota restrictions and the domestic corn price is set by the import price. For soybean meal, since India is a significant exporter, the domestic soybean meal price is set by the world price (including appropriate margins), and exports are the residual between domestic production and feed demand.

A more complete description of the characteristics of the India poultry-feed model is provided in appendix 2.1. Model equations and variable descriptions are provided in appendix 2.2 and model data and parameters are described in appendix 2.3.

to higher real product prices that slow growth. Interestingly, in this example, the impacts of constrained feed supplies are more significant for eggs than for poultry. This is because poultry meat has a higher income elasticity of demand than eggs and is able to bid corn supplies away from egg production as incomes rise.

The results are sensitive to the assumed rate of per capita income growth. The impacts of faster (slower) income growth are, predictably, faster (slower) growth in production and consumption of products, prices, feed use, and feed import demand. With slower demand growth, the quota on corn imports is less of a constraint on the poultry and egg sectors. But with higher growth, the quota imposes its impacts earlier and more severely. Larger and smaller income- and own-price elasticities of demand for poultry meat and eggs have similar impacts on the results, but experiments within a range of plus or minus 0.3 for the elasticities did not alter the results significantly. Importantly, however, the relative impact of growth on the poultry meat and egg sectors is affected

by the differential between the income elasticities used for these products.

### Poultry Integration

Poultry integration in India is analyzed by simulating the impacts of 75 percent integration of poultry meat production across the country by 2010. Partial, as opposed to full, integration is studied because full integration may be an unrealistic assumption in a country now dominated by small-scale agriculture and regional disparities in infrastructure and development. In addition, full integration by 2010 would likely entail unrealistically rapid progress in the acceptance of chilled and frozen poultry meat. If we assume that consumer preferences and cold chain limitations will impede widespread use of chilled and frozen meat, then the marketing constraints imposed by retailing of live birds may also slow the progress of vertical integration.

**Table 15—Selected results of India poultry-feed sector analysis**

Variable	Change over base year in 2010				Difference from income growth scenario in 2010		
	Income growth	Integration	Free corn trade	Integ. and free trade	Integration	Free corn trade	Integ. and free trade
	<i>Percent</i>						
<b>Poultry:</b>							
Production and consumption	66.2	98.5	84.4	122.2	19.4	11.0	33.7
Producer price	31.8	22.8	14.9	0.9	-6.8	-12.8	-23.5
Retail price	19.4	1.2	9.1	-12.2	-15.3	-8.6	-26.5
Farm-retail margin	0.0	-32.7	0.0	-32.7	-32.7	0.0	-32.7
<b>Eggs:</b>							
Production and consumption	16.8	9.8	36.5	36.5	-6.1	16.9	16.9
Retail price	36.1	43.2	16.4	16.4	5.2	-14.5	-14.5
<b>Corn:</b>							
Production	22.6	24.8	19.4	19.5	1.8	-2.6	-2.6
Wholesale price	145.7	177.1	58.3	58.3	12.8	-35.6	-35.6
Feed use	36.5	41.7	55.6	66.8	3.8	14.0	22.2
Poultry	66.2	89.8	84.4	112.4	14.2	11.0	27.8
Imports	--	--	--	--	0.0	224.0	317.6
(2010 level, mil. tons)	0.5	0.5	1.6	2.1	0.5	1.6	2.1
<b>Soybean meal:</b>							
Consumption	39.9	47.2	59.0	72.1	5.2	13.6	23.0
Exports	20.5	16.6	10.4	3.4	-3.2	-8.4	-14.2

Note: More complete results are reported in appendix table 2.4.

-- = Not applicable.

Source: ERS India poultry-feed model.

The impacts of poultry integration, simulated assuming the same 4-percent per capita income growth and trade regime of the income growth scenario, include significantly faster expansion of production and consumption of poultry meat than in the reference scenario, along with smaller increases in real costs and prices. Improved technical efficiency and smaller margins on DOCs and feed inputs limit the rise in production costs and, together with a smaller retail margin, lead to lower retail poultry prices (fig. 17) than with income growth alone.<sup>15</sup> However, with the corn TRQ remaining in effect, corn imports are constrained and domestic corn prices rise and even more corn feed is bid away from egg production. As a result, egg production and consumption are significantly lower (fig. 16), and real prices higher (fig. 18),

<sup>15</sup> The impacts of vertical integration are simulated by adjusting the technical efficiency (FCR) parameter and the size of the three key margins affected by integration: the margins on feed, DOCs, and retailing (see appendix 2.3). The approach used assumes that the current integrated operations reflect the average levels of technical and marketing efficiency that can be achieved nationally. Implicitly, it is expected that additional future gains in efficiency by some integrators, say, in the South and West, will balance inherent relative inefficiencies in others, particularly in the North.

than with income growth alone. Impacts on egg trade are not evaluated in the analytical framework. The large increases in real domestic egg prices that occur in the integration (and the income growth) scenario would likely reduce egg exports, but egg imports may continue to be constrained by the 40-percent tariff.

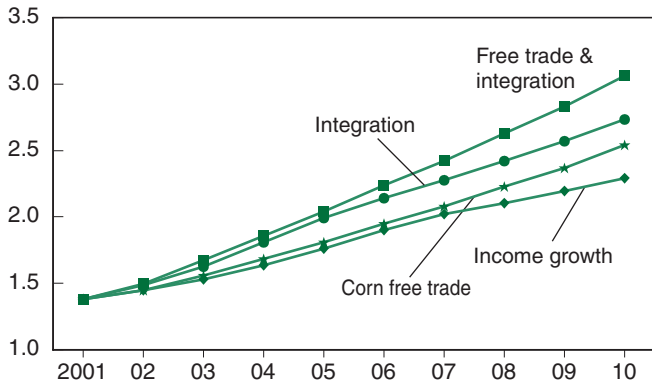
The process of integration helps reduce poultry production costs by increasing technical efficiency and eliminating the margins on feed and DOCs that nonintegrated producers must pay outside suppliers (fig. 21). However, in the analysis, these efficiency gains are mostly offset by higher corn prices when the TRQ restricts imports and domestic corn prices rise. Impacts of integration on poultry retail prices are more significant because of the reduction in the traditionally large farm-retail margins in India (fig. 22). Significant reductions in this margin have, so far, been associated with the establishment and influence of integrated producers in southern Indian markets.

With integration, growth in poultry and feed demand is faster than if income growth alone is driving the sector, and corn imports rise to the 0.5-million-ton TRQ sooner in the projection period (fig. 19).

Figure 15

**Poultry production and consumption under alternative scenarios**

Mil. tons

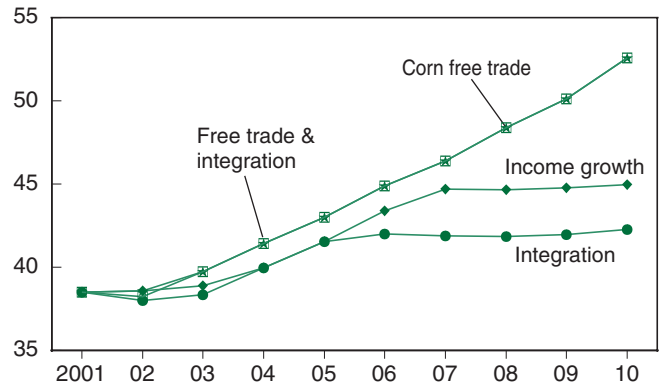


Source: ERS India poultry-feed model.

Figure 16

**Egg production and consumption under alternative scenarios**

Bil. eggs

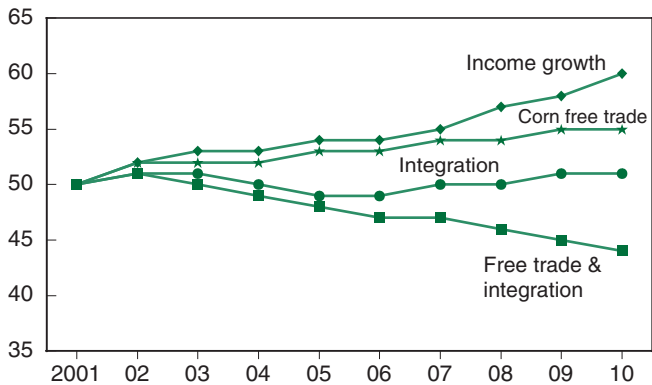


Source: ERS India poultry-feed model.

Figure 17

**Poultry retail prices under alternative scenarios**

Rupees/kg.

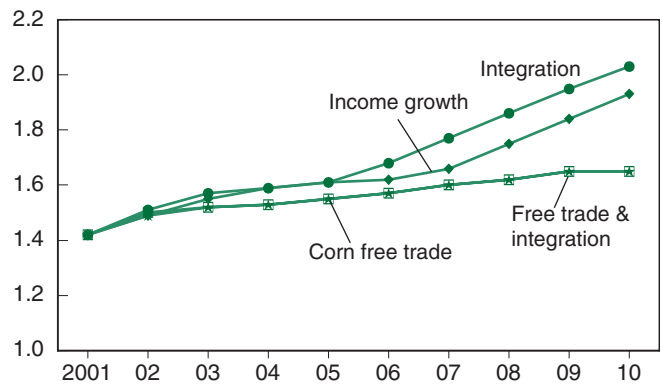


Source: ERS India poultry-feed model.

Figure 18

**Egg retail prices under alternative scenarios**

Rupees/egg

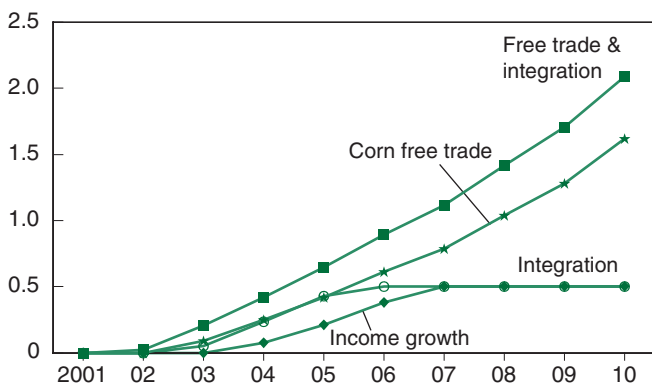


Source: ERS India poultry-feed model.

Figure 19

**Corn imports under alternative scenarios**

Mil. tons

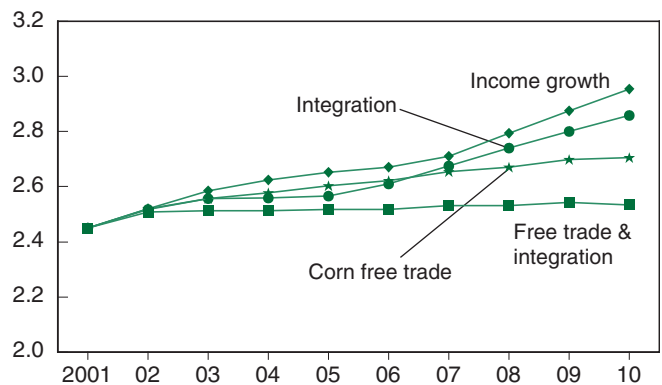


Source: ERS India poultry-feed model.

Figure 20

**Soybean meal exports under alternative scenarios**

Mil. tons

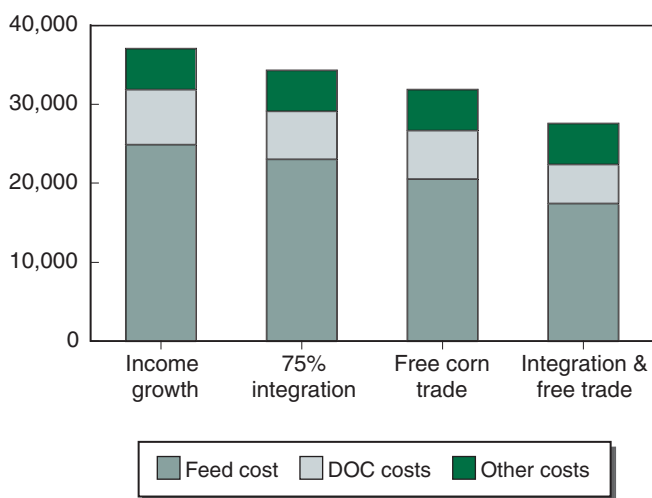


Source: ERS India poultry-feed model.

Figure 21

### Poultry costs of production by scenario

Rs/ton, live weight in 2010

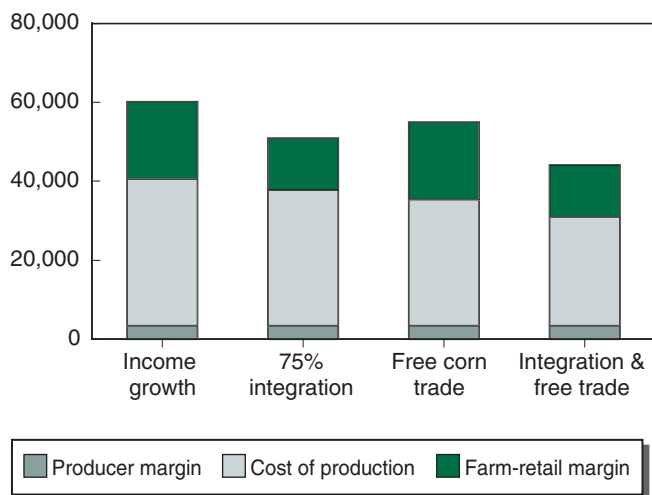


Source: ERS India poultry-feed model.

Figure 22

### Poultry retail prices by scenario

Rs/ton, live weight in 2010



Source: ERS India poultry-feed model.

Although domestic corn production increases in response to higher domestic prices, real corn prices are sharply higher than in the income growth scenario. For poultry meat, the impact of higher corn prices on costs and prices is more than offset by the efficiency gains associated with integration. The egg industry, however, experiences higher costs, and reduced production and consumption, when the poultry meat sector becomes more efficient under integration. Soybean meal exports decline marginally, compared with the income growth-

only scenario (fig. 20), as increased poultry feed demand is partially offset by reduced demand from egg producers.

## Corn Trade Liberalization

Elimination of all tariff and quota restrictions on Indian corn imports would potentially reduce feed prices for poultry and egg producers by allowing corn to be imported freely at the world price. With full liberalization (zero tariff and no quota beginning in 2002) of corn trade, and assuming income growth of 4 percent per capita and no further market integration, poultry production and consumption rise faster than when income growth alone drives the sector (fig. 15). The impacts of corn free trade on sector growth are, however, not as significant as integration. Lower corn prices associated with free trade lead to a relatively large reduction in poultry production costs but, in the absence of further integration, farm-retail margins and retail prices for poultry remain relatively high and there are smaller gains in poultry consumption and production. Perhaps the key impact of corn free trade is that, with corn readily available at the world price, egg production costs and retail prices are kept in check (fig. 18), and egg production (fig. 16) and consumption are sharply higher than when trade restrictions are in place.

With free trade limiting the increase in domestic corn prices, growth in corn output is slower than when trade is restricted, but the loss in corn production is relatively small (about 3 percent). Corn imports rise to 1.6 million tons by 2010, mostly because of increased feed demand rather than lower corn production (fig. 19). With corn free trade leading to higher poultry and egg feed use, soybean meal exports are lower than when corn imports are restricted.

The analysis of corn free trade demonstrates that the availability and price of a major feed ingredient, namely corn, can have a significant impact on growth in production and feed demand by the poultry and egg sectors. These results can, however, be influenced by analytical assumptions regarding such factors as the amount of substitution between feeds, substitution between feed and nonfeed uses of corn, and the growth in domestic corn production. These issues are examined below:

- ◆ *Feed substitution.* This analysis assumes that both corn and soybean meal maintain fixed shares in poultry and egg rations that do not change with rela-

tive prices. These assumptions could lead the analysis to overstate the impacts on demand for corn and soybean meal, but two factors suggest that the assumptions are appropriate. First, the assumed ration shares for poultry (55 percent for corn and 20 percent for soybean meal) are significantly below the averages (60 percent and 29 percent) provided by integrated producers in the field survey. The assumptions for egg producers are also below those provided by informed sources. Thus, some scope for substitution is already built into the assumptions. Second, the integrated producers contacted during the field survey stated a strong preference for maintaining corn and soybean meal rations regardless of the price of competing feeds.<sup>16</sup>

- ◆ *Nonfeed use of corn.* By using fixed trends to project corn food use, the analysis does not account for the possibility that rising corn feed demand can be met by domestic corn that is bid away from food use rather than imports. However, to address this possibility, the assumed rate of decline in food use is set at -0.8 percent per year, faster than the observed rate for 1995-2002.
- ◆ *Corn production.* Faster growth in domestic corn output could also moderate domestic price increases, help meet feed demand, and reduce import needs. With the assumptions used, corn production responds to trends and prices, rising 2.3 percent annually in the income growth scenario, 2.5 percent in the integration scenario, and 2.0 percent in the scenarios involving corn free trade. These rates are slower than actual growth of about 2.8 percent annually between 1990 and 2001 but seem reasonable for what might be sustained under predominantly rainfed conditions.

## Integration and Corn Trade Liberalization

Income growth, integration, and corn free trade each have significant impacts on India's poultry sector growth, and, jointly, their impact is even more signifi-

---

<sup>16</sup> Perhaps the key factor that could force a change in established substitution patterns would be a GOI decision to begin releasing some of its large surpluses of wheat and rice, which include significant amounts of damaged grain, for domestic feed use. This grain would have to be heavily subsidized to be comparable in price to corn and, so far, the GOI has not released stocks for feed use, in part because of concern with undermining market prices and extending subsidies to feed millers. However, the wheat and rice surplus is very large relative to total feed use and the release of relatively small amounts could easily meet any feed shortages for the foreseeable future.

cant. When the impacts of 4-percent per capita income growth, 75-percent integration of the poultry industry, and corn free trade are combined, poultry meat production and consumption are substantially higher, and production costs and prices substantially lower, than when the changes are introduced separately. In addition, as in the corn free trade scenario, the availability of corn at world prices prevents the adverse impacts on the egg sector associated with income growth and poultry integration, allowing relatively large increases in egg production and consumption and low prices.

With relatively high levels of both poultry meat and egg production, feed use of corn and soybean meal is higher than when the changes are introduced separately. For corn, high feed demands combined with a smaller increase in domestic production when domestic prices are linked directly to world prices, pushes corn imports to about 2.1 million tons in 2010, highest of any of the scenarios. Higher domestic demand limits soybean meal net exports to 2.5 million tons in 2010, the lowest of the scenarios.

The results confirm that economic growth, industry restructuring in the form of vertical integration, and trade policy on key inputs can combine to have a major impact on domestic supply, demand, and prices in India's poultry industry. Economic growth is an important driver of industry expansion, but the pace and extent of vertical integration and the cost and availability of key inputs are at least as important.

The model used in the analysis does not provide estimates of the overall impacts of the scenarios on producer and consumer welfare within the sector, or for India's economy as a whole. It appears clear, however, that the cost-reducing impacts of the process of vertical integration and of providing low-cost feeds carry significant benefits for poultry meat consumers in the form of increased availability at lower prices. Consumers of eggs, while potentially facing significantly higher prices as a side effect of the process of poultry integration in the presence of corn trade restrictions, also benefit from lower prices and increased availability when corn trade restrictions are eased. Similarly, consumers of corn for food or in the starch industry face higher prices as a side effect of poultry integration, unless corn trade restrictions are also eased.

Impacts on producers of poultry, eggs, and corn are more ambiguous. Poultry producers and traders may

earn smaller margins in an integrated industry but may also benefit from increased scale and, in the case of contract growers, reduced risk and greater access to technology and credit. Egg producers, while potentially losing when vertical integration of poultry meat production raises feed costs, would also gain if corn trade barriers were lifted. Domestic corn producers would tend to benefit from increased demand, prices, and output associated with income growth and poultry integration but face lower prices and slower output growth if corn trade barriers are eased.

Thus, the combination of vertical integration and corn free trade that appears to yield the maximum benefits to consumers of poultry, eggs, and corn, and also supports expansion of poultry and egg production, carries the potential for at least partially offsetting losses to corn producers. Avoiding any adverse impacts would require India's corn producers to adopt new technology that would permit their production to be competitive with imports, or to shift some portion of their land to a more competitive crop. In this event, the process of poultry industry expansion and integration would appear to carry potential gains for all producers and consumers.