

# METHODOLOGICAL ANNEX 1

## SOURCES OF INFORMATION AND METHODOLOGY FOR CALCULATION OF FTA IMPACT

### 1. Paddy Rice

Domestic Prices without FTA: Price to producer of green paddy rice. Source FEDEARROZ (the Colombian rice growers' federation)

International prices: Implicit FOB export prices from United States to the rest of the world, for paddy rice in husk (subheading 1006.10.0000: Rice in the Husk). Source: Foreign Agricultural Service (FAS), United States Department of Agriculture (USDA).

Maritime Freight: 25 USD per ton from US port to Colombian port. Source: FENALCE (the Colombian national federation of cereal and legume growers) freightage used in formulas for parity prices of cereal imports.

Port charges: 8 USD per ton for port services. Source: FENALCE, charges used in formulas for parity prices for import of grain in bulk.

Domestic Freight: Assuming that the imported product arrives in zones with higher participation in the milling industry, the share of each rice producing zone in milling was calculated. The data on rice production is obtained from the rice growing census of 2007 (*Censo Arrocerero del Año 2007*), produced by FEDEARROZ and DANE, to determine the volume and share in production of the rice producing zones. Based on consultations with experts the following assumptions were made:

- All the Coastal zone production of rice in husk is taken to mills in that zone
- 50% of the production of the two departments of Santander (Santander and North Santander) is processed in the mills of Bucaramanga, and 50% is processed in those of Cúcuta.
- 60% of the production of the Eastern plains is processed in the plains area, and 40% in Tolima (central zone).
- All the production of the central zone is processed in the central zone (principally Tolima).
- The production of the lower Cauca area is processed in Córdoba, in Montería and Sahagun.

Thus, with the weighting for production, and based on the preceding suppositions, the participation of each zone in milling is established.

Finally, using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (*Resolución 3175 August 2008*), the average Colombian freightage is calculated, weighting the freightage from Buenaventura to Ibagué and the

Eastern plains, and from Barranquilla to the two departments of Santander and the Atlantic coast, by the participation noted.

Conversion factors: To transform the international dry paddy rice price to that of green paddy rice, the following information is used:

- The conversion factor for dry to green paddy rice is 84.6%. That is: to obtain a ton of dry paddy rice 1.18 tons of green paddy rice must be taken to the mill. Source: double discount table.
- The present cost of drying and cleaning at the rice mills in Colombia is 40,000 COP per ton on average. Source: consultation with rice millers of Meta.

Domestic prices with the FTA: It is assumed that the price with the FTA will be equal to the tariff free cost of importing from the United States, applying the following formula.

$$P_{TLC} = [P_{FOB} + FM + GP] \times TRM + FI - CS \times FC$$

In which  $P_{FOB}$  is the US FOB world export price, FM is the maritime freightage, GP is port charges, TRM is the representative market exchange rate, FI is the domestic freightage, CS is the cost of drying, FC is the conversion factor for dry paddy to green paddy.

Supply Function: The following models were used to evaluate the response in supply of paddy rice to variations in the price to producers. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in the previous year ( $P_{t-1}$ ), the area cultivated in the previous year ( $A_{t-1}$ ), and the production of the previous year ( $Q_{t-1}$ ).

$$\text{Production: } \ln Q_t = 1.69 + 1.28 \times \ln P_{t-1} + 1.7 \times \ln Q_{t-1}$$

$$\text{Area: } \ln A_t = 1.24 + 1.33 \times \ln P_{t-1} + 1.65 \times \ln A_{t-1}$$

Assuming that, in the long term, the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } \ln Q_t = 2.33 + 0.93 \times \ln P_t$$

$$\text{Area: } \ln A_t = 0.69 + 0.94 \times \ln P_t$$

By substituting the domestic prices with and without FTA in the above functions the estimated level of production and area cultivated is obtained for each scenario.

$$\text{Producción: } \ln Q_t = 2.33 + 0.93 \times \ln P_t$$

$$\text{Área: } \ln A_t = 0.69 + 0.94 \times \ln P_t$$

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), ***La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos***. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

## 2. Yellow Maize

Domestic Prices without FTA: Wholesale price of yellow maize in hull, simple average of the values in the four principal cities of Colombia: Bogotá, Medellín, Cali, and Barranquilla. Source: *CCI – SIPSA* (agricultural price information system)

International Prices: CIF reference price from the price band for yellow maize (subheading 10.05.90.11). Source: *SGCAN* (General Secretary of the Andean Nations Community)

Port Charges: 8 USD per ton for port services. Source: FENALCE, expenses used in the formulas for import parity prices for yellow maize and bulk grains.

Domestic Freight: The data of the chamber of balanced feeds of the National Business Association of Colombia *ANDI*, was used to establish the national distribution of production of balanced feeds as a proxy for the demand in raw materials for these, maize being the main imported raw material.

The average domestic freightage is calculated using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008), weighting the freight costs from Buenaventura to Bogotá, Medellín and Cali, and from Barranquilla to Bucaramanga and the Atlantic Coast region by the participation of these centers.

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = (P_{CIF} + GP) \times TRM + FI$$

Where  $P_{CIF}$  is the CIF reference price from the United States, GP is port charges, TRM is the representative market exchange rate, and FI is domestic freightage.

Supply Function: The following models were used to evaluate the response in the supply of yellow maize to variations in prices to the producer. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in the previous year ( $P_{t-1}$ ), the area cultivated in the previous year ( $A_{t-1}$ ), the production of the previous year ( $Q_{t-1}$ ), a variable dummy ( $D_{1970-86}$ ) which takes the value 1 from the year 1970 to 1986 and 0 in the remaining years, and another variable dummy ( $D_{1998}$ ), that takes the value of 1 in the year 1998 and 0 in other years.

$$\text{Production: } \ln Q_t = 1.07 + 0.22 \times \ln P_{t-1} + 0.50 \times \ln Q_{t-1} - 0.18 \times D_{1970-86} - 0.31 \times D_{1998}$$

$$\text{Area: } \ln A_t = 2.56 + 0.19 \times \ln P_{t-1} + 0.62 \times \ln A_{t-1} - 0.06 \times D_{1970-86} - 0.27 \times D_{1998}$$

Assuming that in the long term the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } \ln Q_t = 8.11 + 0.45 \times \ln P_t$$

$$\text{Area: } \ln A_t = 6.81 + 0.51 \times \ln P_t$$

By substituting the domestic prices with and without FTA in the above functions, the estimated level of production and area cultivated is obtained for each scenario. It should be noted that, although the supply function was estimated based on the average prices of yellow maize and white maize, in the case of the exercise calculating the impact of the FTA, the same function is used separately for each product with its corresponding price.

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), *La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos*. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

### 3. White Maize

Domestic Prices without FTA: Wholesale price of white maize in hull, simple average of the values in the four principal cities of Colombia: Bogotá, Medellín, Cali, and Barranquilla. Source: *CCI – SIPSA*.

International Prices: CIF reference price from the price band for white maize (subheading 10.05.90.12). Source: *SGCAN*.

Port Charges: 8 USD per ton for port services. Source: FENALCE, expenses used in the formulas for import parity prices for yellow maize and bulk grains.

Domestic Freight: It was assumed that the imported product would arrive at Bogotá and Medellín, 50% at each of these cities. Medellín was chosen because the greater part of the milling industry for the manufacture of cornmeal rolls (arepas) is there. It is also the city of reference for the formation of the domestic price. The principal industries of maize and other derivatives, for example precooked maize flour, are in Bogotá.

The average domestic freight costs are calculated using the freightage per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008), weighting the freightage from the port of Buenaventura to Bogotá and Medellín by the participation noted above.

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = (P_{CIF} + GP) \times RM + FI$$

Where  $P_{CIF}$  is the CIF reference price from the United States, GP is port charges, TRM is the representative market exchange rate, and FI is domestic freightage.

Supply Function: The following models were used to evaluate the response in the supply of white maize to variations in prices to the producer. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in the previous year ( $P_{t-1}$ ), the area cultivated in the previous year ( $A_{t-1}$ ), the production of the previous year ( $Q_{t-1}$ ), a variable dummy ( $D_{1970-86}$ ) which takes the value 1 from the year 1970 to 1986, and 0 in the remaining years, and another variable dummy ( $D_{1998}$ ), that takes the value of 1 in the year 1998 and 0 in other years.

$$\text{Production: } LnQ_t = 1.07 + 0.22 \times \ln P_{t-1} + 0.50 \times \ln Q_{t-1} - 0.18 \times \lambda_{1976-6} - 0.31 \times \lambda_{1998}$$

$$\text{Area: } LnA_t = 2.56 + 0.19 \times \ln P_{t-1} + 0.62 \times \ln A_{t-1} - 0.06 \times \lambda_{1976-6} - 0.27 \times \lambda_{1998}$$

Assuming that in the long term the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } LnQ_t = 8.11 + 0.45 \times \ln P_t$$

$$\text{Area: } LnA_t = 6.81 + 0.51 \times \ln P_t$$

By substituting the domestic prices with and without FTA in the above functions, the estimated level of production and area cultivated is obtained for each scenario. It should be noted that, although the supply function was estimated based on the average prices of yellow maize and white maize, in the case of the exercise calculating the impact of the FTA, that function is used separately for each product with its corresponding price.

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), ***La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos***. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

#### 4. Sorghum

Domestic Prices without FTA: Average price of the transactions reported in the National Agricultural Exchange for sorghum grain. Source: *CCI – SIPSA*

Domestic prices with the FTA: It is assumed that the price with the FTA will be equivalent to the price without FTA reduced by the percentage change in prices of yellow maize with the FTA, given the substitution of these two products in the composition of animal feeds.

$$P_{TLC} = P_{OBS} \times (1 + \lambda \frac{MAÍZ AM}{TLC})$$

Supply Function: The following models were used to evaluate the response in the supply of sorghum to variations in prices to the producer. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in the previous year ( $P_{t-1}$ ), the area cultivated in the previous year ( $A_{t-1}$ ), the production of the previous year ( $Q_{t-1}$ ), and a variable dummy ( $D_{1998}$ ), that takes the value of 1 in the year 1998, and 0 in other years.

$$\text{Production: } LnQ_t = 0.22 \times \ln P_{t-1} + 0.78 \times \ln Q_{t-1} - 0.62 \times \lambda_{1998}$$

$$\text{Area: } LnA_t = 0.14 \times \ln P_{t-1} + 0.86 \times \ln A_{t-1} - 0.57 \times \lambda_{1998}$$

Assuming that in the long term the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } LnQ_t = 1.02 \times \ln P_t$$

$$\text{Area: } LnA_t = 0.95 \times \ln P_t$$

By substituting the domestic prices with and without FTA in the above functions, the estimated level of production and area cultivated is obtained for each scenario.

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), *La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos*. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

## 5. Wheat

Domestic Prices without FTA: Price arranged by agreement between producers and the milling industry, simple annual average of half yearly prices. Source: IDEMA and Trigonal S.A.

International Prices: CIF reference price from the price band for wheat (subheading 10.01.10.90). Source: *SGCAN*.

Port Charges: 8 USD per ton for port services. Source: FENALCE, expenses used in the import parity price formulas for yellow maize and bulk grains.

Domestic Freight: It is assumed that the imported product would arrive at the milling center nearest to the production zone. Thus the production of the Cundinamarca - Boyacá Savannah, accounting for 20% of national wheat production, is milled in Bogotá, while the production of Nariño, accounting for 80% nationally, is milled in Cali.

The average domestic freight costs are calculated using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008), weighting the freight costs from the port of Buenaventura to Bogotá and Cali by the participation noted above.

Likewise, the average freightage is calculated for the domestic product (from the production zone to the consumption zone) weighting the freight costs from Duitama to Bogotá and from Pasto to Cali by the participations noted above.

Quality Adjustment Factor: taking into account the fact that dry domestic wheat normally has a humidity of 15% and 3% of impurities, while imported wheat arrives at the mills with 13% humidity and 1% of impurities, a quality adjustment factor of 4% is applied for domestic wheat (2% for humidity and 2% for impurities).

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = P_{CIF} + GP + TRM + FI - FZP \times (1 - FAC)$$

Where  $P_{CIF}$  is the CIF reference price from the United States, GP is port charges, TRM is the representative market exchange rate, FI is domestic freightage from the port to the consumer zone, FZP is domestic freightage from the production zone to the consumer zone, and FAC is the quality adjustment factor.

Supply Function: To evaluate the response in the supply of wheat to variations in prices to the producer, the following models were used. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in the previous year ( $P_{t-1}$ ), the area cultivated in the previous year ( $A_{t-1}$ ), and the production of the previous year ( $Q_{t-1}$ ).

$$\text{Production: } \ln Q_t = -0.61 + 1.43 \times \ln P_{t-1} + 1.81 \times \ln Q_{t-1}$$

$$\text{Area: } \ln A_t = -0.24 + 1.38 \times \ln P_{t-1} + 1.92 \times \ln A_{t-1}$$

Assuming that, in the long term, the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } \ln Q_t = -19.25 + 2.29 \times \ln P_t$$

$$\text{Area: } \ln A_t = -55.80 + 5.01 \times \ln P_t$$

The estimated level of production and area cultivated is obtained for each scenario by substituting the domestic prices with and without FTA in the above functions

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), ***La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos***. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

## 6. Beans

Domestic Prices without FTA: Wholesale price of the Cargamanto variety, simple average of the values in the two principal cities Bogotá and Medellín. Source: CCI - SIPSA

International Prices: Implicit US FOB world export prices, for Pinto beans (subheading 07.13.39.50.50: Pinto beans (*Vigna SPP*, *Phaseolus SPP*), except seed). Source: Foreign Agricultural Service (FAS), United States Department of Agriculture (USDA).

Pinto beans are the variety most exported by the United States, and thus may be the best market reference for imports under the FTA. The most similar Colombian variety to the *Pinto* is the *Cargamanto*, which, along with *Radical* and *Nima Calima*, is one of the varieties with greater domestic production.

An exercise is also carried out taking the domestic prices without FTA of the *Radical variety* and comparing them with the import price of *Small Red* beans from the United States (subheading 07.13.32.20.00: Small Red beans), whose characteristics are similar to Colombian varieties (please see statistical annexes).

Maritime Freight: 70 USD per ton from US port to Colombian port. Source: Garay et al. 2006.

Port Charges: 8 USD per ton for port services. Source: FENALCE, expenses used in the for import parity price formulas for yellow maize and bulk grains.

Domestic Freight: It was assumed that the imported product would arrive at Bogotá and Medellín, 50% to each, as these are the cities with greater consumption of beans in Colombia, and are the references for the domestic price without FTA.

The average domestic freight costs are calculated using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008), weighting the freight costs from the port of Buenaventura to Bogotá and Medellín by the participation noted above.

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = (P_{FOB} + FM + GP) \times TRM + FI$$

Where  $P_{FOB}$  is the US FOB world export price, FM is the maritime freightage, GP is port charges, TRM is the representative market exchange rate, and FI is domestic freightage.

Supply Function: The following models were used to evaluate the response in the supply of beans to variations in prices to the producer. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in that year ( $P_t$ ), the area cultivated in the previous year ( $A_{t-1}$ ), the production of the previous year ( $Q_{t-1}$ ), a variable dummy ( $D_{1994-97}$ ) which takes the value 1 from the year 1994 to 1997 and 0 in the remaining years, and another variable dummy ( $D_{1990}$ ), that takes the value of 1 in the year 1990 and 0 in other years.

$$\text{Production: } \ln Q_t = -0.77 + 0.30 \times \ln P_t + 0.68 \times \ln Q_{t-1} + 0.18 \times D_{1994-97} + 0.22 \times D_{1990}$$

$$\text{Area: } \ln A_t = 0.49 + 0.18 \times \ln P_t + 0.65 \times \ln A_{t-1} + 0.09 \times D_{1994-97}$$

Assuming that, in the long term, the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } \ln Q_t = -2.41 + 0.96 \times \ln P_t$$

$$\text{Area: } \ln A_t = 4.26 + 0.51 \times \ln P_t$$

The estimated level of production and area cultivated is obtained for each scenario by substituting the domestic prices with and without FTA in the above functions.

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), ***La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos***. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

## 7. Potatoes

Domestic Prices without FTA: Wholesale price of the variety *Parda Pastusa* (for human consumption) and R-12 (industrial consumption), in Bogotá, given that the potato industry is mainly situated in Bogotá. Source: CCI - SIPSA

International prices: Implicit FOB export prices from United States to the rest of the world, for fresh potatoes (subheading 07.19.00.00.00: Potatoes (except seed) fresh or chilled). Source: Foreign Agricultural Service (FAS), United States Department of Agriculture (USDA).

Maritime Freight: 35 USD per ton from US port to Colombian port. Source: consultations with experts.

Port charges: 8 USD per ton for port services. Source: FENALCE, charges used in parity price formulas for imports of products in bulk.

Domestic Freight: It was assumed that the imported product would arrive in Bogotá where the greater part of the potato industry is situated.

The average domestic freight costs from Buenaventura to Bogotá were taken using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008),

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = (P_{FOB} + FM + GP) \times TRM + FI$$

Where  $P_{FOB}$  is the US FOB world export price, FM is the maritime freightage, GP is port charges, TRM is the representative market exchange rate, and FI is domestic freightage.

Supply Function: To evaluate the response in the supply of potatoes to variations in prices paid to the producer, the following models were used. These enable the calculation of the annual volume of production ( $Q_t$ ), the area cultivated ( $A_t$ ), from the price paid to producers in the previous year ( $P_{t-1}$ ), the area cultivated in the previous year ( $A_{t-1}$ ), and the production of the previous year ( $Q_{t-1}$ ).

$$\text{Production: } \ln Q_t = 1.44 + 0.14 \times \ln P_{t-1} + 0.85 \times \ln Q_{t-1}$$

$$\text{Area: } \ln A_t = 1.19 + 0.09 \times \ln P_{t-1} + 0.80 \times \ln A_{t-1}$$

Assuming that, in the long term, the production and area are constant given the price, the following long term functions are obtained:

$$\text{Production: } \ln Q_t = 2.81 + 0.92 \times \ln P_t$$

$$\text{Area: } \ln A_t = 5.99 + 0.47 \times \ln P_t$$

The estimated level of production and area cultivated is obtained for each scenario by substituting the domestic prices with and without FTA in the above functions.

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), *La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos*. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

## 8. Chicken

Domestic Prices without FTA: Wholesale price of whole chicken less offal in Bogotá: Source CCI - SIPSA

International prices: CIF reference price from the price band for chicken pieces (subheading 02.07.14.00). Source: *SGCAN*.

Port Charges: 5 USD per ton plus 1% of the CIF price, for port services. Source: Garay et al. 2006

Domestic Freight: It is assumed that the imported product would arrive at Bogotá, both in order to explain the impact in one of the cities where this product is most consumed, and as it is the city of reference for the domestic price.

Thus, using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008) the average domestic freight costs are taken from Buenaventura to Bogotá. The value calculated is augmented by 50% due to refrigeration.

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = (P_{CIF} + GP) \times RM + FI$$

Where  $P_{CIF}$  is the CIF reference price from the United States, GP is port charges, TRM is the representative market exchange rate, and FI is domestic freightage.

Supply Function: To evaluate the response in the supply of chicken to variations in prices paid to the producer, the following models were used. These enable the calculation of the volume of monthly production ( $Q_t$ ), from the price paid to the producer of the two previous months ( $P_{t-2}$ ), the production of the previous month ( $Q_{t-1}$ ), and of 12 months previously ( $Q_{t-12}$ ), the price of balanced feed in that month ( $PABA_t$ ), and a tendency ( $Tend_t$ ).

$$\ln Q_t = 0.24 \times \ln P_{t-2} + 0.59 \times \ln Q_{t-1} + 0.25 \times \ln Q_{t-12} - 0.14 \times \ln PABA_t + 0,001 \times \ln tend_t$$

Assuming that in the long term the production is constant given the price, the following long term functions are obtained:

$$\ln Q_t = 1.50 \times \ln P_t - 0.88 \times \ln PABA_t + 0,006 \times \ln tend_t$$

Also, the present price of feedstuffs is calculated as 50% of the price of chicken, with or without the FTA. This supposition is a result of the research on cost structures by FENAVI (the Colombian national federation of poultry farmers) and the work carried out by AGROCADENAS (a website carrying information on agricultural production chains).

$$PABA_t = 0.5 \times \ln P_t$$

The estimated level of production is obtained for each scenario by substituting the domestic prices with and without FTA in the above function. Annual production is obtained by multiplying this figure by 12.

Source: Ramírez, M.; Martínez, H. (2005), *Transmisión de Precios y Efectos en Producción y Consumo*. In Garay, Luis Jorge (Director), **La Agricultura Colombiana Frente al Tratado de Libre Comercio con los Estados Unidos**. Ministerio de Agricultura y Desarrollo Rural, Bogotá.

## 9. Pork

Domestic Prices without FTA: Wholesale price of pork in carcass, Bogotá: Source CCI - SIPSA

International prices: CIF reference price from the price band for pork (subheading 02.03.29.00). Source: *SGCAN*.

Port Charges: 5 USD per ton, plus 1% of the CIF price, for port services. Source: Garay et al. 2006

Domestic Freight: It is assumed that the imported product would arrive at Bogotá, both in order to explain the impact in one of the cities where this product is most consumed, and as it is the city of reference for the domestic price.

The average domestic freight costs from Buenaventura to Bogotá are taken using the freight cost per ton established by the Colombian Ministry of Transport for the year 2009 (Resolución 3175 of August 2008). The value calculated is augmented by 50% for refrigeration.

Domestic Prices with the FTA: The price with the FTA is assumed to be equal to the duty free cost of importing from the United States, applying the following formula:

$$P_{TLC} = (P_{CIF} + GP) \times TRM + FI$$

Where  $P_{CIF}$  is the CIF reference price from the United States, GP is port charges, TRM is the representative market exchange rate, and FI is domestic freightage.

Supply Function: To evaluate the response in the supply of pork to variations in prices to the producer, the following models were used. These enable the calculation of the volume of quarterly production ( $Q_t$ ), from the price paid to producers during the four previous quarters ( $P_{t-4}$ ), the production of the previous quarter ( $Q_{t-1}$ ), and the price of balanced feed over 5 previous quarters ( $PABA_{t-5}$ ).

$$\ln Q_t = -0.42 + 0.20 \times \ln P_{t-4} + 0.96 \times \ln Q_{t-1} - 0.11 \times \ln PABA_{t-5}$$

Assuming that, in the long term, the production is constant given the price, the following long term functions are obtained:

$$\ln Q_t = -10.8 + 5.11 \times \ln P_t - 2.91 \times \ln PABA_t$$

Also, the present price of balanced feedstuffs is calculated as 50% of the price of pork, with or without the FTA. This supposition is a result of the research on cost structures by FENAVI and the work carried out by AGROCADENAS.

$$PABA_t = 0.5 \times \ln P_t$$

The estimated level of production is obtained for each scenario by substituting the domestic prices with and without FTA in the above function.

Source: Vargas, José Daniel (2007), *Respuesta de la Oferta Porcícola en Colombia*. Thesis PEG Universidad de los Andes, Bogotá.