

Appendix 2.3—India Poultry-Feed Model: Model Data and Parameters

The data and parameters used in the analysis are based on firm-level data collected during field research, available literature, secondary data and, in several cases, expert judgment. The base year for the 10-year projections is 2001, and the data used for model variables are summarized in appendix table 2.3A, while economic parameters are summarized in appendix 2.3B. Key data sources are summarized below:

Poultry supply and use. Production (dressed weight basis) is based on industry average estimates in appendix table 1.2. Poultry trade and stocks are assumed to be negligible, so consumption is set equal to production. Conversion to live weight is based on a dressing rate of .75 typical for the Cobb 100 breed.

- ◆ *Egg supply and use.* Based on USDA estimates.
- ◆ *Feed supply and use.* Based on USDA estimates.
- ◆ *Poultry price, marketing margins, cost of production, and technical data.* These data are based on weighted regional average data collected during the 2001 ERS field survey. Regional weights (South .50, North: .20; West: .15, East: .15) are based on 2001 population data and expert judgment regarding per capita consumption by region. Price and margin data collected in the West and South region during the 2001 survey indicated negative producer margins and were judged to be atypically low due to seasonal and other factors. Based on re-interviews with several key sources, these data were revised to incorporate a more typical and sustainable producer margin of 5 percent.

Technical and margin assumptions used to analyze the impacts of poultry integration are based on field survey data and analysts' judgment, and are summarized in appendix table 2.3C.

- ◆ *Feed price data.* Domestic corn prices are the average of wholesale prices for Bihar, Karnataka, and Uttar Pradesh published by the GOI. Domestic soybean meal prices are based on international prices, adjusted for estimated freight and handling costs. Projected world prices of corn and soybean meal, and the exchange rate for the rupee, are based on the 2002 USDA baseline projections.

Technical and economic parameters were based on findings from the field research, as well as expert judgment. In some cases, the choice of parameters was also motivated by the objective of replicating the base year (2001) levels of the endogenous variables. The initial choice of income elasticities of demand—1.7 for poultry and 1.25 for eggs—is higher than reported in table B-1 on page 7, but more consistent with the base period data. Also, it is reasonable that the preferences for poultry and eggs, and perhaps also dairy, may be relatively high in India due to weak preferences for some other products, including pork and beef.

The parameters for the corn area and yield equations result in supply elasticities of 0.04 and 0.28 in the short run and the long run, respectively, and are based on Kumar and Rosegrant (1993). Soybean area and yield growth rates of 1.7 percent and 1.0 percent, respectively, are taken from the USDA baseline projections.

Appendix table 2.3A—Base values for India poultry-feed model

Variable	Unit ¹	Base value	Variable	Unit ¹	Base value
COArea	1,000 ha.	6,700	PLDOCCOP	Rs/ton, live wght	4,352
CODemand _F	1,000 tons	4,500	PLDOCmargin	Rs/ton, live wght	1,088
CODemand _{ST}	1,000 tons	1,100	PLDresspercent	Percent	75
CODemand _{SW}	1,000 tons	2,172	PLFCR	Feed/live wght prod. ¹	2.22
CODemand _T	1,000 tons	12,000	PLFeedcost	Rs/ton, live wght	16,633
COHandling _{BF}	Rs/ton	800	PLFeedmargin	Rs/ton, live wght	1,533
COMargin _{FW}	Rs/ton	1,334	PLFeeduse _{CO}	1,000 tons	1,686
CONetimports	1,000 tons	0	PLFeeduse _{SM}	1,000 tons	613
COPrice _F	Rs/ton	3,516	PLMargin _F	Rs/ton	3,437
COPrice _W	Rs/ton	4,850	PLMargin _{FR}	Rs/ton	19,608
COProd	1,000 tons	12,000	PLOther	Rs/ton, live wght	5,199
COTariff _{AQ}	Percent	50	PLPrice _F	Rs/ton	30,709
COTariff _Q	Percent	15	PLPrice _R	Rs/ton	50,317
COTR _Q	1,000 tons	400	PLProd _L	1,000 tons	1,379
COYield	Tons/ha.	1.791	PLRS _{CO}	Percent	55
EGDemand	Million eggs	38,511	PLRS _{SM}	Percent	20
EGFCR	Kgs/egg	0.139	Seedwastepercent _{CO}	Percent	18
EGFeeduse _{CO}	1,000 tons	2,543	SBArea	1,000 ha.	6,000
EGFeeduse _{SM}	1,000 tons	696	SBCrush	1,000 tons	4,759
EGMargin _{FR}	Rs/egg	0.25	SBCrushshare	Percent	85
EGPrice _R	Rs/egg	1.42	SBProd	1,000 tons	5,600
EGProd	Million eggs	38,511	SBYield	Tons/ha.	0.933
EGRS _{CO}	Percent	47.5	SMDemand _T	1,000 tons	1,309
EGRS _{SM}	Percent	13.0	SMExtractionrate	Percent	79
EGOthercost	Rs/egg	0.150	SMHandling	Rs/ton	65
OFCost _{PL}	Rs/ton	2,476	SMNetexports	1,000 tons	2,451
PCGDP	Rs /capita	22,128	SMPPrice _B	Rs/ton	8,305
PLCOP	Rs/ton, live wght	27,272	SMPPrice _W	Rs/ton	8,240
PLDemand _L	1,000 tons, live wght	1,379	SMPProd	1,000 tons	3,760
PLDOCcost	Rs/ton, live wght	5,440			

¹DOC plus grow-out.

Source: ERS field survey, August 2001.

Appendix table 2.3B—Parameters and elasticities for India poultry-feed model

Equation & coefficient	Elasticity	Parameter
Poultry demand equation:		
PLPrice _R (PL ¹)	-1.3	-49
PCGDP (PL ²)	1.7	148
Constant	--	0.544
Poultry cost equations:		
PLDOCOthercost _{t-1}	--	1.00
POthercost _{t-1}	--	1.00
OFCostPL _{t-1}	--	1.00
Egg demand equation:		
EGPrice _R (EG ¹)	-1.00	-27,113
PCGDP (EG ²)	1.25	2.17
Constant (cZ ₂)	--	28.89
Corn supply equations:		
Area:		
COArea _{t-1} (CO ¹)	0.436	0.436
COPrice _{F,t-1} (CO ²)	0.031	60
Constant	--	3.67
Yield:		
COPrice _F (CO ³)	0.010	5.30E-06
COYield _{t-1} (CO ⁴)	--	1.005
Corn demand equations:		
CODemand _{FD,t-1}	--	0.992
CODemand _{ST,t-1}	--	1.100
Soybean and meal equations:		
SBArea _{t-1}	--	1.017
SBYield _{t-1}	--	1.010
SMDemand _{FD,t-1}	--	1.00

-- = Not applicable.

Source: ERS, USDA.

Appendix table 2.3C—Technical parameter and margin adjustments for analysis of poultry integration

Parameter/margin	Unit	Base value		2010 value
		Average producer	Integrated producers	
FCR (growout only)	Ratio	1.88	1.75	1.79
DOC margin	Rs/ton, live wght	1,088	0	272
Feed margin	Rs/ton, live wght	1,533	0	383
Farm-retail margin	Rs/ton, live wght	19,608	11,060	13,197

Source: ERS, USDA.

Appendix table 2.4—India poultry-feed model: Detailed results

Variable	Unit	Base				Scenario projections for 2010				Change over base year in 2010				Change over reference in 2010			
		year 2001	Reference	75% integration	Free corn trade	75% integration	Free corn trade	75% integration	Free corn trade	Reference	75% integration	Free corn trade	75% integration	Free corn trade	75% integration	Free corn trade	
Poultry:																	
Production	Mil. tons, live wt.	1.4	2.3	2.7	2.5	3.1	66.2	98.5	84.4	122.2	19.4	11.0	33.7				
Producer price	Rs/ton, live wt.	30,709	40,478	37,708	35,297	30,974	31.8	22.8	14.9	0.9	-6.8	-12.8	-23.5				
Cost of production	Rs/ton, live wt.	27,272	37,041	34,271	31,860	27,537	35.8	25.7	16.8	1.0	-7.5	-14.0	-25.7				
FCR (grow-out)	Rs/ton, live wt.	1.88	1.88	1.79	1.88	1.79	0.0	-5.2	0.0	-5.2	-5.2	0.0	-5.2				
Feed cost (grow-out)	Rs/ton, live wt.	16,633	24,907	23,059	20,519	17,403	49.7	38.6	23.4	4.6	-7.4	-17.6	-30.1				
Feed price	Rs/ton	8,833	13,227	12,915	10,897	9,747	49.7	46.2	23.4	10.3	-2.4	-17.6	-26.3				
DOC cost	Rs/ton, live wt.	5,440	6,936	6,013	6,143	4,935	27.5	10.5	12.9	-9.3	-13.3	-11.4	-28.8				
Misc. cost	Rs/ton, live wt.	5,199	5,199	5,199	5,199	5,199	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Consumption	Mil. tons, live wt.	1.4	2.3	2.7	2.5	3.1	66.2	98.5	84.4	122.2	19.4	11.0	33.7				
Retail price	Rs/kg, live wt.	50.3	60.1	50.9	54.9	44.2	19.4	1.2	9.1	-12.2	-15.3	-8.6	-26.5				
Farm-retail margin	Rs/ton, live wt.	19,608	19,608	13,197	19,608	13,197	0.0	-32.7	0.0	-32.7	-32.7	0.0	-32.7				
Corn:																	
Production	Million tons	12.0	14.7	15.0	14.3	14.3	22.6	24.8	19.4	19.5	1.8	-2.6	-2.6				
Area	Million ha.	6.7	6.9	6.9	6.8	6.8	2.7	3.4	1.7	1.7	0.7	-1.0	-1.0				
Yield	Tons/ha.	1.79	2	2	2	2	19.4	20.7	17.5	17.5	1.1	-1.6	-1.6				
Wholesale price	Rs/ton	4,850	11,915	13,437	7,678	7,678	145.7	177.1	58.3	58.3	12.8	-35.6	-35.6				
Consumption	Million tons	12.0	15.2	15.5	16.0	16.4	26.8	29.0	33.0	36.9	1.7	4.9	8.0				
Feed use	Million tons	4.2	5.8	6.0	6.6	7.1	36.5	41.7	55.6	66.8	3.8	14.0	22.2				
Poultry	Million tons	1.7	2.8	3.2	3.1	3.6	66.2	89.8	84.4	112.4	14.2	11.0	27.8				
Eggs	Million tons	2.5	3.0	2.8	3.5	3.5	16.8	9.8	36.5	36.5	-6.1	16.9	16.9				
Food	Million tons	4.5	4.2	4.2	4.2	4.2	-7.0	-7.0	-7.0	-7.0	0.0	0.0	0.0				
Starch	Million tons	1.1	2.6	2.6	2.6	2.6	135.8	135.8	135.8	135.8	0.0	0.0	0.0				
Seed, waste, other	Million tons	2.2	2.7	2.7	2.6	2.6	22.6	24.8	19.4	19.5	1.8	-2.6	-2.6				
Imports	Million tons	0.0	0.5	0.5	1.6	2.1	--	--	--	--	0.0	224.0	317.6				
Soybean meal:																	
Consumption	Million tons	1.3	1.8	1.9	2.1	2.3	39.9	47.2	59.0	72.1	5.2	13.6	23.0				
Wholesale price	Rs/ton	8,240	10,781	10,781	10,781	10,781	30.8	30.8	30.8	30.8	0.0	0.0	0.0				
Exports	Million tons	2.5	3.0	2.9	2.7	2.5	20.5	16.6	10.4	3.4	-3.2	-8.4	-14.2				
Eggs:																	
Production	Billion eggs	38.5	45.0	42.3	52.6	52.6	16.8	9.8	36.5	36.5	-6.1	16.9	16.9				
Consumption	Billion eggs	38.5	45.0	42.3	52.6	52.6	16.8	9.8	36.5	36.5	-6.1	16.9	16.9				
Retail price	Rs/egg	1.42	1.93	2.03	1.65	1.65	36.1	43.2	16.4	16.4	5.2	-14.5	-14.5				

Source: ERS India poultry-feed model.