APPENDIX B:

DATA

B.1) LIST OF MODELS

- **Unshelled peanuts – Total (100%)**
  - ◗ Producer base price
    - • Pessimistic adoption profile
      - ★ Parallel shift 1
      - ★ Pivotal shift 2
    - • Optimistic adoption profile
      - ★ Parallel shift 3
      - ★ Pivotal shift 4

- **Unshelled peanuts – On farm consumption (24%)**
  - ◗ Unofficial market price
    - • Pessimistic adoption profile
      - ★ Parallel shift 5
      - ★ Pivotal shift 6
    - • Optimistic adoption profile
      - ★ Parallel shift 7
      - ★ Pivotal shift 8
  - ◗ Producer base price
    - • Pessimistic adoption profile
      - ★ Parallel shift 9
      - ★ Pivotal shift 10
    - • Optimistic adoption profile
      - ★ Parallel shift 11
      - ★ Pivotal shift 12

- **Unshelled peanuts – Informal market (10%)**
  - ◗ Unofficial market price
    - • Pessimistic adoption profile
      - ★ Parallel shift 13
      - ★ Pivotal shift 14
    - • Optimistic adoption profile
      - ★ Parallel shift 15
      - ★ Pivotal shift 16

- **Peanut seeds – Formal market (15%)**
    - ⧫ Producer base price
        - Pessimistic adoption profile
            - ★ Parallel shift 17
            - ★ Pivotal shift 18
        - Optimistic adoption profile
            - ★ Parallel shift 19
            - ★ Pivotal shift 20

- **Peanut oil – Formal market (17.5%)**
    - ⧫ World price
        - Pessimistic adoption profile
            - ★ Parallel shift 21
            - ★ Pivotal shift 22
        - Optimistic adoption profile
            - ★ Parallel shift 23
            - ★ Pivotal shift 24

- **Peanut cakes – Formal market (17.5%)**
    - ⧫ World price
        - Pessimistic adoption profile
            - ★ Parallel shift 25
            - ★ Pivotal shift 26
        - Optimistic adoption profile
            - ★ Parallel shift 27
            - ★ Pivotal shift 28

B.2) SPREADSHEETS

1) UNSHELLED PEANUTS (TOTAL) – PRODUCER BASE PRICE

- Supply elasticity: $\varepsilon = 0.77$ (Akobundu, 1998)
- Demand elasticity: $e = 0.18$ (Sullivan et al, 1992)

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.20$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.20/(1+0.30) = 0.15$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 – 0.15 = 0.24$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP_b$
- Proportionate decrease in price: $E_t = K_t\varepsilon/e$

- Proportionate change in population: $u = 0.027$ (Senegal, Republic of, Direction de la Prévision et de la Statistique, 1999)
- Proportionate change in per capita income: $i = 0.0063$ (average of years 1976-86,1987-97 and 1998-02: -0.011-0.004+0.034/3) (IMF, 1998)
- Income elasticity of demand: $e_{ii}+\Sigma e_{ij}+n_i = 0 \rightarrow$ assuming $\Sigma e_{ij}=0$, $n_i = - e_{ii} = 0.18$
- Proportionate change in demand: $u + in = 0.028$ (approximation for L/Q_o)

- Initial consumer price (before demand shift): $P_o = 144$ FCFA/kg (average of years 1996-1999: 183+137.656+114+142/4) (Senegal, Republic of, Ministère de l'Economie, des Finances et du Plan, 2000 a)
- Final consumer price (after demand shift): $P = P_o(1 + (L/Q_o)/e) = 167$ FCFA/kg
- Producer base price: $P_b = 146.5$ FCFA/kg (average of years 1996-1999: 131+150+160+145/4) (Senegal, Republic of, Ministère de l'Economie, des Finances et du Plan, 2000 a)

- Initial quantity (before demand shift): $Q_o = 599{,}731$ 1000kg (average of years 1996-1999 for oil seeds: 588,181+505,894+540,773+764,077/4) (Senegal, Republic of, Ministry of Agriculture, 2000)
- Final quantity (after demand shift): $Q = Q_o = 599{,}731$ 1000kg

- Change in consumer surplus: $\Delta CS = EQ(1+½Ee/P)$ (parallel and pivotal shift)
- Change in producer surplus: $\Delta PS = KQ(1+½\varepsilon K/P_b)$ (parallel shift) or $\Delta PS = ½KQ(1+\varepsilon K/P_b)$ (pivotal shift)
- Change in cost of subsidy: $\Delta GC = EQ\ (1 + ((P_b-P) + E)e/P)$
- Change in net social welfare: $\Delta NSW = \Delta CS + \Delta PS - \Delta GC$

- Cost of salaries: max annual public salary * scientists + minimum annual public salary * assistants for each year between 1985 and 1996 (Table 3.18)
- Research costs: RC = 1.2 * cost of salaries

- Net total benefits: NB = ΔTS – RC
- Discount rate: 0.0625 (1998) (IMF, 2000)
- Net present value in FCFA: (NB, 0.0625)
- Exchange rate: 615.70 FCFA/US$ (1999) (CIA, 2001)
- Net present value in US$: NPV in FCFA/exchange rate

2) UNSHELLED PEANUTS (ON FARM CONSUMPTION) - UNOFFICIAL PRICE

- Supply elasticity: $\varepsilon = 0.77$ (Akobundu, 1998)
- Demand elasticity: $e = 0$

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.21$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.21/(1+0.30) = 0.16$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 - 0.16 = 0.23$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP$
- Proportionate decrease in price: $E_t = K\varepsilon/(\varepsilon + e) = K_t$

- Proportionate change in population: $u = 0.027$ (Senegal, Republic of, Direction de la Prévision et de la Statistique, 1999)
- Proportionate change in per capita income: $i = 0.0063$ (average of years 1976-86,1987-97 and 1998-02: -0.011-0.004+0.034/3) (IMF, 1998)
- Income elasticity of demand: $e_{ii}+\Sigma e_{ij}+n_i = 0 \rightarrow$ assuming $\Sigma e_{ij}=0$, $n_i = - e_{ii} = 0.18$
- Proportionate change in demand: $u + in = 0.028$ (approximation for L/Q_o)

- Initial price (before demand shift): $P_o = 135.5$ FCFA/kg (average of years 1995 and 1996: 125.4+128+129.5+130.3+139.7+160.4/6) (Gaye, 1997)
- Final price (after demand shift): $P = P_o(1 + (L/Q_o)/\varepsilon) =$ 141 FCFA/kg

- Initial quantity: $Q_o = 0.24*599{,}731 = 143{,}935$ 1000kg
- Final quantity: $Q = Q_o (1+L/Q_o) = 147{,}985$ 1000kg

- Change in consumer surplus: $\Delta CS = EQ$ (parallel shift) or $\Delta CS = ½ EQ$ (pivotal shift)

3) UNSHELLED PEANUTS (ON FARM CONSUMPTION) – PRODUCER BASE PRICE

- Supply elasticity: $\varepsilon = 0.77$ (Akobundu, 1998)
- Demand elasticity: $e = 0$

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.20$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.20/(1+0.30) = 0.15$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 – 0.15 = 0.24$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP_b$
- Proportionate decrease in price: $E_t = K\varepsilon/(\varepsilon + e) = K_t$

- Proportionate change in population: $u = 0.027$ (Senegal, Republic of, Direction de la Prévision et de la Statistique, 1999)
- Proportionate change in per capita income: $i = 0.0063$ (average of years 1976-86,1987-97 and 1998-02: -0.011-0.004+0.034/3) (IMF, 1998)
- Income elasticity of demand: $e_{ii}+\Sigma e_{ij}+n_i = 0 \rightarrow$ assuming $\Sigma e_{ij}=0$, $n_i = - e_{ii} = 0.18$
- Proportionate change in demand: $u + in = 0.028$ (approximation for L/Q_o)

- Producer base price: $P_b = 146.5$ FCFA/kg

- Initial quantity: $Q_o = 0.24*599{,}731 = 143{,}935$ 1000kg
- Final quantity: $Q = Q_o (1+L/Q_o) = 147{,}985$ 1000kg

- Change in consumer surplus: $\Delta CS = 0$ (parallel and pivotal shift)

4) UNSHELLED PEANUTS – INFORMAL MARKET – UNOFFICIAL PRICE

- Supply elasticity: $\varepsilon = 0.77$ (Akobundu, 1998)
- Demand elasticity: $e = 0.18$ (Sullivan et al, 1992)

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.21$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.21/(1+0.30) = 0.16$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 – 0.16 = 0.23$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP$
- Proportionate decrease in price: $E_t = K_t\varepsilon/(\varepsilon + e)$

- Proportionate change in population: $u = 0.027$ (Senegal, Republic of, Direction de la Prévision et de la Statistique, 1999)
- Proportionate change in per capita income: $i = 0.0063$ (average of years 1976-86,1987-97 and 1998-02: -0.011-0.004+0.034/3) (IMF, 1998)
- Income elasticity of demand: $e_{ii}+\Sigma e_{ij}+n_i = 0 \rightarrow$ assuming $\Sigma e_{ij}=0$, $n_i = - e_{ii} = 0.18$
- Proportionate change in demand: $u + in = 0.028$ (approximation for L/Q_o)

- Initial price (before demand shift): $P_o = 135.5$ FCFA/kg
- Final price (after demand shift): $P = P_o(1 + (L/Q_o)/(\varepsilon + e)) =$ 141 FCFA/kg

- Initial quantity: $Q_o = 0.10*599{,}731 = 59{,}973$ 1000kg
- Final quantity: $Q = Q_o(1 + L/Q_o – (Le/Q_o)/(\varepsilon+e)) = 61{,}341$ 1000kg

- Change in consumer surplus: $\Delta CS = EQ(1+½Ee/P)$ (parallel and pivotal shift)
- Change in producer surplus: $\Delta PS = (K-E)Q(1+½Ee/P)$ (parallel shift) or $\Delta PS = \Delta TS-\Delta CS$ (pivotal shift)
- Change in total surplus: $\Delta TS = KQ(1+ ½ Ee/P)$ (parallel shift) or $\Delta TS = ½KQ(1+ Ee/P)$ (pivotal shift)

- Cost of salaries: max annual public salary * scientists + minimum annual public salary * number of assistants for each year between 1985 and 1996 (Table 3.18)
- Research costs: RC = 0.10*1.2 * cost of salaries

- Net total benefits: NB = ΔTS – RC
- Discount rate: 0.0625 (1998) (IMF, 2000)
- Net present value in FCFA: (NB, 0.0625)
- Exchange rate: 615.70 FCFA/US$ (1999) (CIA, 2001)
- Net present value in US$: NPV in FCFA/exchange rate

5) PEANUT SEEDS – FORMAL MARKET – PRODUCER BASE PRICE

- Supply elasticity: $\varepsilon = 0.77$ (Akobundu, 1998)
- Demand elasticity: $e = 0.18$ (Sullivan et al, 1992)

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.20$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.20/(1+0.30) = 0.15$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 – 0.15 = 0.24$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP_b$
- Proportionate decrease in price: $E_t = K_t\varepsilon/e$

- Proportionate change in population: $u = 0.027$ (Senegal, Republic of, Direction de la Prévision et de la Statistique, 1999)
- Proportionate change in per capita income: $i = 0.0063$ (average of years 1976-86,1987-97 and 1998-02: -0.011-0.004+0.034/3) (IMF, 1998)
- Income elasticity of demand: $e_{ii}+\Sigma e_{ij}+n_i = 0 \rightarrow$ assuming $\Sigma e_{ij}=0$, $n_i = - e_{ii} = 0.18$
- Proportionate change in demand: $u + in = 0.028$ (approximation for L/Q_o)

- Initial consumer price (before demand shift): $P_o = 144$ FCFA/kg (average of years 1996-1999: 183+137.656+114+142/4) (Senegal, Republic of, Ministère de l'Economie, des Finances et du Plan, 2000 a)
- Final consumer price (after demand shift): $P = P_o(1 + (L/Q_o)/e) = 167$ FCFA/kg
- Producer base price: $P_b = 146.5$ FCFA/kg (average of years 1996-1999: 131+150+160+145/4) (Senegal, Republic of, Ministère de l'Economie, des Finances et du Plan, 2000 a)

- Initial quantity (before demand shift): $Q_o = 0.15*599{,}731 = 89{,}960$ 1000kg
- Final quantity (after demand shift): $Q = Q_o = 89{,}960$ 1000kg

- Change in consumer surplus: $\Delta CS = EQ(1+½Ee/P)$ (parallel and pivotal shift)
- Change in producer surplus: $\Delta PS = KQ(1+½\varepsilon K/P_b)$ (parallel shift) or $\Delta PS = ½KQ(1+\varepsilon K/P_b)$ (pivotal shift)
- Change in cost of subsidy: $\Delta GC = EQ\ (1 + ((P_b-P) + E)e/P)$
- Change in net social welfare: $\Delta NSW = \Delta CS + \Delta PS - \Delta GC$

- Cost of salaries: max annual public salary * scientists + minimum annual public salary * number of assistants for each year between 1985 and 1996 (Table 3.18)
- Research costs: RC = 0.15*1.2 * cost of salaries

- Net total benefits: NB = ΔTS – RC
- Discount rate: 0.0625 (1998) (IMF, 2000)
- Net present value in FCFA: (NB, 0.0625)
- Exchange rate: 615.70 FCFA/US$ (1999) (CIA, 2001)
- Net present value in US$: NPV in FCFA/exchange rate

6) PEANUT OIL – FORMAL MARKET – WORLD PRICE

- Supply elasticity: $\varepsilon = 0.30$ (Sullivan et al, 1992)
- Demand elasticity: $e = 0.20$ (Sullivan et al, 1992)

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.20$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.20/(1+0.30) = 0.15$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 – 0.15 = 0.24$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP_b$

- World price: $P_w = 909$ \$/ton (average of years 1994-2000: 1,023+991+897+1,009+917+788+740/7) (Senegal, Republic of, Ministère de l'Economie, des Finances et du Plan, 2000 a)
  $P_w = 909*560.11/1000 = 509$ FCFA/kg (Table 3.15)

- Quantity supplied: $Q = 0.175*599{,}731 = 104{,}953$ 1000kg

- Change in consumer surplus: $\Delta CS = 0$
- Change in producer surplus: $\Delta PS = KQ\ (1 + ½\ \varepsilon K/P_w)$ (parallel shift) or $\Delta PS = ½KQ\ (1+\varepsilon K/P_w)$ (pivotal shift)
- Change in total surplus: $\Delta TS = \Delta CS + \Delta PS$

- Cost of salaries: max annual public salary * scientists + minimum annual public salary * number of assistants for each year between 1985 and 1996 (Table 3.18)
- Research costs: $RC = 0.175*1.2$ * cost of salaries

- Net total benefits: $NB = \Delta TS – RC$
- Discount rate: 0.0625 (1998) (IMF, 2000)
- Net present value in FCFA: (NB, 0.0625)
- Exchange rate: 615.70 FCFA/US\$ (1999) (CIA, 2001)
- Net present value in US\$: NPV in FCFA/exchange rate

7) PEANUT CAKES – FORMAL MARKET – WORLD PRICE

- Supply elasticity: $\varepsilon = 0.30$ (Sullivan et al, 1992)
- Demand elasticity: $e = 0.20$ (Sullivan et al, 1992)

- Proportionate yield change per hectare: $\Delta Y/Y = 0.30$ (Ndoye, July 19th, 2000)
- Gross proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y = 0.30/0.77 = 0.39$
- Proportionate additional cost per hectare: $\Delta C/C = 0.20$ (Table 3.16)
- Proportionate additional cost per ton of output: $\Delta C/C(1+\Delta Y/Y) = 0.20/(1+0.30) = 0.15$
- Net proportionate cost reduction per ton of output: $\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y) = 0.39 – 0.15 = 0.24$

- Probability of research success: $p = 1$
- Adoption rate: A_t (Table 3.17)

- Supply shift: $K_t = [\Delta Y/\varepsilon Y - \Delta C/C(1+\Delta Y/Y)]pA_tP_b$

- World price: $P_w = 160$ \$/ton (average of years 1994-2000: 168+169+213+221+116+102+130/7) (Senegal, Republic of, Ministère de l'Economie, des Finances et du Plan, 2000 a)
  $P_w = 160*560.11/1000 = 90$ FCFA/kg (Table 3.15)

- Quantity supplied: $Q = 0.175*599{,}731 = 104{,}953$ 1000kg

- Change in consumer surplus: $\Delta CS = 0$
- Change in producer surplus: $\Delta PS = KQ\ (1 + ½\ \varepsilon K/P_w)$ (parallel shift) or $\Delta PS = ½KQ\ (1+\varepsilon K/P_w)$ (pivotal shift)
- Change in total surplus: $\Delta TS = \Delta CS + \Delta PS$

- Cost of salaries: max annual public salary * scientists + minimum annual public salary * number of assistants for each year between 1985 and 1996 (Table 3.18)
- Research costs: $RC = 0.175*1.2$ * cost of salaries

- Net total benefits: $NB = \Delta TS – RC$
- Discount rate: 0.0625 (1998) (IMF, 2000)
- Net present value in FCFA: (NB, 0.0625)
- Exchange rate: 615.70 FCFA/US\$ (1999) (CIA, 2001)
- Net present value in US\$: NPV in FCFA/exchange rate