PN ABX-327

Cereals Marketing Reform Project

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Planning, Economics and Statistics Development Project
for Agriculture

A Cereals Trade Policy Model for Morocco: Marocmod User's Guide

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June 1994

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Introduction

Cereals markets in Morocco continue to evolve in response to changing supply-availability balances and external pressures for reform. Morocco has become increasingly dependent on cereals imports to meet its food needs. Imports in 1992 accounted for 49% of cereals consumption, up from 34% in 1980 and 15% in 1970. The government has intervened substantially in these markets to assure food availability at a reasonable to cost to consumers while providing stable and adequate returns to farmers. While that state involvement in cereals markets continues, it has changed substantially over the last several years, and new forces for change are imminent.

Fiscal and trade imbalances beginning in the late 1970s led to structural adjustment programs negotiated with the World Bank and the IMF. In 1985 an agricultural component was added which included significant changes for cereals market policies. Barley, durum wheat, maize and agricultural input markets were liberalized shortly thereafter, but controls remain on bread wheat, which is the principal imported staple. Morocco's intentions under this structural adjustment program were to implement a variable levy system in April, 1994 to replace state monopoly control of trade by ONICL and to bring prices closer to world market averages, but the recent conclusion of the Uruguay GATT round means Morocco will now most likely implement ad valorem tariffs by January, 1995. Morocco's proposal to the GATT also includes higher, not lower, cereals prices. While cereals market reforms could move Morocco closer to free trade in cereals, the government remains concerned that food security and adequate farm income be assured under whatever trade regime is implemented.

The trade policies being considered in Morocco are an extension of its domestic cereals market policies, since trade policy is implemented to achieve domestic objectives and not simply to restrict trade. The proposed structural reforms of cereals markets also include several potentially significant changes in ONICL intervention and control of domestic cereals markets which could impact trade, consumer welfare and farm income in important ways. Therefore, this model includes specification of certain important domestic policies and their relaxation. For example, a low quality industrial flour (FNBT) is now sold at subsidized prices in rationed quantities. Policy alternatives which could impact markets and trade include elimination of those subsidies at one extreme, and relaxation of the production quota which limits availability of this subsidized flour at the other extreme. The way in which bread wheat and industrial flour markets are now managed may induce a bias in favor of imports to meet miller's input requirements for FNBT production, which might be more readily met by domestic production with freer trade.

In order to make the decisions necessary to implement proposed cereals market reforms, the Government of Morocco needs information on the likely impacts of those reforms. At one level, the government must establish a level of protection to be offered to farmers and the consequent cost of that to consumers and the government budget. The concern with government costs must also consider foreign exchange needs to meet Morocco's increasing cereals import requirements, and the extremes that may be reached in drought years as were experienced in 1992

and 1993. This raises the concern manifest in earlier policy to maintain stability in domestic cereals markets, which could change dramatically under the trade regime required by GATT. Hence, the consequences of choice of trade regime for market stability and likely adjustments when market extremes (production shortfalls, high world prices or low prices and so low farm incomes) need to be assessed.

The cereals trade model described in this user's guide (*Marocmod*) is intended to assist Morocco in making these trade and domestic policy decisions by providing information on likely impacts. It represents the functioning of the four principle cereals markets in Morocco -- bread wheat, durum wheat, barley and maize -- and their interactions with the processing of bread wheat into industrial and traditional flours. The interactions of intervention by the state and ONICL control of markets at a number of different levels is permitted in the specification of this model. It is also designed to yield both static and dynamic impacts of alternative trade policies as well as the distribution of outcomes given the uncertainties Morocco faces in its production of cereals and in the international cereals prices. Essential features include equilibrium in parallel public and private markets, flexible policy options and trade regimes, and assessment of financial, income distribution, market stability and food security impacts of those policy alternatives.

Several earlier models of Moroccan cereals trade were developed in collaboration with World Bank and USAID consultants to assess the likely consequences of evolving cereals market reforms. While those models were important steps in providing information on outcomes from cereals market reforms or costs associated with existing protection of cereals markets, inflexibilities in each model could not captured the range of alternatives Moroccan officials needed to consider. For example, an initial model developed by Mateus essentially considered Morocco as a closed economy, which was an accurate representation of the way in which ONICL managed cereals markets at the time the model was built, but could not capture the reforms which intended to open the economy to freer trade. The Multi-Market model was able to represent an ad valorem tariff regime, but could not represent the quantitative restrictions which have evidently remained in place for durum wheat and barley markets. It represents well the outcomes from full liberalization, but not the status quo nor partial liberalization. de Janvry and de Janvry et. al. also argue that durum wheat and barley are essentially non-tradeables, but whether that is a consequence of Moroccan consumer preferences or trade policy remains an open question.

The intention in this effort was to permit the full range of trade policy options and trade regimes which may be operative in Morocco, rather than eliminating certain options by model design. This flexibility permits more complete assessment of the outcomes of alternative policies under a variety of assumptions. Hence, a variety of trade regimes as well as assumptions on cereals and flour tradeability are permitted.

The questions this cereals market trade model (Marocmod) is designed to address may be summarized in the following categories:

1) What is the appropriate *level of protection* (domestic price level) and who are the beneficiaries or losers from changes in that level of protection? Agents impacted include farmers, consumers and the government.
2) What form should that protection take? That is, what are the consequences for market stability and food security from alternative *trade regimes* (ad valorem tariffs, variable levies, or quantitative market controls)?

3) How do trade policy outcomes differ under alternative assumptions concerning the *economic environment*? Tradeability of cereals, whether policy restricted or based on local preferences; alternative world prices and exchange rates; and alternative trends in production and income growth should all be considered.

4) How do proposed changes in trade policy interact with domestic cereals market reforms? What are the trade and welfare impacts of those *complementary domestic reforms*?

The economic model which examines these questions is empirically implemented using two tools. The user of this model interacts with a QUATTRO 4.0 spreadsheet interface (workspace in Quattro's terminology) which is composed of six worksheets. In this workspace the user may set base data and parameter assumptions, alter exogenous variables to capture changes in policy or the economic environment, and view the consequences of static, dynamic and stochastic simulations in comparison with base market outcomes. The model is built around supply-demand equilibrium for each cereal and flour, so equilibrium domestic market prices must be found. Since non-tradeability and quantitative restrictions are permitted, the small country assumption -- that domestic prices are directly determined by world prices and tariffs -- is but one option. A FORTRAN program uses a fixed point algorithm to solve this market equilibrium problem. The FORTRAN equilibrium duplicates the economic model underlying the spreadsheet interface, and in addition has the capability of finding static and dynamic equilibria as well as conducting a Monte Carlo simulation. The spreadsheet interface launches the Fortran program and facilitates reading and interpreting results. The existence of both programs aided in debugging this system. The user who is satisfied with the flexibility now offered by the model need only learn how to use the spreadsheet interface, however.

The organization of this User's Guide, which documents this model is as follows. First, the institutional setting for Moroccan cereals markets is described. Supply-utilization balances for the principal cereals and flours are briefly presented, and the tradeability issue is discussed further. Policy objectives and existing government interventions are then described, as well as likely changes in those policies. Issues to be address in assessing those policies are then identified. The next major section then provides an overview of the model. Characteristics of the model are explained and a graphical presentation of market interactions provides an intuitive explanation of how critical features of Moroccan cereals and flour markets are represented. Then details of the model specification are presented. This third section presents and explains the equations underlying the model and its projections. The fourth section describes model implementation. It uses the spreadsheet interface to present base data and parameter assumptions, indicating data sources as well as how those base assumptions may be changed. It also presents the organization of that spreadsheet interface. Solution of model equations is accomplished by linking that spreadsheet interface to a Fortran program. While that program is largely invisible to the user, its design is also discussed in this section on model implementation. In order to illustrate use of the model, the nest section presents the running and interpretation of an alternative scenario. A typical case is constructed and static impacts for the short run (within a year), one year hence, and five years later are projected. Monte Carlo simulation of this alternative case to assess market stability, food security and the risks of reaching market extremes is also presented. The concluding section assess the strengths and weakness of this

model for trade policy analysis. References on trade modeling in Morocco and on data sources used to implement this model are then provided.

Several appendices are attached to help with documentation of this model. Appendix A presents a table of notation used in the spreadsheet interface, Fortran equilibrium solver, and the model specification section of this document. Appendix B presents complete printouts of each of the worksheets which constitute the spreadsheet interface. Appendix C lists the files used to link the spreadsheet interface to the FORTRAN equilibrium solver. Appendix D provides complete printouts for the assumptions and results of the alternative scenarios presented to illustrate the use of this model. Appendix E describes the contents of the diskette containing files needed to run this model on an IBM compatible PC with Quattro 4.0 installed, along with guidance on how to "install" this model and how to load the Quattro workspace. Appendix F describes revisions to an earlier version of this model which was documented in the M.S. thesis of Hamid Imrani.

Institutional Setting -- Markets and Policy

The Moroccan Cereals Sector

Within Moroccan agriculture, the cereals sector is among the most important, accounting for about 80% of sown agricultural land. Four principal cereals are grown -- bread wheat (BW), durum wheat (DW), barley (BL) and maize (MZ). Bread wheat is transformed into three classes of flours -- FNBT (a low quality, subsidized flour), FL (higher quality flours produced by industrial millers), and traditional flours produced by artisinal mills (ART). Trade has become increasingly important to the evolution of these cereals and flour markets and to the implementation of cereals market policies.

Table 1 presents supply and utilization balances for the four principal cereals in recent years (1989-92). It provides information on the importance of trade by cereal, the various uses (e.g., feed use versus food use) for each, and the extent of government involvement in domestic markets as measured by the degree of commercialization. These years will also be used to calculate normal supply and utilization levels for the model's base assumptions.

Table 1. Cereals Supply and Utilization, 1989-92 (in thousand quintals).

Durum Wheat	**1989**	**1990**	**1991**	**1992**	**Average**
Carry-in Stock	500	500	500	5490	1748
Production	17665	16167	22158	6818	15702
Imports	0	520	330	2400	816
Feed Use	0	0	0	0	0
Industrial Mills	0	0	0	0	0
Commercialization	623	874	1039	167	676
Consumption	17600	16990	17500	14510	16575
Carry-out Stock	500	500	5490	200	1673
Bread Wheat	**1989**	**1990**	**1991**	**1992**	**Average**
Carry-in Stock	2570	1800	2730	7430	3633
Production	21604	19972	27232	8804	19403
Imports	11870	10060	17960	15470	13840
Feed Use	0	0	0	0	0
Industrial Mills	21650	22102	23537	22500	22447
Commercialization	10148	5997	10497	1229	6968
Consumption	32430	37000	38000	38420	36463
Carry-out Stock	1800	2730	7430	1960	3480

Table 1. Cereals Supply and Utilization, 1989-92. (Continued)

Barley	1989	1990	1991	1992	Average
Carry-in Stock	9400	7800	3910	9000	7528
Production	29986	21376	32525	10807	23674
Imports	0	1910	2180	5350	2360
Feed Use	18500	15500	16000	15000	16250
Industrial Mills	0	0	0	0	0
Commercialization	920	416	469	69	469
Consumption	13090	11680	13620	9160	11888
Carry-out Stock	7800	3910	9000	1000	5428
Maize	**1989**	**1990**	**1991**	**1992**	**Average**
Carry-in Stock	200	200	200	200	200
Production	4028	4356	3350	3440	3794
Imports	910	1530	2190	3000	1908
Feed Use	3300	4200	4000	4000	3875
Industrial Mills	0	0	0	0	0
Commercialization	1146	668	273	157	561
Consumption	1640	1690	1540	1260	1533
Carry-out Stock	200	200	200	100	175

During the 1980's, the average Moroccan self-sufficiency rate for total cereals was around 60%. Morocco was entirely self-sufficient in two principal cereals, durum wheat and barley. The average self-sufficiency rate for bread wheat (BW) was only about 40%, however. Hence, both BW and flour production depend heavily on import policy, even though relatively little flour is now imported. Self-sufficiency for maize was even lower (30%), but corn imports did not cause as much concern as those for BW because the corn market is less regulated. Most corn is used as animal feed. Hence, low income consumers are less sensitive to its price, and imported quantities and cost are low compared to those of BW.

These averages for self-sufficiency rates hide a much more important problem -- production variability. Because of climate variability and the fact that most grain tends to be grown on rainfed areas, total cereals production is highly variable. Compared to its average for 1980-1991, cereals production varied from -67% to +72%. This variability was more pronounced for BW (-79% to +100%) than for the three other cereals.

During the 1980's, BW production has been steadily increasing. Other cereal production has increased as well, but with a less evident trend and large variability, especially in the case of barley since the drought of 1981. The use of irrigation in cereals production has not had a major impact on production stability because of its small share in total production.

During the 1970's, overall cereals availability increased because of imports. Until 1982, per capita availability had been decreasing, despite increasing imports. Since 1984, cereals production has been increasing, imports have been decreasing, and per capita availability has increased. The droughts of 1992 and 1993 exposed the need for imports to maintain adequate consumption in the face of production variability, however.

BW imports have been relatively independent of local supply variability, except for the 1986 and 1992-3 droughts. The low substitutability between the two sources of supply for BW (local and international markets) may be explained by both technical and economic reasons. Industrial wheat millers may prefer imported wheat because of quality differences. Furthermore, during the period of macroeconomic difficulties during the 1980s, imported wheat was less costly to industrial millers because of domestic producer price protection and an overvalued currency.

Cereals import bills have been steadily increasing during the 1980s. Market regulation of BW was also becoming more costly. The government intervened heavily in these markets, and that regulation brought about fiscal and foreign exchange burdens which were not sustainable given Moroccan economic difficulties starting in the late 1970s. Structural adjustment programs negotiated with the IMF and World Bank included specific reforms for cereals markets beginning in 1985.

Cereals Sector Regulation

The regulation of flour markets goes back to the creation of the Interprofessional Cherifian Grain Agency (O.N.I.C), subsequently Office National Inter-professional des Céréales et Légumineuses (ONICL), in 1937. The mission of this parastatal agency was to organize cereals and oilseeds markets and to enforce the regulations related to price determination and market organization all the way along the marketing chain from production to consumption. Through such acts, the government pursues the following objectives:

Producer welfare: higher farm revenue by means of producer support prices, procurement campaigns, import monitoring, input subsidies, and transportation subsidies;
Consumer welfare: lower food costs, especially for the poor, through offering reasonable consumer prices, monitoring distribution channels, and targeting consumption subsidies to low income groups;
Cereals price stability: through monitoring and control of imports and distribution channels; and
Cost minimization: both foreign exchange requirements and government budgetary implications are concerns.

ONICL intervenes in production by supporting prices, buying cereals production at official prices. In consumption, its actions aim to regulate supply with cereals at affordable (subsidized) prices on a regional basis, targeting those subsidies with a low quality flour, FNBT, produced by industrials millers.

Before the agricultural campaign of 1989/90, two official price regulations were applied to cereals. The first was a unique and obligatory price, called the "taxed price", fixed for BW. On the basis of this price, all commercialization (procurement) operations were undertaken in controlled channels. In fact, only about 35% of BW domestic production makes use of the controlled circuit, the remaining being marketed privately.

The second regulation is a "support price", which was fixed until the agricultural campaign of 1987/88 for DW, barley and corn. ONICL had the obligation of buying at that support price all supply offered to it. It was then a guaranteed floor price which gives to the farmer the choice between official and parallel channels. In fact, this support price was not very effective. The marketed share of domestic production of DW, barley and corn remained below an average of 10%.

Official prices were increased frequently, amounting to stable real prices for wheat and slightly increasing real prices for barley and corn. The official producer price for BW is established each year by the Inter-ministry Price Commission (CIP) in the Ministry of Economic Affairs. This official price is maintained year round and for the entire country. The cereals markets are so regulated that each of the operators has a precisely defined role to play, is prohibited from any other action, and receives a guaranteed margin. Activities, such as storage and grain shipments are also subject to significant regulations. Transportation and storage costs are subsidized by ONICL.

Consumer prices are also regulated by the CIP. The prices of FNBT (a low quality subsidized flour of BW) and deluxe flour (higher quality flour of BW) have remained at fairly low levels for long periods, subsidizing consumers and hence increasing the consumption of BW products at the expense of other industrial flour and traditional cereal products. The ratio of FNBT price to the price of FL has decreased significantly in favor of FNBT, especially since 1983.

ONICL has monopoly control of cereals imports. More exactly, it allocates import licenses to authorized traders (about fifteen) or to the Union of Cooperative Agencies by an "adjudication" procedure based on tender offers by ONICL. Imported cereals are treated in the same manner as domestically produced cereals. The difference between import cost and the official domestic price is subject to an adjustment which results in a profit to either importers or ONICL.

As conceived, the commercial policy was aimed to stabilize the consumer price. In the process it also resulted in consumption increases for BW and maize. These changes in cereal demand have been directly tied to consumption subsidies. Commercial policy has largely ignored DW and barley, except in 1987/88 when a surplus of barley production was exported.

The financing of this system is maintained through a rather complicated web of expenses (storage bonuses, retrocession margins, approach expenses, exchange rate incidence, bonuses on stock assimilating and compensating bonuses) and receipts (commercialization taxes, compensating import taxes, cost recovery on transportation and storage, marketing subsidy, and inter-annual compensation).

Food Security and Structural Adjustment

Although a common belief since 1980 was that fundamental structural adjustments needed to be undertaken, the liberalization of domestic and international cereals trade, and the elimination of consumer subsidies, were not immediately accepted. Trade liberalization could

have dramatic effects on market outcomes, on ONICL's power and role, on other interest groups, and ultimately on the conflicting objectives of food policies (Abbott).

In fact, the Moroccan government had good reasons to be concerned with the country's food security. The erratic pattern of wheat production and quasi-inelastic cereals demand, together with the willingness of the government to reduce producer protection and consumer subsidies, in the context of uncertainty over the exchange rate, world prices of imported goods, conclusion of GATT negotiations, the evolution of international protectionism, and the recent past social unrest generated great apprehension on adoption of such drastic measures as the proposed cereals market reforms which were part of Morocco's structural adjustment program.

Some facts may make clearer why fear of the recommended adjustments exist:

> As a result of the consumer subsidy policy, per capita consumption has been steadily increasing. Matheus, Behrman, Pines and Schneider found that the low income group benefits little from them, however. Only 16 % of these subsidies go to the poorest 30 % of the population. But Matheus et. al. also reported that urban consumers have shown a sensitivity to higher cereals prices, rioting in 1981 and 1984 when prices were increased. Without analyzing in detail the national income distribution, the mere fact of such riots tells much about the vulnerability of the low income groups (Economist, 1990). Hence, it appears to be politically difficult to adjust quantities by consumer prices.
>
> Skully, outlining the seriousness of the Moroccan food situation, reported that in 1985 "Morocco had planned to purchase 1 million tons of US wheat under the Blended Credit Program. However, when the Program was suspended, Morocco had to turn to France; The US had no other means of subsidizing exports to Morocco. Morocco was in arrears to France on an earlier C.O.F.A.C.E credit and ... France did not offer additional credit. Rather than import wheat with scarce foreign exchange, Morocco exhausted its wheat stocks to less than one month's reserve. ...France recognized the political implications of the impending wheat crisis and capitulated with a C.O.F.A.C.E line of credit for 500,000 tons of wheat".
>
> The parastatal agency (ONICL) experienced financial difficulties between 1983 and 1987 with overdue payments to industrial flour mills. Even under such strict regulation, ONICL overdue payments caused middlemen to sell at the market price and purchase at the official price, and cheat on the quality and quantity of the flour. Speculation may become worse under deregulated market conditions.

Thus, Morocco seems to have, if not an unambiguous food security problem, at least some difficulties in maintaining its cheap food policy. This is due to many reasons, such as low productivity in cereals, variable production, inelastic demand, shortages of international reserves and storage capacity, overregulation of the sector, and sensitivity of consumers to price changes. Uncertainty about the outcomes of proposed policy reform measures added to this fear.

Proposed Reforms

Under Moroccan structural adjustments proposed in the 1980's, many economic reforms -- such as eliminating input subsidies, reducing government expenditure, and freeing domestic and foreign trade -- were proposed. Some have already been applied. Others are still to come. The overall objectives of proposed reforms can be best understood in the context of the macroeconomic objective of the IMF and World Bank approaches to Morocco's economic difficulties - to bring the external current account into line with the available supply of foreign capital inflows. The World Bank concentrated on augmenting the supply of foreign exchange and improving the efficiency of resource allocation. The IMF emphasized containment of government expenditure and reduction of the government's budget deficit (Horton).

These approaches resulted in a set of reforms with respect to the Moroccan economy in general and to its cereals sector, in particular. Cereals market reforms were proposed as a component of the 1985 Agricultural Structural Adjustment Loan (ASAL 1) from the World Bank. Their slow application, in a step-wise fashion (Abbott), reflects the concerns of Moroccan officials for food security and income distribution.

Agricultural policies in effects prior to 1985 resulted in price distortions, less efficient resource allocations, substantial efficiency losses, financial difficulties of parastatal agencies, government budget deficits, and expanding foreign debt (Abbott, Dommen, MARA). Conversely, free trade together with subsidy elimination would permit price signals to operate, reduce or eliminate efficiency losses, permit better functioning of the markets, permit better resources allocation, and improve the government fiscal position. Thus, the basic cures would be to free domestic and foreign trade, and to eliminate input and consumption subsidies.

The strength of these arguments -- free trade and undistorted prices, and World Bank pressure -- led Morocco to apply many reforms by 1987. In 1987, cereals support prices were eliminated for durum wheat, barley and maize (Abbott, ONICL Prices and Incentives study II (EPI 2), Group C). Input subsidies were largely eliminated (EPI 2, Abbott). Proposed reforms at the time were to remove the support price from BW and to eliminate FNBT subsidies, but these have not yet been implemented. Reforms also eventually involved the reduction or elimination of milling, storage, and transportation subsidies, as well as the elimination of ONICL's monopoly power over domestic and foreign cereals trade.

Reference to an international price for the determination of the BW taxed price was introduced in the second phase of the Agricultural Adjustment Loan (ASAL 2). A reference market is identified, and its price is used in determining the "national official price". The intervention price, or "floor price", is equal to a moving average of FOB prices for the last five years, plus transportation and insurance expenses. This sum is increased by a 25% protection rate. The import price is this floor price plus transportation expenses from the port to the reference mill, located at 65 Km from the port, plus import duties and taxes. The international reference price minus ONICL marketing charges is equal to a "revised official price." However, a protection clause now disconnects national prices from international reference prices. If the calculated international reference price is below the 1986 real national price, a domestic price as high as this later price can be maintained. Hence, the national price is not likely to decrease in real price terms. Current protection is now substantially above 25%, the rate used in international reference price calculations and approved for the industrial sector under their components of the structural adjustment program.

Laraki found that better targeting of consumer subsidies would involve subsidizing barley and DW instead of BW. These, he said, are consumed more by low income groups. Salinger estimated that in 1992, FNBT subsidies were 133.3 Dirhams per quintal (DH/Ql), 50 DH of which were transferred from the consumer to industrial millers as a rent due to the quota on FNBT production. These findings led naturally to the proposition of eliminating FNBT subsidies. Elimination of FNBT subsidies has been delayed because of technical and political difficulties. Advocates of FNBT subsidies argued that FNBT was the only targeted consumption subsidy. Its motivations included income transfer considerations, food rationing, risk reduction for the poor in the face of large price fluctuations and political sensitivity.

The removal of the producer official price from BW was delayed because BW represents the bulk (75%) of Morocco's cereals imports (Abbott, 1993) and keeping a producer support price would help improve the country's food security. The argument on producer welfare improvement proved to be weak. The combined effect of all incentives to farmers resulted in negative protection of cereals production over the period 1984-86 (EPI 1), and neutral protection over the period 1988-1990 (EPI 2). Freeing trade and eliminating the BW official price would not hurt large cereals producers. However, these reforms may not benefit small and medium farmers in non-irrigated areas (De Janvry and Raki). Small scale farmers represent the majority of cereals farmers: 74% of cereals is produced on farms of less than 20 hectares (Raki). De Janvry and Raki also found that the elasticity of supply response of tradable cereals (BW and corn) is reduced by the presence of non-tradable cereals (barley and DW). On the other hand, keeping a BW support price would result in less efficient resource allocation and in efficiency losses.

The elimination of ONICL monopoly power over international and domestic cereals trade was also in the reform schedule. It was officially (thought not in practice) eliminated for DW, barley and maize since 1987 (Abbott), but delayed for BW.

Advocates of marketing boards, such as ONICL, often emphasize the large number and importance of the food policy goals these agencies seek to attain. Replacing these agencies by market forces may jeopardize some goals (USDA\ERS). This may be the case for goals such as maintaining stability of consumer prices and improving the country's food security. On the other hand, keeping the status quo may prevent price signals from operating. Some in-between role for ONICL may need to be defined. Currently, a felt need for government involvement in cereals marketing remains. The heart of the debate is now about the nature of trade regime to be implemented, the level of border protection for BW, the consequences of eliminating FNBT consumption subsidies, and the elimination of the FNBT milling quota (Tyner and Benaissa, Abbott, Groupe C).

The recent conclusion of the Uruguay GATT round has altered significantly the direction and form of cereals market reforms in Morocco. A variable levy was to be implemented for cereals trade in April, 1994. That measure was not implemented, since it is likely to be illegal under the recently signed GATT accord. Morocco now plans on implementing an ad valorem tariff in January, 1995. Fears concerning trade and market stability consequences of this form of border protection have caused Morocco to propose quite high tariff levels, even relative to the 80 - 100% implicit tariffs now in effect.

Trade Policy Issues

Several key trade and domestic cereals policy issues are evident in the above discussion. These issues concern the level and form of trade protection, and interactions between trade regimes and domestic cereals policy. The model describe here may be used to examine policy alternatives and to calculate resulting market adjustments, food security implications, financial outcomes for farmers and the government, and consumer welfare changes.

A central concern in modeling trade and domestic policies, and in understanding how trade regimes affect domestic market adjustments is the *tradeability* of each type of cereal. Abbott and de Janvry and Sadoulet both recognized that under current market regulation, barley and durum wheat are effectively non-tradeables. Thus, these cereals adjust to domestic supply-demand conditions in a closed economy fashion. Whether appropriate policies can turn a non-tradeable commodity into a tradeable by permitting /encouraging imports is an important open question. This model is designed to investigate alternative scenarios with tradeability assumptions by cereal set the model user.

For tradeable cereals, the preferred *extent of border protection* then emerges as an important policy concern. Currently, protection at nominal exchange rates approaches 100% for each cereal. While the structural adjustment program proposed substantial reduction of this protection level, to 25% (the same as the level of industrial protection), Morocco's recent GATT submission proposes greatly increased levels of protection. The consequences of alternative protection levels will be useful information as the debate on the appropriate level of protection for this sector unfolds.

Price levels and protection are the consequence of domestic as well as border interventions. Furthermore, the effectiveness of trade policy depends upon the nature of domestic cereals policies, and vice versa. For example, relaxing the FNBT production quota or changing the extent of FNBT subsidies will have trade and/or pricing consequences in the bread wheat market which will spill over into other cereals markets. A second objective of the model is to represent the *interactions of trade and domestic policy* alternatives.

Market consequences of trade and domestic policy alternatives, and their implications for food security depend as much on the *form of trade intervention (trade regime)* as on the level of intervention instruments. Uncertain future world prices and Moroccan production levels will lead to differing outcomes, depending on whether the trade regime stabilizes domestic markets (with a variable levy), exposes domestic markets to world price variability (with an ad valorem tariff), or effectively closes the sector and forces market adjustments to domestic conditions (with quantitative border controls). The model uses both alternative forms of border protection and stochastic simulation methods to address the consequences of policy alternatives given these uncertainties affecting food security.

Model Overview

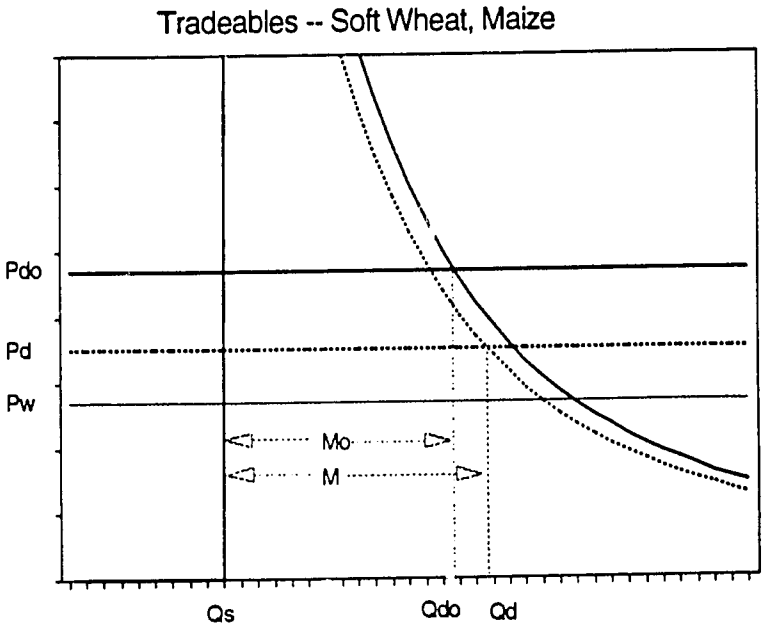
The Moroccan cereals market/trade model described in this User's Guide represents supply and utilization of the four principal cereals -- bread wheat (BW), durum wheat (DW), barley (BL) and maize (MZ). Bread wheat (BW) is transformed into three types of flours -- FNBT, FL and ART, with demand by millers for BW to produce these flours derived from consumer demand for flour. FNBT is a subsidized, low quality flour produced by industrial millers. FL, or Farine Libre (free market flour) is an aggregation of the higher quality flours produced by industrial millers, and ART is the output of traditional (artisinal) millers. Supply of cereals is composed of carry-in stocks, production and imports. Utilization includes animal feed use, food use broken into demand by region (urban or rural) and income class, and carry-out stocks. Industrial mill demand for BW determines supply of flours according to transformation coefficients for each type of flour (FNBT, FL).

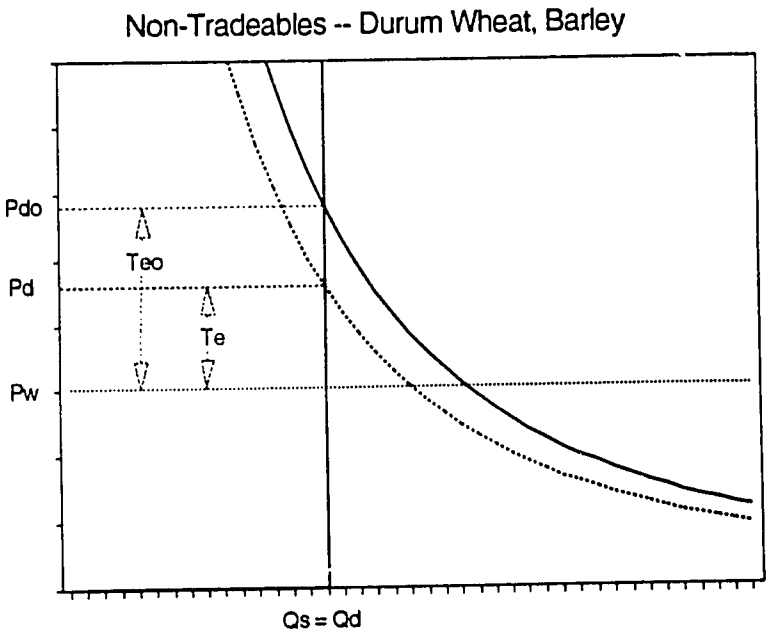
Cereals and flour markets are represented in a partial equilibrium, multi-commodity framework which takes into account the special institutional features of Moroccan markets. These features are largely due to the control exercised over these markets by ONICL and the parallel functioning of private cereals markets with official commerce managed by ONICL. The underlying economic assumptions of this model are relatively simple and may be described in typical supply-demand graphs. Tradeability or non-tradeability of a cereal is a critical assumption affecting how markets adjust to policy changes or other exogenous shocks. BW and MZ are now assumed to be tradeable, and are modeled with prices generally determined by world price and policy, so that imports adjust to bring about equilibrium. DW, BL and the flours are home goods, with supply-demand equilibrium determining prices and quantities in a closed economy fashion. Policy affects market outcomes for all cereals, both directly and through substitutions among goods as relative prices change.

Figure 1 presents in a simplified format the economics of the cereals markets, using a reduction in the level of BW protection to illustrate model behavior. BW and MZ are shown as tradeable cereals subject to the small country assumption, with policy driving a wedge between world (Pw) and domestic (Pd) prices. The intersection of Pd with supply (Qs) determines production, the intersection with demand determines Qd, and imports are the difference between Qd and Qs. Durum wheat and barley are modeled as non-tradeables, so that supply (Qs) equals demand (Qd), with imports and exports effectively equal to zero (fixed within small limits). The effects of a reduction in border protection for a tradeable cereal are shown in Figure 1. With all Pw fixed, this policy change causes Pd to fall from Pdo (the bold solid line) to Pd (the dotted line). Substitutions between cereals may shift demand (from the solid to the dotted curve), since the prices of non-tradeables will fall, though by less than the decrease in tradeable cereals prices, so the likely market adjustment is an increase in imports from Mo to M.

Non-tradeables (DW and BL) are shown in the lower panel of Figure 1. Lower BW protection shifts downward the demand for DW and BL due to substitution effects. With supply fixed, due to no trade in these cereals and predetermined production, the domestic price falls from Pdo to Pd at the intersection of the vertical supply curve with the shifted (dotted) demand curve. The effective tariff falls from Teo to Te, and will not necessarily equal the change in BW protection. Note that for the tradeable cereals, price changes are exogenously imposed through policy linkages, and market adjustments come through substitution among cereals and changes

Figure 1. Supply-Demand Equilibria for Tradeable and Non-tradeable Cereals.





in imports. For the non-tradeables, the adjustment mechanisms are different, as market quantities are fixed in the short run, so that domestic prices adjust to bring about equilibrium.

Figure 2 describes the adjustments in flour markets following such a reduction in bread wheat (BW) protection. The situation differs for market flours, which are simply a reflection of transformation of BW and its cost, and FNBT, where a production quota and subsidies now apply. In the lower panel, supply of FL and ART are shown to be perfectly elastic (horizontal) and depend on production costs including the cost of BW. When the price of BW is lower, this cost savings is passed on as a downward shift in the supply of FL or ART. While substitutions among flours and cereals may shift the demand curve location, the market price for these flours is determined by the price of BW. Thus, adjustments for flours are passed on to the BW market as changes in miller demands.

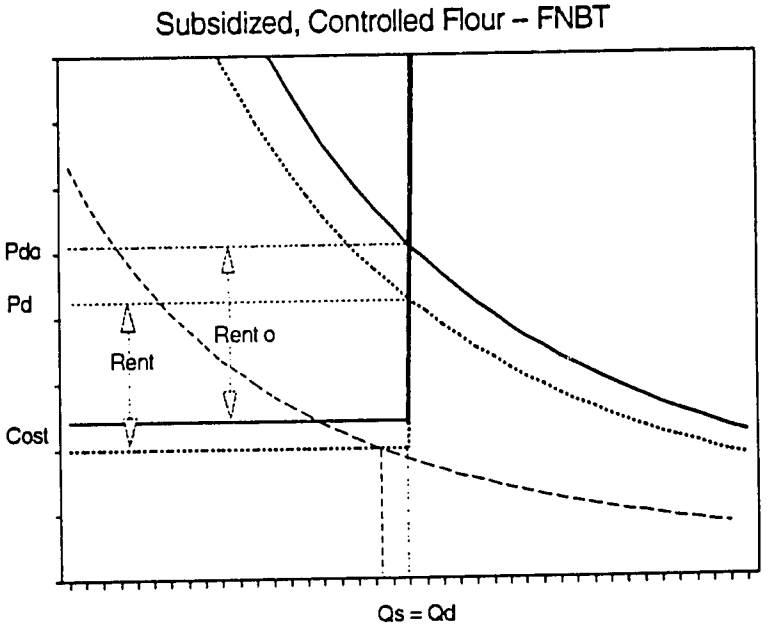
The supply curve for FNBT includes two parts. The horizontal portion of the curve reflects the cost of production, including the cost of BW and any subsidies. The vertical portion of the curve is due to the production quota. This figure shows that quota to remains binding for the initial demand shift due to changing relative flour and cereals prices. Shifts in demand due to flour substitutions change the market price of FNBT, and hence the rent which accrues to owners of the production quota. That is, the price of FNBT is market determined, since supply is constrained, so that consumers pay more than the official price and the industrial millers reap part of the benefits from subsidies. As the price of BW is lowered, both supply and demand shift, so the effect on the rent depends on market behaviors, and may increase or decrease. The dashed demand curve represents a downward shift in FNBT demand sufficiently large to make the production quota no longer binding. Then FNBT supply and demand behave in a manner similar to FL and ART, and the rent on the production quota goes to zero.

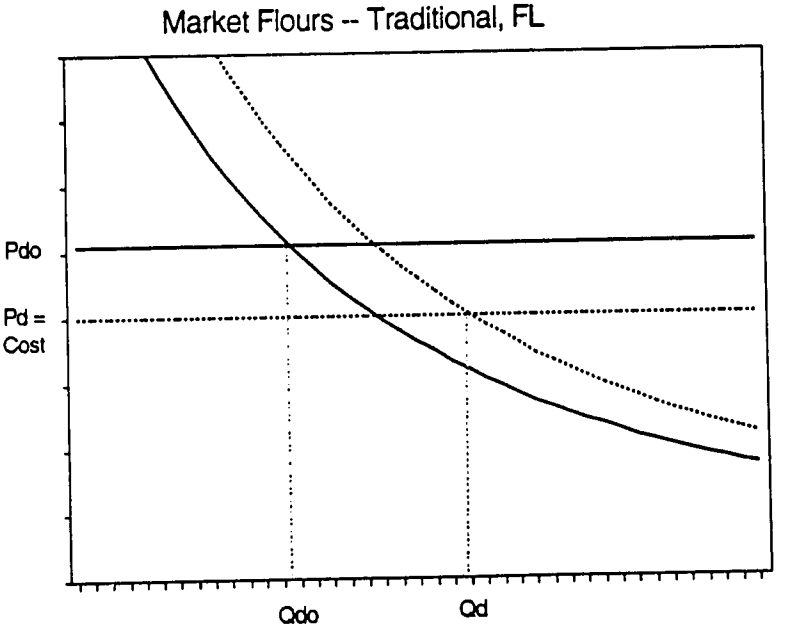
Outcomes in this supply-demand framework are critically dependent on the policy assumptions invoked. The model user has considerable flexibility in altering those assumptions. Tradeability, including the export prohibition, are assumptions which may be changed for each cereal. Hence, the fundamental adjustment mechanisms for each market can be changed. For example, tradeability of DW and BL may now be constrained by policy rather than consumer preferences, so one can permit imports of these using policy instruments similar to those available for BW.

The policy wedges between domestic and world prices for tradeables may be determined by ad valorem or specific tariffs, variable levies, or quantitative restrictions on trade. Market prices also depend on domestic policies, flour transformation costs and marketing margins. Domestic policies which affect market outcomes include the FNBT production quota, and subsidies to millers for imports, commercialization or transportation. Official consumer prices for FNBT are used to gauge the subsidy and hence production cost, but the consumer price is market determined, since observed prices are well above the official price and millers are collecting part of the subsidy. Official farm gate prices for BW are also permitted, and determine the effectiveness of ONICL's procurement campaign.

Results projected by the model include prices at the border, the mill, the farm gate and for the consumer as well as all quantities included in supply and utilization balances. Welfare and financial impacts for consumers, producers and the government are also calculated. The

Figure 2. Supply-Demand Equilibria for Wheat Transformed to Flour





model calculates static equilibrium market prices following equation specifications and then quantities and financial outcomes consistent with those prices.

To assess the income distribution impacts of policy alternatives and to determine the impact on Moroccan food security, food use for cereals and flours is divided into demand by four consumer groups. Urban and rural consumers are separated, and in each region, vulnerable consumers (the poorest 30%) are disaggregated from others (the remaining 70%). This division permits representation of the skewness of the income distribution and the fact that lower income consumers are more price and income elastic, thus absorbing a greater share of the adjustment burden when market prices change. Rural income is also linked to farm gate prices and production levels, reflecting the fact that as prices are lower or production falls, lower producer income will result in decreased demand by farmers for those cereals.

To further capture the food security implications of policy alternatives, the model is designed to run stochastic (Monte Carlo) simulations in order to asses the price, consumption and welfare risks associated with that alternative. World cereals prices and domestic productions are projected using a random number generator, and market equilibrium is determined for each of 1000 alternative world price and production combinations. The distributions for world price and production are base on the means and variance-covariance matrices of actual world prices and production. Hence, interdependence of cereals production and world prices is represented. For these alternative equilibria, the model keeps track of average outcomes and, more importantly, how often market extremes are reached or constraints become binding. Market extremes include low farm prices (and hence farm income) or high prices and low cereals consumption. The distribution of these market outcomes under alternative trade regimes is generated. This permits assessment of the implications for relative stability of prices and consumption with variable levies versus quantitative restrictions or ad valorem tariffs under alternative tradeability assumptions. Constraints which may bind policy and market functioning include quantitative trade restrictions as well as limits on foreign exchange available for cereals imports.

Several variants on model solution are in fact possible. The Monte Carlo simulations are slow to run and unnecessary to answer certain policy questions. Therefore, the model may also be run to generate static or dynamic impacts of policy alternatives. That is, the model may be used to simulate short run equilibrium, where production is fixed, or medium to long run equilibrium, where production dynamics follow a lagged adjustment model and inter-annual stocks adjustments are represented. The stochastic simulations are also dynamic, in that these stocks interactions and production dynamics are captured by simulating 200 repetitions of five-year sequences. In practice, the length of run in dynamic and stochastic scenarios, and the number of repetitions of sequences of years are parameters to be set by the model user. The user may also set population, income and production trends in the dynamic simulations, although these are suppressed in the stochastic simulations in order to insure comparability with static outcomes.

This model is implemented using a Quattro 4.0 workspace consisting of six spreadsheets, and a Fortran program interfaced with the workspace to determine market equilibrium using a reliable fixed point algorithm and to run dynamic and stochastic simulations. The equations used identically in both model components are presented below. Then model implementation and usage will be discussed.

Model Specification

Model specification is described in five sections below. First, the basic accounting identities expressing equilibrium conditions and identifying market flows are given. Price linkages due to marketing costs and policy are specified. Behavioral relationships for each market flow (economic agent) are explained. Calculation of financial and welfare outcome measures are then described. Finally, variations in model specification and use for static, dynamic and stochastic simulation are presented.

Accounting Identities

Central to this model of public and private parallel markets are market balance accounting identities relating supply and utilization by commodity. Supply and demand for cereals and flours, disaggregation of food use by region and income group, derived demand for BW by industrial millers based on consumer demand for flour, and inter-annual stocks accounting constitute the basic equilibrium conditions of this model.

Cereals supply and demand must be equal in each commodity market. Supply of a given cereal is comprised of carry-in stocks, domestic production, and imports. Total demand for a cereal includes animal feed use, food use (consumption), derived industrial miller's demand and carry-out stocks. Therefore, cereals market balance is:

$$So_i+Q_i+qI_i=B_i+M_i+C_i+S_i$$

where: So = carry-in stocks,
Q = domestic production,
qI = imports,
B = animal feed use,
M = derived demand by millers,
C = food use (consumer demand)
S = carry-out stocks,
i = commodity (BW, DW, BL, MZ)

and all market flow quantities are expressed in thousands of quintals[1].

For both cereals and flours, food use (consumer demand) or industrial mill demand is the sum of region/income groups' demands, product by product, according to the following:

$$C_i=Cuv_i+Cuo_i+Crv_i+Cro_i;\ i=DW,BL,MZ$$

[1] Quintals are the standard Moroccan unit of measure. Ten quintals equal one metric ton. Base case values are denoted by adding o to the end of the variable name. Hence, Qo is base (normal year) production.

$$C_{BW}=Cuv_{ART}+Cuo_{ART}+Crv_{ART}+Cro_{ART}$$

$$M_i=Cuv_i+Cuo_i+Crv_i+Cro_i;\ i=FNBT,FL$$

where[2]: Cuv = food use (demand) by the vulnerable urban income group,
Cuo = food use by the other urban income group,
Crv = food use by the vulnerable rural income group,
Cro = food use by the other rural income group.
M_{FNBT} = total FNBT supplied by industrial mills, and
M_{FL} = total FL supplied by industrial mills.

Millers' derived demand for BW must equal the sum of all flours supplied by the industrial flour mills, converted from a flour basis to a grain basis by respective extraction rates. Artisinal flour is modeled on a grain equivalent basis, since extraction rates are variable and uncertain, whereas industrial flours are represented in terms of flour. Food use for BW therefore includes demand for artisinal flour (ART), and the derived demand for BW as intermediate input to industrial millers, which is:

$$M_{BW}=\frac{M_{FNBT}}{tx_{FNBT}}+\frac{M_{FL}}{tx_{FL}}$$

where: M_{BW} = total industrial mills' demand for BW,
tx_{FNBT} = extraction rate for FNBT, and
tx_{FL} = extraction rate for FL.

Inter-annual stocks accounting requires that carry-in stocks in period t must equal the carry-out stocks in period t-1 (the previous year):

$$So_t = S_{t-1} = St$$

where: So_t = carry-in stocks for year t, and
$St=S_{t-1}$ = carry-out stocks for the previous year, t-1.

Policy and Price Linkages

Several price linkages represent transformation and marketing margins and incorporate policy effects. The average industrial mill (near Casablanca) serves as the reference point for all other prices in this model. Assuming this average flour mill is 65 kilometers from the port, and taking into account observed mill prices and transportation and marketing costs, price linkages are established for the private market. Producer, consumer, and border prices are all linked to

[2] Other definitions are as previously stated. Appendix A also lists all variable definitions for this document and the modeling tools.

the mill prices. This theoretical "average mill" is also taken as the comparison point between domestic and international cereals prices.

Transportation and Marketing Margins

Cereals produced by farmers and then transported to mills receive the private market producer price (Pr), derived from mill prices (Pm) by subtracting average transportation costs between assumed locations of millers and the typical farmer:

$$Pr_i = Pm_i - mp_i$$

where: Pr = private market producer price in DH/Ql,
Pm = private market mill price in DH/Ql,
mp = transportation and marketings costs from the average producer to the reference industrial mill in DH/Ql.

Consumer prices (Pc) for cereals and flour are also derived from mill prices, and corrected for transportation and marketing costs. Their linkage with the mill prices was modeled as follows:

$$Pc_i = Pm_i + mc_i$$

where: Pc = consumer price in DH/Ql, and
mc = transportation and marketing costs from the average mill to the average consumer, in DH/Ql.

Border prices for cereals and FL (before policy effects are incorporated) equal the product of world prices in dollars at the US border plus freight (from the U.S. Gulf to Morocco) times the Moroccan exchange rate in Dirhams per US dollar (DH/US$). For the four cereals and FL, border prices were modeled as:

$$Pf_i = (Pw_i + af_i) * tc$$

where: Pf = pre-policy border price of imported commodities in DH/Ql,
Pw = world market price at the US border (Gulf) in US$/Ton,
af = freight, insurance and shipment costs from the US gulf to Morocco, in US$/Ton, and
tc = exchange rate in DH/US$.

Trade Policy and Import Supply

If Moroccan cereals trade were free, border prices of imported cereals would equal mill prices, corrected for transportation and marketing costs from the mill to the border. The wedge between these prices for a given cereal could theoretically come from an import quota, a tariff, or another border policy. In the Moroccan case, there is no explicit cereal import quota at present, and existing cereal import tariffs cannot explain observed price differences. Quantitative cereals market regulation by ONICL must therefore operate as border protection to explain these

observed price wedges. Therefore, implicit import tariffs must be estimated. Implicit import tariffs are calculated for the four cereals as well as FL. The implicit tariff is equal to a ratio where the numerator is the difference between the domestic price of BW at the average industrial flour mill and the equivalent import price of BW, corrected for transportation to that mill, and the denominator is the border price (Pf):

$$dd_i = 100 * (Pm_i - mf_i - Pf_i)/Pf_i$$

where: dd = Estimated implicit import tariff in % of the border price, and
mf = transportation and marketing costs from the sea port to the reference industrial mill in DH/Ql.

In the base case, implicit import tariffs are modeled as an equivalent variable levy. The model allows for modelling three different tariffs (specific, ad valorem, and variable levy) and two kinds of quantitative restrictions on imports (import quotas on quantities and limits on the import bill). Thus, for tariff interventions the relationship between mill and border prices becomes:

$$Pfm_i = (Pw_i + af_i) * tc * (1 + Tav_i/100) + Tsp_i + PreV_i$$

where: Tav = ad valorem tariff in % of the border price,
Tsp = specific tariff in DH/Ql,
PreV = variable levy in DH/Ql, and
Pfm_i = equivalent (post-tariff policy) border price at the reference industrial mill.

For the static and dynamic versions of this model, there is no difference between a variable levy and a specific tariff because world prices are fixed. For stochastic simulations, the variable levy guarantees a fixed import price while world prices vary. Given a domestic reference price, the variable levy equals the difference between the randomly generated world price of that commodity and its domestic reference price, so:

$$PreV_t = PreVo - (Pw_t - Pwo)$$

Variability in world prices is represented by:

$$Pw_t = Pwo + dsPf/tc$$

where dsPf is a stochastic disturbance term representing variability in Moroccan border prices with a mean equal to zero, and a variance-covariance matrix covPf. IF PreVo is set equal to zero, this policy option is inoperative.

Two types of quantitative restrictions on imports could also result in a wedge between equivalent border (Pfm) and mill prices (Pm): import quotas and limits on foreign exchange spent on cereals imports. By using import quotas, the model permits setting as tradable (quota higher than base imports) or non-tradable (quota set equal to very low base imports) any of the four cereals as well as FL. When quotas are always binding and/or cereals are non-tradable, producer

and consumer prices adjust to domestic market conditions, not the world market, and the linkage between border prices and mill prices via tariffs (above) is broken ($Pm \neq Pfm$).

Import quotas are generally fixed for FL and all cereals except BW. Export maximums, which are initially set equal to zero, are also exogenously specified. Quotas are potentially quantitative regulators of the domestic market (in the case of BW). That is, BW imports quotas may be endogenously adjusted following variations in domestic supply, if ONICL[3] imports some fraction of excess domestic demand that could not be satisfied by domestic supply. In either case, imports cannot exceed the import quota:

$$qIc_i = eqIo_i - \sum_j eqIq_{ij} * (Q_{jt} - Qo_j) \quad j = DW, BW, BL, MZ$$

$$-Exmax_i \leq qI_i \leq qIc_i$$

where:
- qIc = effective import quota,
- $Exmax$ = maximum exports (initially zero),
- Q_{jt} = current domestic production of cereal j,
- Qo_j = base year domestic production of cereal j,
- eqI_o = base (fixed) import quota, and
- $eqIq_{ij}$ = a parameter endogenously linking imports (the quota) of cereal i to annual variations in production of cereal j.

The limit on international reserves allocated to cereals imports was set given the possibility of occasional shortages of foreign exchange reserves. Import cost limits in international currency are given by:

$$(Pw_i + af_i) * qI_i \leq DEmax_i$$

where DEmax is an assumed maximum of foreign exchange reserves that Morocco would be willing to pay for its imports of cereal i. The most binding between DEmax and qIc determines imports. If neither is binding, the domestic price is determined by tariffs ($Pm = Pfm$).

Industrial Flour Milling

Industrial millers are assumed to simply transform BW into FL at constant costs, fully passing on the cost of BW to consumers. Millers' supply of FL then simply equals its total demand by all region/income groups, at a (BW) market clearing price determined by the costs to transform BW into FL. So the FL supply function is infinitely elastic (see Figure 2) at this cost determined price. The mill price of FL equals the mill market price of BW corrected for extraction rates plus the average net costs of milling BW (mcn):

$$Pm_{FL} = Pm_{BW}/tx_{FL} + mcn_{FL}$$

[3] This option, endogenous quotas, is included to capture the status quo trade regime -- quantitative market regulation by a parastatal.

ONICL sets a BW support price, an official consumer price for FNBT, and a production quota for subsidized FNBT supply. That quota has remained fixed and binding at 10 million quintals for a substantial period. Millers are expected to buy BW at the support price and sell FNBT at its official consumer price. ONICL then gives subsidies to the millers to compensate for the difference between their production costs and their expected selling price. Therefore, FNBT subsidies are calculated using the official FNBT consumer price and BW producer support price plus transformation and marketing margins:

$$sFNo = (Po_{BW} + mp)/tx_{FNBT} + mcn_{FNBT} - Po_{FNBT} - mc_{FNBT}$$

where: Po_{BW} = bread wheat producer support price in DH/Ql,
Po_{FNBT} = official FNBT consumer price in DH/Ql,
SFNo = base FNBT consumption subsidy (given to industrial millers) in DH/Ql, and
mcn_{FNBT} = net milling cost for FNBT in DH/Ql.

ONICL will not give the industrial millers any subsidy for FNBT production beyond the quota set quantity. In fact, millers sell FNBT for a price much higher than the official consumer price, extracting some of the consumer subsidy benefits as a rent. Therefore, the FNBT supply function was modeled as shown earlier in Figure 2. Unlike the FL mill price, the base case FNBT mill price includes FNBT subsidies and millers' rent. Millers' rent is generated by the scarcity of FNBT in the market, caused by the policy set quota on the production. This rent is equal to the difference between what the millers receive for a quintal of FNBT, including the official subsidy, and the cost of production. This rent equals zero when (if) the FNBT production quota is no longer a binding constraint. Then FNBT production is simply transformation from BW at fixed costs. So, this rent is either strictly positive when the FNBT quota is binding, or equal to zero when the FNBT quota is not binding:

$$Pc_{FNBT} = Pm_{BW}/tx_{FNBT} + mcn_{FNBT} + sFN + RMCT$$

$$M_{FNBT} \leq MCT \qquad RMCT \geq 0$$

$$RMCT * (M_{FNBT} - MCT) = 0$$

where: MCT = production quota on subsidized FNBT supply, and
RMCT = industrial millers' rent in DH/Ql.

These price linkages and complementary policies provide the incentives which drive the behaviors of economic agents in Moroccan cereals and flour markets. Functions representing those behaviors are described below.

Behavioral Equations

Economic agents whose behaviors are modeled here include farmers, consumers, livestock producers, and storage. We chose specifications to permit reproduction of the base case when

policy and exogenous variables are set at their base levels (benchmarking the model). We specify below the behavioral functions used for each of these agents.

Farmers -- Production and Commercialization

Farmers must take two decisions: 1) how much of each cereal to produce, and 2) where to sell (commercialization to ONICL or to the private market).

For any of the four cereals, a farmer's decision on production depends upon the expected price, as production decisions must be taken in advance of harvest and sale of crops. Therefore, supply functions are based on a modified Koyck lagged adjustment model, with constant supply elasticities. The final supply function shows that farmers' decisions on production depend upon a growth coefficient (which in turn depends upon exogenous supply trends), previous year's supply, and the previous year's farmgate market price (to implement the adaptive expectations model):

$$Q_i=(gQ_i+elq_i)*Qo_i+(1-elq)*Qo_i*\Pi_j\left(\frac{Pr_{jt-1}}{Pro_j}\right)^{Eqpij}+dsQ_i$$

where: gQ = exogenous supply growth coefficient (trend),
EqP = short run price elasticities of supply ($Eqp_{ii}>0$): cross price elasticities are $Eqp_{ij} < \phi$, $i \neq j$).
elq = lagged adjustment coefficient ($0<elq<1$),
Pr_{t-1} = lagged private market producer price in DH/Ql, and
dsQ = stochastic disturbance term for production.

In a dynamic analysis, the growth coefficient will shift up the supply function each year, from the second year and thereafter. The growth coefficient is:

$$gQ_i=(1+dQdt_i/100)^{t-1}-1$$

where: dQdt = supply trend in percent growth per year, and
t = year, equal to 1 for the initial year, to 2 for the second, etc.

and gQ's are set equal to zero for static and Monte Carlo simulations.

The adjustment coefficient (elq) represents how supply expectations are being adjusted, taking into account previous prices and supply. elq could also be interpreted as a coefficient measuring how fast supply adapts to changes in prices in the short run compared to the long run. The larger is the adjustment coefficient (elq), the greater is the long run elasticity (EqpL) relative to the short run elasticity (Eqp). The adjustment coefficient relates short run and long run supply price elasticities (respectively, Eqp and EqpL) through the following:

$$EqpL=\frac{Eqp}{1-elq}$$

where: EqpL = long run price elasticity of supply,

The stochastic disturbance term (dsq), or error, represents supply uncertainty. The greater is the variance of this stochastic disturbance, the greater is the supply variability for upcoming years. The variance of dsq was estimated from historical information on production. This stochastic disturbance is used in stochastic simulations only. dsq is set to zero for static and dynamic simulations.

Once farmers have decided on their cereal(s) production, they also must decide if they will sell their BW crop in the private market or to ONICL (commercialization). The differences between the official price and the private market price and quantities sold in both the private and the official market are needed in order to derive reform impacts on farmers' revenue.

Some believe that procurement is simply ONICL's budget constraint divided by the procurement price. We could not use this approach because we have no information on this budget constraint. Given that farmers' wheat supply to ONICL equals procurement, commercialization can also be approached as a supply function. So commercialization (ONICL procurement) depends less on the ratio of the official procurement price offered by this public agency relative to the private market price, and the ratio of production (in the current year) to base production.

$$Qc = Qco * \left(\frac{Pr * Poo}{Pro * Po}\right)^{Eqcp} * \left(\frac{Q}{Qo}\right)^{Eqcq}$$

where: Qc = Commercialization (procurement to ONICL),
Eqcq = supply elasticity of procurement, and
Eqcp = own-price elasticity of procurement.

Consumers

Total cereals demand levels are essential in determining market and financial outcomes. Since we are interested in the impacts of policy alternatives on specific income groups, and especially on the vulnerable low income groups, we disaggregated total demand by region and income group. Demand function parameters also differ by region and income group, affecting each group's share of the market adjustment burden when prices and supplies vary. The functions and parameters describe below are applied separately to each income group ij = uv, uo, rv, ro.

Demand functions by income group/region are demands for food (consumption) use, based on observed per capita annual demand. Two types of functions were used: 1) A linear expenditure system (LES) modeled aggregate cereals and animal product consumption, and 2) nested constant elasticity of substitution functions (CESs) were used to disaggregate wheat use between BW and DW, and BW use into FL, FNBT, and ART. These forms were chosen for simplicity, to permit calculation of an explicit measure of consumer welfare based on underlying utility functions, and to represent likely substitution possibilities.

The LES for cereals and animal products is specified as follows:

$$Cij_k = gPop_{ij} * (Ecis_{ijk} + Emi_{ijk} (Y_{ij} - SUM\ l\ Pc_l\ Ecis_{ijl})/Pc_l)$$

where: Cij_k = demand for k by income group ij,
k = l = B (Wheats), BL, MZ, AN (Animal Products) and OT (other goods),
gPop = growth factor for this demand,

Ecis = subsistence consumption, a parameter of the LES,
Emi = marginal budget share (the average budget share for k times the income elasticity of demand for k), and
Yij = income of region/income group ij.

Several features of this demand equation require explanation, particularly as implemented here. First, consumption of wheat is represented by an index (CB), subsequently allocated by the CES functions first to wheats, and then to flours. Hence:

$Cij_B = CB_{ij}$ = the CES index for wheat consumption.

Consumer prices for wheat, animal products and other goods are also indices. Other goods are taken as the numeraire, so prices are essentially expressed in real terms, with Pc_{OT} held constant (= 1). Prices for animal products are based on index of feed costs, hence the farmgate prices of barley and maize:

$$Pc_{AB} = PAB = (B_{BL}\ Pr_{BL} / Pro_{BL} + B_{MZ}\ Pr_{MZ} / Pro_{MZ}) / (B_{BL} + B_{MZ})$$

where PAB is the animal products cost index, reflecting feed costs, which equals unity at base year farmgate prices.

The marginal budget share is taken from average budget shares and income elasticities of demand (EcR) as follows:

$$Emi = EcR\ Pco\ Cijo / Yo$$

Subsistence consumption is calculated to fit this demand equation to base consumption, using a "Frisch parameter" measuring price responsiveness (sigmaC):

$$Ecis = (Pco\ Cijo - Yo\ Emi\ sigmaC) / Pco$$

Price elasticities of demand are larger as sigmaC increases, and own price elasticities of demand for cereals (Ecip) may be calculated for this system using:

$$Ecip_k = -1 + Ecis_k\ (1 - Emi_k) / Cijo_k$$

Thus, the LES is implemented to yield base consumption at base prices, and parameters are derived from income elasticities of demand and a single additional parameter (sigmaC) which was chosen to approximate price elasticities and so cereals substitution.

This system applied to wheats and flours directly would understate substitution possibilities between wheats and flours, so the nested CES system was adopted to allow for setting independently elasticities of substitution between wheats (durum and bread) and flours (ART, FNBT, FL). The price of wheat in the LES is then an index characteristic of a CES function:

$$Pc_B = PB = aPb\ (\ dbd\ Pc_{DW}^{(1-sigb)} + dbt\ Pc_{BW}^{(1-sigb)}\ )^{1/(1-sigb)}$$

where PB is the wheat price index,

sigb = the elasticity of substitution between wheats (BW and DW), and

aPb, db = benchmarking parameters of the wheat CES function which insure base prices yield base consumption),

This CES function also yields a simple set of wheat demand functions:

$$Cij_{DW} = CB\ dbd^{sigb}\ (Pc_{DW}\ /\ PB)^{-sigb}$$

$$Cij_{BW} = CBT = CB\ dbt^{sigb}\ (PBT\ /\ PB)^{-sigb}$$

where PBT and CBT and price and consumption indices for products of bread wheat (flours) determined by the second level CES function which allocates consumption among flours. The price index for BW (PBT) is given by:

$$PBT = Pc_{BW} = aPbt\ (dfa\ Pc_{ART}^{(1-sigf)} + dfn\ Pc_{FNBT}^{(1-sigf)} + dfl\ Pc_{FL}^{(1-sigf)})^{1/(1-sigf)}$$

where sigf = the elasticity of substitution between flours(ART, FNBT and FL), and

aPbt, dfk = benchmarking parameters of the flour CES.

With these indices, the demand functions for flours may be derived:

$$Cij_k = CBT\ dfk^{sigf}\ (Pc_k\ /\ PBT)^{-sigf}$$

where k = ART, FNBT, and FL.

In dynamic simulations, growth in both income and demand shift these function outward. Population growth is incorporated in the LES function through the term gPop, which is:

$$gPop_{ij} = (1 + dPopdt_{ij}/100)^{t-1}$$

where dPopdt is the percentage annual growth rate for population of region/income group ij. Income also includes an exogenous trend, as well as the effect of cereals production and price changes. Income accounting is explained below with other financial and welfare indicators taken from the results of this model.

Livestock Producer Feed Use

Among the four cereals considered here, only barley and maize are used as feedstuffs. Feed use demand depends upon base year feed use, changes in total demand for animal products, and changes in the producer price of the cereal. Feed use demand functions are modeled using constant feed use own price demand elasticities:

$$B_k = Bo_k * \frac{\sum_{ij} Cij_{AN}}{\sum_{ij} Cijo_{AN}} * \left(\frac{Pr_k}{Pro}\right)^{Eab_k}$$

where: Cij_{AN} = demand for animal products by income group ij,
Eab_k = price elasticity of feed-use demand for k ($Eab_k < 0$).

Stocks

Storage demand functions describe annual carry-out stocks adjustment. The only stocks considered here are annual carry-in and carry-out stocks. Carry-in stocks are simply carry-out stocks of the previous year, and so are predetermined according to the accounting identity previously specified. Carry-out stocks in a given year adjust to changes in production and producer prices according to the following:

$$S_t = S_o * \left(\frac{Pr}{Pro}\right)^{Esp} * \left(\frac{Q}{Qo}\right)^{Esq}$$

where: Esp = own price elasticity of storage demand ($Esp < 0$).
Esq = supply (production) elasticity of storage ($Esq > 0$).

Welfare and Financial Outcome Measures

Outcome measures for income, expenditure and welfare are calculated for farmers, consumers and the government. These measures are used both to highlight market results for income distribution and cost and to link income and expenditures for the demand system.

Farmer income is the result of production, prices and commercialization. Farmers receive the official price for sales to the procurement campaign and the market price for remaining sales. Hence, farmer income from cereals is:

$$Rev_{CER} = Po_{BW}\, Qc_{BW} + SUMi\, P_i\, (Q_i - Qc_i) \quad ; i = DW,BW,BL,MZ$$

where RevCER is farmer income (gross revenue) from cereals production.

Consumers in each income group receive a fixed proportion of cereals revenue and a growing exogenous income component. Hence, for each region/income group ij, income is:

$$Y_{ij} = Yo_{ij}\, (1 + dYdt_{ij}/100)^{t-1} + (Rev_{CER} - Revo_{CER})\, revcer_{ij}$$

where dYdt is the growth rate for income of group ij, in percent per year, and
revcer = share of farmer cereals revenue going to group ij.

Consumer impacts of market changes can be gauged using two other types of measures. The simplest is expenditures on cereals (EXP_{CER}):

$$Exp_{CER} = SUMk\, Cij_k\, Pc_k \; ; k = DW, ART,FNBT,FL,BL,MZ$$

Consumer expenditure levels are not a consistent measure of welfare impacts, but the choice of the LES at the top level of the demand system permits the derivation, and so calculation, of explicit welfare measures for consumers. An index for the utility of each group ij may be derived form this system:

$$U/Uo = (Y - SUMk\ Pco_k\ Ecis_k) / (UoBo\ PIk\ (Pc_k/Pco_k)Emi_k$$

where k = B,BL,MZ,AN,OT and UoBo is a constant given by:

$$UoBo = Yo - SUMk\ Pco_k\ Ecis_k$$

A more easily interpreted measure is the increase in income at base prices (Pco) which would give the same increase in utility as the entire set of changes created by an alternative scenario. That is found to equal:

$$Ypo - Yo = SUMk\ Pco_k\ Ecis_k + U/Uo\ UoBo\ PIk\ (Pc_k/Pco_k)^{Emik}$$

where Ypo is equivalent income at base prices.

The other important financial measures are government subsidy and foreign exchange costs. Subsidies are calculated as follows:

$$SUB = Qc_{BW}\ sQc_{BW} + qI_{BW}\ sI_{BW} + M_{FNBT}\ sFN + C_{FNBT}\ sQc_{FNBT}$$

where SUB is total government subsidy cost,
- sQc is the transportation subsidy applied to procurement (commercialization) from farmers,
- sI is the subsidy given to importing agents for transport and marketing expenses,
- sFN is the subsidy given to industrial millers for producing FNBT, and
- sQc is the transportation subsidy for shipment from mills for FNBT.

Foreign exchange costs for cereals imports (FX) are:

$$FX = SUMk\ (Pw_k + af_k)\ qI_k \quad ; k = DW,BW,BL,MZ$$

Tariff revenue generated by these imports (TARREV) equals:

$$TARREV = SUMk\ Pf_k\ (Tav_k/100 + Tsp_k + PreV_k)\ qI_k$$

These measures and their components are reported as model results to provide further information on the consequences of alternative policies.

Model Variants - Static, Dynamic and Stochastic Simulations

Four variations in the use of this model, based on the time frame projected, the number of equilibria found and the nature of the results reported, are permitted. Each is based on a static

within year equilibrium solution for private cereals and flour markets. A one year simulation first projects that static equilibrium, and then the resulting equilibrium one year later after the effects of price and policy on production and stocks adjustments are taken into account. A dynamic simulation projects a sequence of n (typically 5) years of static equilibria, with production, population and income growth taken into account, as well as between year accounting linkages. Stochastic simulations project multiple sequences of dynamic equilibria (for example, 200 repetitions of five year sequences) to map out the distribution of market and financial outcomes when production and world prices are uncertain. The same basic final year outcomes are reported for each simulation mode, along with variable distributions and counts on when market extremes are reached for the stochastic simulations.

In the *static* market *equilibrium*, production is assumed predetermined by expected (lats year's, not current) prices, and so is fixed and known. The policy specification sets the locations of supply and demand curves, including perfectly elastic import supply at given world prices[4]. Demand is the consequence of choices by consumers in each region/income group between cereals and flours according to the LES/CES system, and aggregation of group demands. Feed use is based on animal product demand and feed cost calculated from cereals prices. Interactions between flour and wheat markets are as represented in figure 2, with prices being a mark-up on wheat and milling costs, and a quota potentially yielding rents for FNBT. Equilibrium is found for tradeables at world prices plus policy interventions by adjustments in imported quantities, while for non-tradeables and when quotas are binding, prices equate supply with demand, as depicted in figure 1. This static market equilibrium may be projected and examined, and is also used as the basic market equilibrium procedure in the other model variants.

In a *one year simulation*, a static market equilibrium is first projected. Then the equilibrium prices from that outcome are used to project next year's production using the lagged adjustment specification, with the stochastic term in production set to zero so that no uncertainty in production is operative. World prices also remain fixed and known. Carry-out stocks of that static equilibrium become next year's carry-in stocks, and demand shifts out due to one year's population and income growth. Thus, a new static market equilibrium is solved for this next year which incorporates the one year effects on production and stocks from the specified policy alternative plus exogenous trends. Results report the market, welfare and financial outcomes from this second static equilibrium solution.

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[4] A modeling "trick" is employed to permit a cereal to be at times tradeable and at other times non-tradeable. A net import supply function is specified with a large elasticity, and market equilibrium is found with total supply equaling fixed production plus carry-in stocks plus price sensitive imports. With a very large net import supply elasticity, and benchmarking the import supply function to base imports, prices for tradeables will deviate only very slightly from border prices (less than 0.1%), so that the small country assumption is effectively implemented.' This supply function becomes vertical at the import quota, so that the import component of total supply is then also fixed, effectively making the cereal non-tradeable for very small quotas. The speed of the solution procedure is sensitive to the elasticity, and may fail if too large a number is picked, so the net import supply elasticity (EI) is a parameter picked by the user. EI = 20 has proven reliable in model testing.

In a *dynamic simulation*, a repeated sequence of static equilibria are projected. As in the one year simulation, an initial static equilibrium is found, then prices and stocks are taken from that outcome, and with population and production growth, a second year's equilibrium is found. This new equilibrium sets prices, prior year production and stocks for another static equilibrium (one year later), with population and income growing again as specified by exogenous trends. This is repeated n times, where the user sets how many years forward the simulation stops (the model is initially set for a sequence of five years). The final outcome reported is the static market equilibrium for the nth year. That outcome incorporates exogenous and policy induced long term production, population and income growth. Production, world prices and income are treated as known, not stochastic.

In a *stochastic (Monte Carlo)* simulation, the dynamic sequence described above is repeated for m repetitions, where the user may set both n (years in the sequence) and m. m is initially 200 repetitions, so that at n=5 years 1000 static equilibria are projected. In these simulations, the exogenous trends are set to zero for population, income and production to facilitate comparability with a static solution. The model interface then first projects a static equilibrium outcome, and that result is used as a comparison point in the report on distributions and market extremes. In the stochastic simulations which follow, both production and world prices are treated as stochastic variables, with a variability defined by variance-covariance matrices which permit the relationships (dependence) between uncertainty among cereals production and among world prices to be represented. For each of the n*m (1000) static equilibria, stochastic terms (dsQ_i for production and $dsPf_i$ for border prices) are drawn using a random number generator. The distributions given by the variance-covariance matrices for dsQ and dsPf (estimated from observed data) as parameters, for a sufficiently large number of simulations, closely resemble the actual distributions for production and world prices. Hence, these simulations make projections with the distributions of uncertain production and world prices given and generate the resulting distributions for other variables from the market equilibrium, welfare and financial outcomes. For each static equilibrium, counters are incremented when either constraints (e.g. quotas) are binding or market extremes (consumption below, or prices above or below, critical thresholds[5]) are reached. Thus, information on how well the policy regime insures food security by avoiding those market extremes is generated. These are important measures in evaluating how well alternative institutions (e.g. ad valorem tariffs, variable levies, or regulation by quantity) perform in insuring market stability.

The user will choose among these four model variants depending on the issue to be addressed and the outcome measures needed. For some issues, several variants may be employed.

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[5] The user may set these thresholds by specifying one threshold closest to the static outcome -- in % change from the comparison point -- and a % increment or decrement in that threshold. Initially, these thresholds are set at five different levels: Consumption thresholds range from 95% (-5% change) to 85% (-15% change) of static equilibrium consumption in 2.5% decrements. Price thresholds range between 80 and 90% of static equilibrium prices for low prices, and 110 to 120% for high prices (+/- 10 to 20% changes also in 2.5% increment)s. Several thresholds are set to permit a more complete mapping of price and consumption distributions.

Model Implementation

The economic model described above is empirically implemented on an IBM compatible personal computer (PC) using two software tools -- a Quattro 4.0 workspace consisting of six linked spreadsheet files and a Fortran market equilibrium solver implementing a fixed point algorithm. The Quattro 4.0 workspace serves as the user interface, where base model parameters are set, alternative scenarios are specified, and model results are compared to the base case. The Fortran program is used to find the static market equilibrium described above, and it also runs the one year, dynamic and stochastic simulations by controlling sequences and repetitions of market equilibria, saving results for each scenario. ASCII files and Quattro "macro" procedures are used to link the workspace and Fortran program. One spreadsheet file (modele.wq1) expresses market equilibrium conditions given market prices, and these prices are the information that must come from the Fortran program. Underlying equations are therefore identical in that spreadsheet and in the Fortran program,[6] and so similar notation was used in each tool as well as in this manual (see Appendix A).

Quattro Workspace -- Spreadsheets

The Quattro user interface is designed around three basic tables. Table 2 describes the price linkages and policy interventions. World, border, mill, consumer and producer prices are all presented, along with marketing margins, policy instrument levels and implicit tariffs. The contents of this table vary a bit across spreadsheet based on the needed information in each instance. The base case table is most complete, whereas the table in modele.wq1 draws from base.wq1 and alt.wq1 and reports only the resulting market and official prices at each relevant level. Table 3 presents the commodity flows within and between markets. It includes carry-in and carry-out stocks, production, imports, industrial mill derived demands, consumption in aggregate and by group, and commercialization. Table 4 reports financial and welfare outcomes based on model equations and the data in Tables 2 and 3. It presents farm revenue from official and private markets, consumer expenditure patterns, foreign exchange implications of import levels in dollars and Dirhams, and the cost of the government of subsidies on BW and FNBT.

Tables 2-4 include all the base year assumptions on commodity flows, prices and policy linkages and financial consequences. The French labels are those included in the spreadsheet, while English translations of each label are presented below to aid English speaking model users. Units of measure in these tables are generally thousand quintals for commodity flows and Dirhams per quintal for prices, subsidies and margins. In spreadsheets reporting results, these same tables with entries expressed as a percentage of base case values are also provided to facilitate comparisons and interpretation of model solutions.

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[6] Having two tools with in principle the same equation structure facilitated debugging this model. For a set of prices taken from a market equilibrium solution of the Fortran program, the Quattro workspace must generate and report identical results. The modeler may therefore compare in detail the results of each model component to verify behavior or detect errors.

Table 2. Policy and Price Linkages.

PRIX, SUBVENTIONS, et MARGES Prices, Subsidies and Margins		*DW*	*BW*	*FNBT*	*FL*	*BL*	*MZ*	*AN*
	Prix -- *Prices*	Blé		Farines		Orge	Maïs	Animale
	Marché Libre (DH/QT) -- *Free Market*	dur	tendre	FNBT	Libre			Indexe
Pm	à la Minoterie Mill	276.0	235.0	255.0	351.0	192.5	195.0	1.0
Pr	au Producteur Farmgate	271.0	230.0			187.5	190.0	1.0
Pc	au Consommateur Consumer	294.0	253.0	273.0	369.0	210.5	213.0	1.0
Po	Officiel (DH/QT) -- *Official Prices*							
	au Producteur Farmgate		240					
	au Consommateur Consumer			200				
Pw	Mondial ($/tonne FOB) World Market Price	156	137		200	91	100	
af	Frêt et Assurance Freight and Insurance	22	22		22	22	22	
tc	Taux de Change (DH/$) Exchange Rate	8.50	8.50		8.50	8.50	8.50	
Pf	Frontière (DH/QT CAF) Border Price (CIF)	151.3	135.2		188.7	96.1	103.7	

	Subventions -- *Subsidies*	*DW*	*BW*	*FNBT*	*FL*	*BL*	*MZ*	*AN*
sFN	Minoterie - marge Mill -- margin			133.3				
sQc	Commercilisation Commercialization		13.0	6.3				
sI	Importation Imports		28.4					
	Rente Quota FNBT et Droits de Douane Implicite *FNBT Quota Rent and Implicit Tariffs*							
RMct	Rente du Quota FNBT FNBT Quota Rent			79.3				
dd	Droit de Douane Implicite % Implicit Tariffs	74	64		79	87	75	
	Marges des Producteurs, Minoteries et Consommateurs *Marketing Margins - Producers, Mills, and Consumers*							
mf	Port à la Minoterie Port to Mill	13.2	13.2		13.2	13.2	13.2	
mp	Producteur à la Minoterie Farmgate to Mill	5.0	5.0			5.0	5.0	
mcn	Minoterie - coût net Net Milling Cost			15.3	24.6			
mc	Minoterie au Consommateur Mill to Consumer	18.0	18.0	18.0	18.0	18.0	18.0	

Table 3. Market Flows.

	QUANTITES (mille quintaux) de l'Offre et de la Demande Supply-Demand Market Flows	*DW*	*BW*	*FNBT*	*FL*	*BL*	*MZ*	
		Blé		Farines		Orge	Maïs	TOTAL
	OFFRE -- *SUPPLY*	dur	tendre	FNBT	Libre			
So	Stockage début Carry-in Stocks	1700	3600			6500	200	12000
Q	Production Production	15700	19400			23700	3800	62600
I	Importation Imports	800	17000		0	3250	1800	22850
	DEMANDE -- *DEMAND*							
B	Alimentation Betail Animal Feed Use	0	0			16000	3900	19900
M	Minoteries Industrielles Industrial Mills	0	22500	-10000	-7200	0	0	5300
Qc	Commercialisation ONICL Commercialization	0	7150			0	0	7150

		DW	Art BW/ART	FNBT	Libre FL	BL	MZ	Cereales
C	Consommation Consumption	16500	13900	10000	7200	10950	1700	60250
	Consommation des vulnerables Vulnerable Income Groups							
Cuv	Urbain -- Urban	566	671	819	464	156	11	2687
Crv	Rural -- Rural	664	589	1301	212	1593	214	4572
	Consommation des autres Other Income Groups							
Cua	Urbain -- Urban	5721	5779	2741	3373	774	149	18537
Cra	Rural -- Rural	9550	6862	5139	3151	8426	1326	34453
S	Stockage finale Carry-out Stocks	1700	3600			6500	200	12000
	BALANCE	0	0	0	0	0	0	0

Table 4. Financial Outcomes.

REVENU ET DEPENSES (millions DH) Income and Expenses	*DW*	*BW*	*FNBT*	*FL*	*BL*	*MZ*	
	Blé		Farines		Orge	Maïs	CEREALES
Revenu des Agriculteurs des Céréales Farmer Income from Cereals	dur	tendre	FNBT	Libre			
Commercialisation Commercialization		1716					1716
du Marché Libre from Free Market	4255	2818			4444	722	12238
Total	4255	4534			4444	722	13954
Dépenses des Consommateurs aux Céréales Consumer Expenditures on Cereals							
Consommation des vulnerables Vulnerable Income Groups							
Urbain -- Urban	166	170	224	171	33	2	766
Rural -- Rural	195	149	355	78	335	46	1158
Consommation des autres Other Income Groups							
Urbain -- Urban	1682	1462	748	1245	163	32	5332
Rural -- Rural	2808	1736	1403	1163	1774	282	9165
Total	4851	3517	2730	2657	2305	362	16422

Devises Etrangers (millions de:) Foreign Exchange Expense	*DW*	*BW*	*FNBT*	*FL*	*BL*	*MZ*	*Total*
Importations ($) Imports	14	270		0	37	22	343
Importations (DH) Imports	121	2298		0	312	187	2917
Revenu Droits de Douane (DH) Tariff Revenue	89	1473		0	271	141	1973
Subventionnes ONICL (DH millions) Subsidies from ONICL		576	1396				1972
Importations Imports		483					483
Commercialisation Commercialization		93	63				156
Minoteries Mills			1333				1333

The six linked spreadsheet files in the Quattro workspace and the purpose of each are:

Base.wq1 --	the benchmarked initial assumptions, parameters and data for this model are contained here, and may be modified by the user.
Alt.wq1 --	information for the alternative scenario to be simulated, including policy alternatives, exogenous economic conditions and trends, are set by the user here.
Modele.wq1 --	is the QUATTRO equilibrium price solver for this model. It calculates all model variable values given equilibrium market prices and passes those results to other spreadsheets.
Stochdat.wq1 --	is the spreadsheet used to pass information to the FORTRAN equilibrium price solver (program).
Resol.wq1 --	is the worksheet which reports the outcome for the last year simulated, taking its information from modele.wq1, with equilibrium prices passed through stochrlt.wq1. This worksheet also compares that outcome to the base data.
Stochrlt.wq1 --	this worksheet retrieves information from the FORTRAN solver, reports the outcomes for Monte Carlo simulations, and passes the equilibrium market price from the last year simulated to modele.wq1.

The sequence of files specified above must be maintained in loading Quattro spreadsheets, as each file requires information contained in the files above (but not below). "Echange.wsp" contains the definition, hence contents of the QUATTRO workspace. It is used in loading at once and in order the spreadsheet files listed above.

Details on each of these spreadsheets and their contents for the base case as distributed are described below. Printouts of each spreadsheet are contained in Appendix B.

Base.wq1 -- Benchmarking the Base Case

The purpose of this spreadsheet is to help establish a consistent set of prices and market flows which represent cereals market conditions in a normal year. Prices and policy linkages are established in a table similar to Table 2. Prices at the mill and world level, policy instrument settings and marketing and transportation margins are entered as data, while the other prices are calculated using model price linkage equations. A table similar to Table 3 follows which is used to set base market flows. A balance is calculated to insure that supply equals demand following the accounting identities which must equal zero. Behavioral parameters are then entered in the form of elasticities. Parameters used in the production model, the demand system, for feed use, Commercialisation, stocks and import supply are entered. Model equations are specified in a manner so that constants in behavioral equation constants are automatically calculated to insure that, for whatever elasticity values are chosen, the relevant behavioral equation gives base market flows at base prices. Hence, the model is automatically benchmarked to the specified base case.

Variance-covariance matrices for the stochastic variables -- production and border prices -- are also set in base.wq1.

Some intermediate calculations are included in this spreadsheet to perform calculations for parameters of the consumption demand system. Finally, a table similar to Table 4 calculates the financial and welfare outcomes, and is used subsequently in comparisons of alternative scenario results and the base case situation.

Alt.wq1 -- Specifying and launching alternative scenarios

This spreadsheet is used to create alternative scenarios and launch solution procedures. Policy instrument levels are entered first, with settings for trade policy (tariffs of various forms, quotas and constraints on exports and foreign exchange expenditures), official prices, subsidies and the FNBT production quota. In each case, the base case assumption is presented in the spreadsheet through links to base.wq1 in order to allow quick comparisons as changes are made. Changes to exogenous economic conditions -- the world market price; marketing and transportation margins; initial conditions for prices, production and stocks; and growth rates for population, income, and production follow. Several intermediate calculations are presented, including a comparison of base and potential alternative scenario prices (using world price links and the small country assumption) as well as parameters for the demand model to represent growth. The parameters used for each of the scenario options -- static, one year, dynamic and Monte Carlo simulations -- and the thresholds for consumption and price distributions are then set and the macros to launch each option are listed and then specified. These macros must be started from alt.wq1.

Modele.wq1 -- equilibrium and variable calculations

This spreadsheet uses exogenously set equilibrium prices at the mill level and model equations to calculate prices at all other levels and market flows. The price linkages appear first, drawing information from links to both base.wq1 and alt.wq1. These links also allow the behavioral equations to be specified in order to calculate the market flows. Implementation of the consumer demand system comes first, followed by a table similar to table 3, with a supply-demand balance calculated from the flows resulting from the assumed equilibrium mill prices. Consumer welfare indicators are also calculated at the bottom of modele.wq1 based on the LES/CES demand specification. Both a utility index and equivalent income change at base prices are determined.

The "exogenous" equilibrium mill prices may be found in two ways. The Quattro 4.0 equation solution procedure may be invoked to search for mill prices which set the balances to zero. This corresponds to a static scenario solution. Since the Quattro solver has proven slow and unreliable, a Fortran program (to be described below) implements the identical equations. The macros take the prices found in the last scenario/year simulated and enter them into the row for equilibrium mill prices. After that is done, the spreadsheet automatically recalculates price linkages and market flows. Balance may be verified by insuring that the calculated excess demand in the balance row is at or very near zero.[7]

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[7] Either solution algorithm finds prices such that balance is within a "convergence tolerance" of zero. Setting balances exactly equal to zero is not practical given the numerical solution methods employed here, and the solution is now within 0.1% of equilibrium for each commodity.

Resol.wq1 -- Final year results

Two sets of tables similar to Tables 2-4 are reported on the final simulated scenario/year in this spreadsheet. First, these tables report prices, market flows and financial outcomes in the same units of measure as were used in base.wq1. That is, prices are in Dirhams per quintal, market flows in thousand quintals, and financial calculations in millions of Dirhams. The changes in consumer welfare are reported for this alternative scenario (set in alt.wq1), and the three initial tables are repeated, reporting the same information in percentage differences from the base case. That is, each entry in these three final tables is the difference between the alternative scenario outcome and the base case value, divided by the base case value, and then multiplied times 100 to express these tables in percentages. This procedure facilitates quick comparisons of base case and alternative scenario results.

The results reported in resol.wq1 are drawn from modele.wq1, using information as necessary from base.wq1 and alt.wq1. Hence, they represent the situation for whatever policy is set in alt.wq1 and whatever equilibrium prices are set in modele.wq1. After the macros have run, these prices are taken from the final year equilibrium found in the Fortran program and passed to Quattro.. Before the macros are run or the Quattro solver is invoked, if the mill prices in modele.wq1 have not established equilibrium, these results are meaningless. For static simulations, the results in resol.wq1 are comparable to the base year. For one year or dynamic simulations, the subsequent or nth year result is reported where n is five (or the length of the dynamic simulation as set by the user).

Stochdat.wq1 -- Linking to the Fortran equilibrium solver

The purpose of this spreadsheet is to assemble base data, scenario assumptions and calculated parameters in a format compatible with the procedure for passing this information to the Fortran equilibrium solver. Links are established with base.wq1 and alt.wq1 to create a listing data which is then "printed" to a file by the macro invoked in alt.wq1. This file contains the minimum information need to implement the model, plus some additional information to simplify coding the program. The scenario title, price linkage information, market flows, elasticities and parameters, policy and simulation control parameters are presented in that order.

This procedure generates the file "stochast.dat", which is the input file of the Fortran program. That file is listed for static equilibrium solution for the base case verification in Appendix C, along with the output files from the Fortran program (stochast.rlt, stochast.out). This printing procedure is designed to generate an ASCII file, so the default printer in Quattro should not be a Postscript printer (HP and Epson compatible printers work well). Cell formats and information contained in the printing specification are either part of the spreadsheet (e.g.,Print Block) or set by the macro (filename printed). Model accuracy requires maintaining the number of decimal places now set for each entry in this spreadsheet. The user who is familiar with Quattro may generate several files under different names, to be run later using the Fortran

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If the user wishes greater accuracy, he may alter toler in alt.wq1 at the expense of each equilibrium solution taking substantially longer.

program. The Fortran program, however, always assumes the input file is contained in stochast.dat.

Stochrlt.wq1 -- Monte Carlo results

Both retrieving equilibrium outcomes from the Fortran program and reporting results for the Monte Carlo simulations are accomplished in this spreadsheet. A limited set of information on the Monte Carlo simulations is saved in the Fortran program and passed to this spread sheet. For example, only world, border and mill prices are reported for Monte Carlo simulations since other prices would follow distributions very closely related to one or another of these prices -- consumer and producer prices are just mill prices plus or minus a constant.

In the part of stochast.rlt reporting Monte Carlo simulation results, first means, then standard deviations are presented for the m repetitions of n yearly equilibrium outcomes for important prices, market flows, and financial variables. Then distributions for prices and consumption are described by reporting the probabilities (in %) that certain thresholds are surpassed. Five thresholds each for low prices, high prices and low consumption are set by the user in alt.wq1 and results are reported here. Counts on how often constraint are binding (again in % of the N * M repetitions) are also reported for import quotas, and limits on foreign exchange expenditure, exports, and FNBT production. The first table presents aggregate variable probabilities, then a second table reports the distributions for low consumption by region and income group. One objective from these tables is to see how often market extremes and so food security problems would be encountered under alternative trade regimes. A final table repeats the initial table on variable means, expressed as percentage differences from base case results.

Linkage to the Fortran equilibrium solver outcomes is through the ASCII file stochast.rlt. The contents of stochast.rlt are formatted to be input to Quattro using the Tools/Import procedure for comma delimited data. That is, in stochast.rlt, commas separate entries for individual cells. The macros invoke this importing procedure to locate the results in specific cells reference elsewhere in stochrlt.wq1 and copied to modele.wq1 in the case of final year mill equilibrium prices. Only prices and initial conditions (prior year data) are needed to reproduce the static, one year and dynamic simulation results. The remaining information concerns means, standard deviations, and distributions from the Monte Carlo simulations.

Fortran Equilibrium Solver

The Fortran program which is part of this modeling tool is used both to find static mill level market equilibrium prices for the cereals and flours and to run the dynamic and Monte Carlo simulations, which require finding repeated equilibria. That is accomplished by using a fixed point algorithm to solve F(P) = 0, where P is a vector of equilibrium prices, and F(P) constitutes this model expressed so that at any mill prices (P), excess demand for each cereal/flour is calculated, and the problem is solved when equilibrium prices give all excess demands equal to zero. Calculation of excess demand is identical to calculation of the balance row in modele.wq1, and is found using the model equations specified above. The economic model in both this program and the Quattro workspace are identical for static simulation. The supply demand equilibrium accounting identity determines excess demand, with the behavioral equations determining the adjustments in each component of that balance in response to price

changes. Policy sets price linkages and constraints on adjustments. Hence, the mathematical problem to be solved is straightforward, yet it contains the full specification of this model.

Inter-annual linkages of one year and dynamic simulations and running of Monte Carlo simulations are controlled in this Fortran program. Each of those simulation procedures involves finding one or several static equilibria using the fixed point algorithm. In the case of one year or dynamic simulations, a static equilibrium is found and given that solution, the next year is then solved as a new static equilibrium. This is repeated for n years in the case of dynamic simulations, and for m repetitions of n year sequences in Monte Carlo simulations. For each of these multi-year simulations, initial (prior year) conditions must be updated for each new equilibrium solved, and in the case of Monte Carlo simulations, a random number generator is used to generate the exogenous variations in production and world price following the user specified distributions (variance-covariance assumptions) in each repetition/year. That is, the random number generator provides a value for dsP and dsQ for each year in each repetition, and equilibrium is found for the resulting world prices and production. When this is repeated over many repetitions and years, the distributions for Q and Pb closely approximate observed or user set distributions for the random variables. Information passed from one year to the next include farmgate prices and production for the lagged adjustment production model, and carry-out stocks which become the next year's carry-in stocks. Exogenous growth trends also shift out consumer demand and production in one year and dynamic scenarios.

The user interface for this model is generally through the Quattro workspace. The user sets alternative assumptions in alt.wq1 and launches this program using the macros found in that spreadsheet. The model may be run, however, by setting data and parameters in the input file of this program -- stochast.dat. As seen above, while this file is terse, row names identifying variables are provided in the file. The Fortran program is quite unforgiving of changes in the format of this input file, so care must be taken if that file is altered directly rather than through the Quattro workspace. Alternatively, the user may generate several files with the Quattro workspace, saving each under a name other than stochast.dat. The Fortran program may be run independently using the file generated, after renaming that input file to stochast.dat.

This program generates two output files. "stochast.out" is created for debugging purposes, and its contents will vary depending upon which write statements in the Fortran program are activated. "stochast.rlt" links the Fortran program results and Quattro workspace. It is an ASCII file in a comma delimited format designed specifically for importation into this Quattro workspace. As was the case for stochast.dat, these file are presented for base case verification in Appendix C, and are described above in the sections on the spreadsheet files which use them (stochdat.wq1 generates stochast.dat, and stochrlt.wq1 imports stochast.rlt). The user may examine stochast.rlt directly, or may rename it for later importation into the Quattro workspace if several scenarios are being run outside the workspace. The workspace greatly facilitates interpretation of results, however, as only the information needed to generate results reported in the workspace and the Monte Carlo results are passed between the Fortran program and the workspace.

The code for this program is contained in six ASCII files. Listings of those files are included on the diskette containing this model. The file stochast.for is the basic module for the program. It invokes the fixed point algorithm and controls sequences of years for dynamic simulations as well as repetitions for Monte Carlo simulations. It also calls other routines to read

data and parameters, generate random variables, save results from an equilibrium solution, calculate averages and standard deviations and count thresholds and limits for Monte Carlo simulations, and report appropriate results by generating output files. Within this program, data for the model is passed between routines using COMMON blocks defined in comdef.for, which also contains variable definitions. Data are read by routines in data.for. Excess demand (the economic model implementation) is calculated in qfp.for. Results are saved and the output file is generated by rslt.for. prgaux.for contains the random number generator, the fixed point algorithm, and some file and definition handling routines (naming stochast.dat and stochast.rlt).

Use of this Fortran program together with the Quattro workspace permits the user friendly interface of a spreadsheet along with the flexibility in specification of the economic model and reliability in finding equilibrium solutions by using the fixed point algorithm. Especially for the Monte Carlo simulations, which require solution of multiple, repeated equilibria, this reliability is crucial. Because of its speed and reliability, the Fortran program, through use of the macros, is used to find solutions for all simulation options.

Base Data and Parameter Assumptions

Data and parameter estimates from several sources were used to implement this model. Much information was obtained directly from ONICL and DPAE/MARA in connection with assignments for the Cereals Market Reform Project. Other information was taken from published studies on the Moroccan cereals sector and economy. Accounting identities were used to minimize data needs and insure consistency[8]. When appropriate information was not available, or when conflicting estimates were available from several sources, considerable judgement was applied to obtain the base parameters chosen. The quality of this model's projections depends heavily on those behavioral parameter choices. Additional work on obtaining better parameter estimates could enhance model reliability. Sensitivity analysis, using alternative parameter estimates, can also give the analyst better information on the consequences of the scenarios to be investigated. The actual values used for both base commodity flows and behavioral parameters are reported in spreadsheets base.wq1 and alt.wq1 which are listed in Appendix B and are also partially reported in Tables 1-4 presented earlier. Sources and procedures for setting those assumptions are discussed below.

Supply and Utilization

Supply-demand balances in the base year are fundamental information on which this model is based. The base year is intended to represent a "normal year" for the Moroccan cereals sector, taking into account the substantial variability in cereals production, especially in recent years, and consequential adjustments in utilization. After discussion with DPAE/MARA and ONICL officials, and examining recent data, an average of market flows for 1989-92 was chosen as the basis for base year cereals and flour flows. Those flows were reported in Table 1 along with averages, and the base year assumptions on commodity flows are reported in Table 3 and base.wq1.

Data on cereals production, imports, feed use, wheat milling, and official commercialization were official statistics provided by ONICL, who also provided data on earlier market flows used to estimate some behavioral parameters and trends. Estimates on cereals stocks were provided by the US agricultural attaché at the US embassy in Rabat, who uses the official ONICL statistics plus additional information on usage to make those estimates. Total consumption of durum wheat, barley, maize, bread wheat and BW flours was calculated as a residual using the supply-demand balance accounting identity.

Total consumption of FNBT was assumed to equal the subsidized quota of 10 million quintals (flour basis). ONICL statistics were used to estimate the quantity of FL, based on total output of the industrial mills and the FNBT quota, and taking into account extraction rates for

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[8] Only the bold cells in base.wq1 are fundamental data assumptions. Other cells have been calculated using model equations, especially the accounting identities and price linkage formulae. If the user wishes to enter alternative base case data, he should only enter new data in those bold cells, and the spreadsheet will calculate remaining cells. Consumption must be adjusted, however to insure market balance, so that the balances reported in base.wq1 must equal zero.

each flour, also provided by ONICL. These data were subtracted from BW total consumption to calculate BW consumption from traditional mills and other uses (ART).

Moroccan officials argued that only barley and maize are part of the feed use mix. Hence, feed use was set to zero for wheats and flours. ONICL data on feed use for barley and maize were used.

Since official support prices no longer exist for durum wheat, barley, and maize, commercialization was set to zero for those cereals. They were not relevant to model calculations, since no subsidies are now given. Bread wheat official commercialization was provided by ONICL.

We also needed to allocate consumption of each commodity among regions and income groups. Data on urban versus rural consumption shares for each commodity and population information were based on per capita consumption rates in Laraki. The shares of cereals going to urban versus rural consumption for each commodity were used to allocate the residual total consumption from the supply utilization balance (Table 3) between these two regions.

The 1990/91 Living Standards Survey provided budget shares and food expenditure composition by region and income group. It also set a poverty standard, which served as the basis for allocating rural and urban population estimates from U.N. and official Moroccan data between income groups. Budget shares, total expenditure per group, and the population of each group were used to estimate total expenditures per good for each region/income group. Expenditure shares calculated from this total were used to allocate urban and rural consumption between the two income groups for each region. This procedure used in each instance the data we felt were most reliable, and insured consistency with the overall supply utilization balances.

Animal product consumption, flour usage, and total income must also be set for the four region/income groups. Total animal product and flour consumption were estimated and distributed among the four groups in a manner similar to cereals, using the Living Standards Survey. That survey also provided information on income distribution, and the consumption of all other goods, a residual category in the consumption model. Total income was made to be consistent with IMF data.

Behavioral equations of this model were benchmarked to these supply and utilization flows at assumed base year prices. That is, constants in those functions are calculated so that when all base year prices and policy are assumed, the model yields these base or "normal year" flows. This benchmarking is accomplished through cell formulae in base.wq1 and in the specifications chosen, which typically use ratios of scenario variable values to base values. The price and policy assumptions for this base year are described in the following section, followed by elasticities describing behavioral adjustments.

Prices and Policy Linkages

Data on domestic mill level cereals and flour market prices and official BW and FNBT prices were provided by ONICL for 1991. Current base assumptions approximate the conditions in this year, which was the latest year in the set of years for base flows for which full price and policy information was available. World market prices at the US Gulf were taken from USDA statistics. Exchange rates come from the IMF and official Moroccan statistics. Other prices were estimated using relevant, assumed transportation and marketing margins and policy interventions,

following the price linkage equations described above. Base year price, policy and transportation and marketing margin information are contained in Table 2.

Information on internal and external transportation and marketing margins for bread wheat and flour were provided by Salinger. Following the assumptions of the Prices and Incentives study (EPI II), it was assumed that these could be applied to the other cereals and flours, as well.

Salinger's study also provided detailed information on ONICL interventions in the flour market. These were allocated among the various subsidies for BW and FNBT based on discussions with Salinger and ONICL and DPAE/MARA officials. Commercialization and import subsidies were set using this data. Rent to millers and the mill level subsidy for FNBT were calculated using observed FNBT market prices and official prices, with net milling costs a residual, following the price linkage specification for FNBT. (The FNBT production quota is assumed binding in the base case.) Net milling cost for FL is also a residual calculated from observed market prices, BW cost and the extraction rate.

Cereals and FL border prices were derived from world market prices (at the US Gulf), taking into account the base exchange rate (8.5 DH/US$) and freight and insurance (22 US$/Ton) as reported by Salinger. Implicit tariffs were calculated using price and policy linkage formulae in the model specification, and these were used to calculate base variable levies so that observed mill prices were consistent with border prices and the variable levy trade regime specification. The variable levy therefore equals the difference between the CIF border price and the equivalent domestic mill price (moved to the border using the port to mill marketing and transportation margin).

Import quotas were set at very high levels to insure they would not bind for the tradeable cereals, BW and MZ. For the non-tradeables, DW, BL and FL, import quotas were set at the small import levels from the base supply utilization table. Export maximums were all set to zero, thus assuming Morocco would never export any surpluses. Maximum foreign exchange expenditures were set at levels much larger than current expenditure levels to insure this constraint would only bind for very high world prices or much increased imports.

Behavioral Parameters and Elasticities

Behavioral parameters, generally expressed as elasticities, determine how each economic agent will respond to changes in market prices and other economic conditions. Several studies report estimates of supply and consumption demand elasticities. Regressions were performed using the ONICL provided time series data on market flows and prices. These results were supplemented with considerable judgement and experience on elasticities from other countries to arrive at current model assumptions

Studies by Driouchi and Laraki, and by Houmy provided very different supply elasticity estimates representing farm production in response to farmgate price changes for both the short and long term. Driouchi and Laraki used only time series data, while Houmy pooled time series and cross-sectional (regional) data, finding more elastic farmer responses. Houmy's estimates were judged more complete and plausible, and so were used as the basis for model assumptions, after some revisions were applied. Lagged adjustment terms were calculated from the ratio of short term supply elasticities to long term elasticities. These parameters are contained in base.wq1 in Appendix A.

The LES/CES demand system which represents consumption by region and income group has limited and specific parameter requirements. It is largely based on income elasticities of demand, for which reasonable estimates were available from several sources. Groupe D from the CMR Project reviewed the results of these studies and judged that the estimates of Laraki were the most reasonable. It is also generally found that income elasticities of demand are higher for low income consumers. That result combined with Laraki's estimates were used to set current model assumptions found in base.wq1.

Price elasticities for this system follow from the income elasticities, a Frisch parameter, and elasticities of substitution between wheats and between flours. The Frisch parameter was set close to conventional values, and to yield own price elasticities similar to those found by Laraki. The assumed Frisch parameter (0.6) and own price elasticities derived from the LES are reported in base.wq1. Substitution elasticities for wheat and flour were set to reflect the assumed considerable substitution possibilities among these products and to capture presumed differences among income groups and regions.

Elasticities for feed use, storage (carry-out stocks) and commercialization are reported in base.wq1. These are largely guesses, based on the notion that production is more important that price in determining these flows, and on judgement and simple regression models using ONICL data and prices.

Additional parameters for dynamic simulations include exogenous trends represented by annual growth rates for population and income by region and income group, and by production trends. Assumed production trends were based on regressions of historical data, while official projections for income and population growth were available from DPAE/MARA. These are found in alt.wq1.

Stochastic simulations require variance-covariance matrices for border prices and domestic production, the variables that were considered stochastic. The variance-covariance matrix for CIF border prices in DH/Ql was calculated using world price time series from the IMF and various USDA sources, converted to Dirhams using exchange rate data from IMF. For Maize and BW, world prices were Gulf prices. For DW, we used a Kansas City DW price. For barley, the Minneapolis barley price was used. Production time series data are from ONICL, and the variance covariance matrix is taken from the error term of the regression used to estimate exogenous production trends. These matrices are reported in base.wq1.

Information on financial and welfare outcomes are all calculations based on the above behavioral parameters and base data using model specification, also as described above. They are contained in Table 4.

Scenario Analysis - An Example

This model is used by changing policy parameter settings and exogenous variables reflecting the economic environment in alt.wq1. This sets the conditions for an "alternative scenario", for which results of simulations may be compared to the base case, and other information on the consequences of these changed assumptions may be found in the results reporting spreadsheets -- resol.wq1 and stochrlt.wq1. The user will seldom change entries in base.wq1, which established an initial, "normal year" equilibrium and set behavioral parameters. (Sensitivity analysis on behavioral parameters would involve changes in parameters found in base.wq1.) The cells to be changed are unprotected and appear in bold on the listing in Appendix B. Other cells present information which is intended to be helpful in making these changes, by showing values assumed for the base case.

Once these changes are entered, and an alternative scenario is established, the user may run any or all of the simulation variants using Quattro "macros" found in alt.wq1. These macros are steps taken in Quattro which transfer the information describing the alternative scenario along with parameters setting the simulation variant choice to the file stochast.dat; the Fortran equilibrium solver is automatically started; and when it is finished, the new equilibrium mill prices and other necessary information are passed to the workspace so that results spreadsheets reflect the consequences of that simulation. Each time a macro is run, the resylts repoirting spreadsheets reflect theat variant's oucome. Spreadsheet files must be printed or saved under another name to preserve results. Macros are invoked by typing simultaneously the <ALT> key and a letter (like <Shift> plus a letter to type a capital letter). When such a sequence is typed in alt.wq1, a Macro begins. The key combination choices for each simulation variant are:

- <Alt>s Static simulation (one year, one repetition, certain production and world prices - dsPb=dsPw=0)
- <Alt>y One year simulation (two years - to yield next year's outcome, one repetition, certain production and world prices)
- <Alt>d Dynamic simulation (N years - now five years hence, one repetition, certain production and world prices)
- <Alt>m Stochastic or Monte Carlo simulations (M repetitions of N years -- now 200 repetitions of 5 year sequences for 1000 equilibria, stochastic production and world prices -- dsPb and dsQ set in each repetition/year by a random number generator).

If the user prefers, he may simply generate the file to be passed to the Fortran equilibrium solver using another macro -- <ALT>f. This creates a file with a name taken from the scenario title cell. If the scenario name were "base", for example, the file "base.dat" would be created when this macro is invoked. To run the simulation for this alternative scenario, the user would then need to rename this file to stochast.dat at the DOS prompt, and run the Fortran solver by typing "stochast", again at the DOS prompt. The results file "stochast.rlt" should then be saved under another name and would need to be imported into stochrlt.wq1 later to view the results generated. This procedure might be used if the user wished to run a number of alternative

stochastic simulations overnight, using a DOS batch file, since each stochastic simulation may take some time for solution.

The running of an alternative scenario which updates some information to 1993 conditions is describe below to illustrate model use, and results reporting spreadsheets for these simulations are listed in Apppendix D.

The assumptions for this alternative scenario are contained in the spreadsheet altnew.wq1. This scenario updates world prices, the exchange rate, the official price for BW and FNBT, and tariff rates to 1993 levels. All subsidies are also set to zero and the FNBT production quota is relaxed. This scenario reflects the consequences of domestic reforms for FNBT at current protection rates and market conditions. The trade regime is also changed from a variable levy to an ad valorem tariff. Table 5 presents this new data, and altnew.wq1 is listed in Appendix D.

These data are entered into alt.wq1 as follows. The row labeled Tav contains the new ad valorem tariffs. The row below PreV is set to zero, deactivating the variable levy in subsequent simulations. Import quotas are two orders of magnitude above base import levels for BW and MZ to insure they will not bind. Import quotas for DW and BL are at the low base import levels, effectively making these cereals non tradeable, as are FL and fNBT which have zero quotas. In the Tc row, the exchange rate is set at 9.0 DH/$, in the Po row the BW official price is set to 260DH/Qx, in PoF, the FNBT official price is 333.3DH/Qx, which yields a zero subsidy, set in SFn. Other subsidies are set to zero in Rows aQc and sI. The FNBT production quota is set at 25000 thousand Qx, a value large enough that this constraint will not be binding. New world prices are then set in the row labeled Prix Mondial (Pw). All other entries remain at base case settings, including the growth rates for income, population and production sued in the dynamic simulations, and the simulation parameter settings.

A static simulation is run by typing <Alt>s, and results from that simulation are contained in static.wq1, also listed in Appendix D along with the other simulation results file. a one year simulation, generated using <alt>y is found in One_year.wq1. A five year dynamic simulation is in one_year.wq1, and stochastic simulation results are in stochnew.wq1. The first three files are identical to resol.wq1, except that they correspond to a new equilibrium using altnew.wq1 assumptions. stochnew.wq1 is similar to stochrlt.wq1.

Table 5. Example Alternative Scenario Assumptions

	DW	*BW*	*FNBT*	*FL*	*BL*	*MZ*
World Market Price ($/ton)	150	112	--	200	85	95
Exchange Rate (DH/$)	9	9	9	9	9	9
Official Price (DH/Qx)	--	260	333	--	--	--
Ad Valorem Tariff (%)	75	90	--	--	33	50
Subsidies (DH/Qx						
Consumers/Millers	--	--	0	--	--	--
Commercialization	--	0	0	--	--	--
Importation	--	0	--	--	--	--

Conclusion

The model described here offers a flexible framework for analysis of cereals trade and domestic policy options for Morocco. Alternative policies, trade regimes and exogenous economic conditions may be considered. While the framework captures important institutional features of Moroccan cereals markets, those assumptions may be relaxed to examine the consequences of changing institutions. Detailed results on market, financial and welfare outcomes from alternative scenarios are generated, permitting policymakers to choose among those alternatives with more complete information.

This model improves upon earlier models in several ways. Its greatest advantage is its flexibility. This model permits tariffs of various forms, variable levies, endogenous quantitative restrictions, and even whether a cereal is tradeable as choices by the user. Most earlier models assumed a single trade regime and could not accommodate alternatives. For example, the Multi-market model (Aloui, Dethier and Houmy) is well suited to examining ad valorem levies, but it cannot handle non-tradeables nor quantitative restrictions on trade. Its flexibility was lost when its authors determined what trade regime was to be modeled. This model may complement other models. For example, issues concerning the efficiency of the internal distribution system are be considered here, whereas, they may be addressed in conjunction with the spatial and temporal models of Arndt and Salim. While Serghini considers more fully the income and production linkages in his computable general equilibrium (CGE) framework, stronger assumptions on trade alternatives are imposed. This model is also unique in its ability to conduct Monte Carlo analysis of policy options for food security assessment, and its ability to represent regulation by quantity as now practiced by ONICL. Income redistribution issues are also examined by identifying low income groups with their own behavioral parameters, who bear a disproportionate share of the market adjustments to high prices and supply shortages.

Another advantage of this model is its user friendly interface. Experience has shown that users familiar with spreadsheets can quickly learn to take advantage of the power of this model. Interfacing the spreadsheets with a Fortran equilibrium solver permitted specification of a more complicated mathematical problem, allowing the flexibility in this model's specification.

The greatest weakness of this model is shared with the other models addressing Moroccan trade policy. Results are sensitive to the base data and behavioral parameters chosen. While the parameters now in the base model represent the best judgement of the author and were chosen in collaboration with Moroccan experts, and we believe the base case is a good approximation of a "normal" year for Moroccan cereals markets, policy impacts simulated depend strongly on the parameter choices now made. Sensitivity analysis on behavioral parameters and efforts to improve the quality of econometric estimates employed here should enhance the quality of information generated by this model.

This model is specifically designed to address some of the key cereals policy issues emerging from the debate over structural adjustment reforms and Morocco's entry into GATT. Key issues identified earlier include:

1) What is the appropriate level of protection for Moroccan cereals producers. How does that level of protection affect other segments of society (consumers, the government budget and so taxpayers)?

2) What form should that protection take to insure the food security goals of Morocco? What are the implications of ad valorem tariffs, variable levies or quantitative measures as trade policy instruments for price and consumption stability? How often will problems with consumption, prices or cost be encountered under each regime?

3) How do trade and domestic cereals policies interact to determine market outcomes, the distribution of benefits, and the degree of food security attained?

4) What are the consequences of alternative economic conditions (world market prospects for cereals imports or exports, exchange rates, alternative trends in income growth or cereals production) on the impacts of policy and trade regime alternatives?

The objective of this model is to provide the Moroccan government and other interested analysts with better information on these and other issues.

References

Abbott, P. "A Methodology for Evaluating National Grain Stocking Strategies," FAO, Rome, Italy, May 1991.

Abbott, P., "Harmonization of Domestic Agricultural and Trade Policies in LDCs: The Liberalization Dilemma in Morocco," Staff paper #93-8, Department of Agricultural Economics, Purdue University, West Lafayette, IN, July 1993.

Abbott, P. "Trade Modeling in Support of Moroccan Cereals Market Reforms." CMR Report CMR-2. Department de la Planification et des Affaires Economiques, Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, December 1991.

Abbott, P., M. Benirshka and P. Konandreas. "Public Sector Interventions and Food Security: Evaluation Using Static and Stochastic Simulation Models." Food Security Problems in Developing Countries, P.Berck and D. Bigman, eds. CAB International, Wallingford, UK, 1992.

Agro Concept. "Evaluation Economique du Systeme de Commercialisation." Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, April 1986.

Aloui, O., J.J. Dethier and A. Houmy. "L'Impact de la Politique d'Ajustement sur les Secteurs des Cereales et de l'Elevage au Maroc." Department de la Planification et des Affaires Economiques, Ministere de l'Agriculture et de la Reforme Agraire and World Bank, Rabat, Morocco, November 1989.

Belghazi, S. et. al., Deuxieme Enquete Nationale sur la Minoterie Artisanale: Rapport de Synthese, INSEA, Rabat, Morocco, January 1993.

Byerlee, D. and G. Sain. "Food Pricing Policy in Developing Countries: Bias Against Agriculture or For Urban Consumers." American Journal of Agricultural Economics, 68(4), November, 1986, 961-969.

de Janvry, A., M. Fafchamps, M. Raki, and E. Sadoulet. "Structural Adjustment and the Peasantry in Morocco: A Computable Household Model Approach," unpublished, November, 1990.

Direction de la Planification et des Affaires Economiques. "Les Systemes de Protection de la Production Locale Vis-A-Vis des Importations." Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, September 1987.

Direction de la Plannification et des Affaires Economiques, Associates for International Resources and Development, and Agro Concept. Etude de la Politique de Prix et d'Incitations dans le Secteur Agricole: Phase II. Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, January 1990.

Direction de la Planification et des Affaires Economiques. "Analyse de l'Evolution Recente du Commerce Exterieur Agricole du Maroc." Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, October 1987.

Dommen, A., et.al. "Food Policies in Developing Countries," Foreign Agricultural Economic Report #194, USDA, Economic Research Service, Washington, DC, December, 1983.

Gardner, G. and D. Skully, "The Conduct of Wheat Marketing in North Africa," Staff report AGES860808, ERS/USDA, Washington, DC, September 1986.

Groupe de Travail sur la Politique de Prix et d'Incitations dans le Secteur Agricole and Associates for International Resources and Development. La Politique de Prix et d'Incitations dans le Secteur Agricole: Rapport Final et Annexe. Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, January 1986.

Groupe C, Projet de Réforme de la Commercialisation des Céréales. "Groupe C: Commerce Extérieur." Ministere de l'Agriculture et de la Reform Agraire et Office Interprofessionel des Cereales et des Legumineuses, April, 1992.

Groupe D, Projet de Réforme de la Commercialisation des Céréales. "Consommation et Demande des Cereales, Report Principal," Department de la Planification et des Affaires Economiques, Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, February, 1992.

Horton, B., "Morocco: Analysis of reform of Economic Policy," Analytical case study # 4, EDI, World bank, Washington, DC, June 1990.

Imrani, H. "Cereals Adjustment Policy Alternatives and Food Security," M.S. Thesis, Department of Agricultural Economics, Purdue University, West Lafayette, IN, May 1994.

Jones, W.O. "Food-Crop Marketing Boards in Tropical Africa," The Journal of Modern African Studies, 25:3 1987, 375-402.

Jones, W.O. "Economic Tasks for Food Marketing Boards in Tropical Africa," Food Research Institute Studies, Vol. 19, No. 2, 1984.

Kreuger, A. "Trade Policy in Developing Countries." Handbook of International Economics, R. Jones and P. Kenen, eds., North Holland, Amsterdam, 1984, 519-69.

Laraki, Karim. "Food Consumption and Food Subsidies in Morocco: Justifications for Policy Reform," Ph.D. thesis, Cornell University, 1988.

Mateus, A., J. Behrman, J. Pines, and R. Schneider. "Morocco: Compensatory Programs fo Reducing Food Subsidies." World Bank Repor. # 6172-MOR, Washington, DC, April 1986.

Mateus, A. "Towards Structural Adjustment in Moroccan Agriculture: Cereals," Ministere de l'Agriculture et de la Reforme Agraire and World Bank, Rabat, Morocco, April, 1985.

MARA/Groupe d'Etude de la Stratégie Alimentaire, "Evolution des Prix Relatifs Des Produits Alimentaires et de Leurs Coûts de Production." DPAE/MARA, Rabat, Morocco, October 1985.

MARA and AIRD, "La Politique de Prix et d'Incitations Dans le Secteur Agricole, Rapport Final," (EPI 1), DPAE/MARA, Rabat, Morocco, January 1986.

Metzel, J. and MARA/DPAE, "The Impacts of Cereals Market Reform on The Feed And Livestock Sectors," MARA/DPAE, Rabat, Morocco, October 1992.

Ministry of Planning, "Enquête Nationale Sur Les Niveaux de Vie 1990/91, Resultats Definitifs," (Living Standards Survey) Ministry of Planification, Rabat, Morocco, March 1992.

McIntire, J. Food Security in the Sahel, Variable Import Levy, Grain Reserves, and Foreign Exchange Assistance, Report No 26, IFPRI, Washington, DC, 1981.

Metzler, J. and L. Salinger. "Reform de La Politique Commerciale Agricole au Maroc: Systeme des Prix de Reference: Rapport Final - Note de Synthese." Associates for International Resources and Development, Cambridge, MA, October 1991.

Salinger, B.L. "Bread Wheat Marketing Margins Under Liberalization: A Cost-Benefit Analysis," Projet de Réforme de la Commercialisation des Céréales. Ministere de l'Agriculture et de la Reform Agraire et Office Interprofessionel des Cereales et des Legumineuses, December, 1992.

Salinger, B. L., and J.C. Metzel. "L'Evolution de la Politique Commerciale Agricole Au Maroc: Examen de l'Impact des Prix de Reference," Associates for International Resources and Development, Cambridge, MA, February, 1993.

Salinger, L., O. Aloui, and H. Imrani, "Etude de la Politique de Prix et d'Incitations Dans le Secteur Agricole," EPI 2, MARA/DPAE, Rabat, Morocco, January 1990.

Steedman, C., and H. Benabderrazik, "Sécurité Alimentaire et Réformes Des Marchés Céréaliers," DPAE/MARA, Rabat, Morocco, June 1992.

Tyner, W. and S. Benaissa. "Policy Reform to Liberalize Domestic Marketing and Foreign Agricultural Trade in Morocco." DPAE working paper, Department de la Planification et des Affaires Economiques, Ministere de l'Agriculture et de la Reforme Agraire, Rabat, Morocco, April 1987.

Tyner, W., and L. Salinger, "La Loi sur le Commerce Extérieur et Ses Mesures d'Applications: Option de Tarification Des Céréales," MARA/DPAE, Rabat, Morocco, June 1993.

Wenner, M., "Government Intervention In Moroccan Agriculture: Evolution of Subsidy Equivalents And Possible Trade Reform Effects." Staff Report No. AGES9208, ERS/USDA, Washington DC, March 1992.

Appendix A. Variable Definitions

This appendix presents variable definitions for this model. the same variable names are used in this guide, in the FORTRAN equilibrium solver, and where appropriate in the QUATTRO workspace. Variable names and their definitions are presented below:

Simulation Solution Parameters

nyear	number of years to be projected in a simulation
nrp.	number of repetitions of simulations of n years
iyear	current iteration year being simulated
irpt	current repetition
toler	convergence tolerance for solution algorithm
seed	seed for random number generation
ncmd	number of commodities (markets)
	DW = BD = Ble Dur — Durum Wheat
	BW = BT = Ble Tendre — Bread Wheat
	FNBT — National (subsidized) Flour
	ART = FA = Artisinal — Traditional Flour
	FL = Farine Libre — Deluxe Flour
	BL = OR = Orge — Barley
	MZ = MA = Mais — Maize
	AN = Animale — Animal Products
istoch	stochastic or certainty indicator (1= stochastic)
o	attached to the end of a variable name denotes base case value
t	attached to the end of a variable name denotes previous year value (in equations in text, t-1 is used for clarity).

Prices and Marketing Margins

Market Prices in Dirhams per quintal (DH/Ql)

Pm, Pmo	Miller prices
Pr, Pro, Prt	Producer (farm gate) prices
Po,Poo	Official producer support price
Pc, Pco	Consumer prices
PoFNBT	Official FNBT consumer price
Pfm	Border equivalent price at the mill
Pf	Border prices (CIF)
dsPf	deviation in Pf, hence dsPf
covPf	Variance-Covariance matrix for Pf
PAB	Animal feed use cost index (PABo =1)
PBT,PBTo	Wheat flour aggregate price index
PB, PBo	Wheat aggregate price index

World Prices in $ per ton

Pw	World Price (FOB US Gulf)
af	Freight and Insurance (US to Morocco)
tc,tco	Exchange rate (DH/$)

Marketing margins and flour milling costs in DH/Qx

- mf Port to mill
- mp Producer to mill
- mc Mill to consumer
- mcn Net milling cost

Trade and Domestic Policy Instruments

Tariffs and Border Price Measures

- Tsp Specific tariff in DH/Qx
- Tav Ad valorem tariff in %
- PreV,PreVo Variable levy in DH/Qx
- dd Implicit tariff equivalent, based on Pfm and Pm, in %

Quota and Foreign Exchange parameters

- eqIo Fixed import quota (Qx thousands)
- eqIq Quota adjustment to production changes (Qx per Qx)
- qIc Net effective import quota (Qx thousands)
- Exmax Export quota (Maximum exports in Qx thousands)
- DEmax Maximum foreign exchange expenditure ($ millions)

Domestic Policies

- Mct;MCTo FNBT production quota (Qx thousands)
- RMct Rent to millers on FNBT production quota (DH/Qx)
- sFN FNBT production (consumer) subsidy (DH/Qx)
- sQ Commercialization subsidy (DH/Qx)
- sI Importation subsidy (DH/Qx)

QUANTITIES (Market flows in Qx thousands)

SUPPLY

- So, St Carry-in stocks (S in prior year)
- Q,Qo,Qt Production
- qI Imports (net)

DEMAND

- B Animal Feed use
- M Industrial mill demand (for flour production)
- Qc Commercialization by ONICL (official price purchases)
- C,Co Consumption demand (Total)
- Cij,Cijo Consumption by income group and region
  i= u urban, r rural ; j= v vulnerable, a others
- CBT,CBTo Flour consumption (by income group and region)
- CB,CBo Aggregate Wheat Consumption (by income group and region)
- CANo Animal product consumption (by income group and region)
- S Carry-out stocks

Behavioral Elasticities and Parameter

Production

Eqp	Price elasticities of supply (own- and cross-price)
elq	Lagged adjustment parameter
dsQ	Production deviation (Qx thousands)
covQ	Variance-Covariance matrix for Q, hence dsQ
dQdt	Production growth rate (trend) in % per year

Animal Feed Use

Eab	Feed use own price elasticity of demand

Commercialization

Eqcp	Commercialization supply price elasticity (using Pr/Po)
Eqcq	Commercialization response to Production (Qx per Qx)

Stocks

Esp	Stocks demand price elasticity
Esq	Stocks demand response to Production (Qx per Qx)

Consumption demand (by region/income group)

EcR	Income elasticity of demand
Emi	Marginal budget share (LES)
Y, Yo	Income by region and group
dYdt	Income growth rate in % per year
dPopdt	Population growth rate in % per year
Ecis	Subsistence consumption (LES) in Qx thousands
sigmaC	Frisch demand elasticity (LES)
sigb	Substitution elasticities for wheats (CES- Wheat)
sigf	Substitution elasticities for flours (CES- Flour)
dbi	constants in CES Wheat functions
dfi	constants in CES Flour functions
aPb	constants in Wheat Price index
aPbt	constants in Bread Wheat price index
tx	flour extraction rates (Qx flour per Qx grain)

Trade

EI	Net import supply elasticity

Appendix B. Base Spreadsheets

This appendix presents a printout of the contents of the six worksheets contained in the QUATTRO workspace which constitutes this model. This printout was conducted when results in this model component represented the Base case -- a variable levy trade regime. Files listed in this appendix include:

Echange.wsp --	this file contains the definition, hence contents of the QUATTRO workspace. It is used in loading the six worksheets listed below.
Base.wq1 --	the benchmarked initial assumptions and data for this model.
Alt.wq1 --	information for the alternative scenario to be simulated, in this case set to base case values in order to verify that case.
Modele.wq1 --	the QUATTRO equilibrium price solver for this model. Also calculates model variable values given equilibrium prices.
Stochdat.wq1 --	the worksheet used to pass information to the FORTRAN equilibrium price solver.
Resol.wq1 --	the worksheet which reports the outcome for the last year simulated, taking its information from modele.wq1, with equilibrium prices passed through stochrlt.wq1. This worksheet also compares that outcome to the base data.
Stochrlt.wq1 --	this worksheet retrieves information from the FORTRAN solver, reports the outcomes for Monte Carlo simulations, and passes the equilibrium mill price from the last year simulated to modele.wq1.

ECHANGE.WSP

This file contains the information required by QUATTRO to load the six worksheets which constitute the spreadsheet component of this model. The contents of this file define the "Workspace" named "ECHANGE.WSP". The order in which the worksheet files appear are the order in which they are retrieved. If that order is changed, loading the workspace will require several updates by the user, as the current order is set so that each worksheet only uses information retrieved earlier. This order also insures that after the workspace is restored, BASE is in the current window. The contents of that file are:

Workspace
C:\MAROC\BASE.WQ1 0 2 77 24 Z
C:\MAROC\ALT.WQ1 0 2 77 24 Z
C:\MAROC\MODELE.WQ1 0 2 77 24 Z
C:\MAROC\RESOL.WQ1 0 2 77 24 Z
C:\MAROC\STOCHDAT.WQ1 0 2 77 24 Z
C:\MAROC\STOCHRLT.WQ1 0 2 77 24 Z

Modèle du Commerce Extérieur des Céréales au Maroc

BASE.wq1 Etablir une base 1989-92 (Moyenne)

PRIX, SUBVENTIONS, et MARGES

	Prix	Blé	Blé	Farines		Orge	Maïs	Animale
	Marché Libre (DH/QT)	dur	tendre	FNBT	Libre			(Indexe)
Pm	à la Minoterie	***276.0***	***235.0***	***255.0***	***351.0***	***192.5***	***195.0***	1.0
Pr	au Producteur	271.0	230.0			187.5	190.0	1.0
Pc	au Consommateur	294.0	253.0	273.0	369.0	210.5	213.0	1.0
Po	Officiel (DH/QT)							
	au Producteur		***240***					
	au Consommateur			***200***				
Pw	Mondial ($/tonne FOB)	***156***	***137***		***200***	***91***	***100***	
af	Frêt et Assurance	***22***	***22***		***22***	***22***	***22***	
tc	Taux de Change (DH/$)	***8.50***	8.50		8.50	8.50	8.50	
Pf	Frontière (DH/QT CAF)	151.3	135.2		188.7	96.1	103.7	
	Subventions							
sFN	Minoterie - marge			133.3				
sQc	Commercilisation		***13.0***	***6.3***				
sI	Importation		***28.4***					
	Rente Quota FNBT et Droits de Douane Implicite							
RMct	Rente du Quota FNBT			79.3				
dd	Droit de Douane Implicite	74	64		79	87	75	
	Marges des Producteurs, Minoteries et Consommateurs							
mf	Port à la Minoterie	***13.2***	***13.2***		***13.2***	***13.2***	***13.2***	
mp	Producteur à la Minoterie	***5.0***	***5.0***			***5.0***	***5.0***	
mcn	Minoterie - coût net			***15.3***	***24.6***			
mc	Minoterie au Consommate	***18.0***	***18.0***	***18.0***	***18.0***	***18.0***	***18.0***	

QUANTITES (mille quintaux) de l'Offre et de la Demande

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL		
	OFFRE									
So	Stockage début	1700	3600			6500	200	12000		
Q	Production	15700	19400			23700	3800	62600		
I	Importation	800	17000		0	3250	1800	22850		
	DEMANDE									
B	Alimentation Betail	0	0			16000	3900	19900		
M	Minoteries Industrielles	0	22500	-10000	-7200	0	0	5300		
Qc	Commercialisation ONICL	0	7150			0	0	7150		
			Artis	FNBT	Libre				Animal	Revenu
C	Consommation	16500	13900	10000	7200	10950	1700	60250	23187	153285
	Consommation des vulnerables									
Cuv	Urbain	566	671	819	464	156	11	2687	758	6756
Crv	Rural	664	589	1301	212	1593	214	4572	718	6878
	Consommation des autres									
Cua	Urbain	5721	5779	2741	3373	774	149	18537	11483	89719
Cra	Rural	9550	6862	5139	3151	8426	1326	34453	10228	49932
S	Stockage finale	1700	3600			6500	200	12000		
	BALANCE	0	0	0	0	0	0	0		

ELASTICITIES et PARAMETRES de Comportement des agents economiques

	l'OFFRE	Blé dur	Blé tendre	Orge	Maïs
	Production				
lq	Ajustement (lag)	***0.60***	***0.80***	***0.70***	***0.60***
Eqp	Prix				
	Blé dur	***0.70***	***0.20***	***0.00***	***0.00***
	Blé tendre	***0.30***	***0.90***	***0.00***	***0.00***
	Orge	***0.00***	***0.00***	***0.55***	***0.00***
	Maïs	***0.00***	***0.00***	***0.00***	***1.00***

	la DEMANDE						
	Consommation	Blé dur	Blé tendre	Orge	Maïs	Animale	Partage de Reve Cereales
EcR	***Revenu***						
	Vulnerables - Urbain	***0.40***	***0.25***	***0.40***	***0.30***	***1.50***	0.00
	Rural	***0.50***	***0.35***	***0.60***	***0.50***	***1.50***	0.12
	Autres - Urbain	***0.25***	***0.15***	***0.20***	***0.15***	***1.00***	0.00
	Rural	***0.30***	***0.20***	***0.30***	***0.25***	***1.00***	0.88

		Farines			***Ble dur - Ble tendre***
EcS	***Substitution (Ble tendre)***	Artisan	FNBT	Libre	***Substitution***
	Vulnerables - Urbain	1.30	***1.30***	1.30	***2.50***
	Rural	1.80	***1.80***	1.80	***2.00***
	Autres - Urbain	2.50	***2.50***	2.50	***3.00***
	Rural	3.00	***3.00***	3.00	***2.00***
tx	Taux d'Extraction des Farines	***1.00***	***0.80***	***0.72***	

	Alimentation Betail					
Eab	Prix	*-1.00*	*-1.00*		*-0.50*	*-0.30*
	Commerclalisation					
Eqcp	Prix (Pr/Po)	*0.00*	*-2.50*		*0.00*	*0.00*
Eqcq	Production	*1.00*	*1.20*		*1.00*	*1.00*
	Stockage					
Esp	Prix	*-0.15*	*-0.15*		*-0.25*	*-0.25*
Esq	Production	*1.00*	*0.40*		*1.00*	*0.50*
El	Importation	*15*	*15*	*15*	*15*	*15*

COVARIANCES des Prix a la Frontiere et du Production

covP	PRIX a la Frontière (DH/QT CAF) ^2	Blé dur	Blé tendre	Farine Libre	Orge	Maïs
	Blé dur	*1429*	*674*	*744*	*405*	*496*
	Blé tendre	*674*	*470*	*482*	*236*	*302*
	Farine libre	*744*	*482*	*743*	*143*	*275*
	Orge	*405*	*236*	*143*	*259*	*220*
	Maïs	*496*	*302*	*275*	*220*	*304*

covQ	PRODUCTION (million QT) ^2	Blé dur	Blé tendre	Orge	Maïs
	Blé dur	*11.2*	*10.9*	*17.8*	*2.03*
	Blé tendre	*10.9*	*14.8*	*18.6*	*1.78*
	Orge	*17.8*	*18.6*	*45.7*	*3.87*
	Maïs	*2.03*	*1.78*	*3.87*	*0.819*

PARAMETRES de Consommation Calculee

		CBTo	Artis	FNBT	Libre	Cbdo	CBo	PBTo	PBo
	Consommation des vulnerables								
Cuv	Urbaine	2339	671	819	464	566	2905	293.7	251.6
Crv	Rurale	2509	589	1301	212	654	3173	279.6	245.0
	Consommation des autres								
Cua	Urbaine	13890	5779	2741	3373	5721	19611	297.1	261.9
Cra	Rurale	17662	6862	5139	3151	9550	27211	289.0	261.3

CES farines

Consommation des vulnerables	dfa	dfn	dfl	aPBT
Urbaine	0.3295	0.4145	0.3622	1.4013
Rurale	0.4044	0.67797	0.3343	1.5185
Consommation des autres				
Urbaine	0.5997	0.48019	0.7052	1.4892
Rurale	0.6388	0.62594	0.7187	1.4057

CES Bles

Consommation des vulnerables	dbd	dbt	aPB
Urbaine	0.60733	1.0705	1.2091
Rurale	0.54887	1.0146	1.3467
Consommation des autres			
Urbaine	0.74437	1.0109	1.1734
Rurale	0.66665	0.8912	1.398

LES - Mi partage du budget marginale

Consommation des vulnerables	Blé	Orge	Maïs	Animale	Reste
Urbaine	0.03021	0.0019	0.0001	0.16829	0.7994
Rurale	0.04311	0.0293	0.0033	0.15659	0.7677
Consommation des autres					
Urbaine	0.01026	0.0004	5.3E-05	0.12799	0.8613
Rurale	0.03347	0.0107	0.0014	0.20484	0.7496

LES - Cis subsistence consommation sigmaC = 0.65 Frisch parameter

Consommation des vulnerables	Blé	Orge	Maïs	Animale	Reste
Urbaine	2377.75	115.71	8.8761	18.95	1721.1
Rurale	2386.24	971.77	144.51	17.95	1569.3
Consommation des autres					
Urbaine	17327.2	673.71	134.27	4019.05	22673
Rurale	23053	6783.1	1110.6	3579.8	6209.2

Own Price Elasticities -- Calculated

Consommation des vulnerables					
Urbaine	-0.2062	-0.261	-0.195	-0.9792	-0.934
Rurale	-0.2803	-0.408	-0.327	-0.9789	-0.927
Consommation des autres					
Urbaine	-0.1255	-0.13	-0.098	-0.6948	-0.957
Rurale	-0.1812	-0.204	-0.164	-0.7217	-0.949

REVENU ET DEPENSES (millions DH)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES		
Revenu des Agriculteurs des Céré									
Commercialsation		1716					1716		
du Marché Libre	4255	2818			4444	722	12238		
Total	4255	4534			4444	722	13954		
Dépenses des Consommateurs aux Céréales								Depens Animale /Revenu (%)	
Consommation des vulnerables									
Urbain	166	170	224	171	33	2	766	11.34	758
Rural	195	149	355	78	335	46	1158	16.84	718
Consommation des autres									
Urbain	1682	1462	748	1245	163	32	5332	5.94	11483
Rural	2808	1736	1403	1163	1774	282	9165	18.36	10228
Total	4851	3517	2730	2657	2305	362	16422	10.71	23187
Devises Etrangers (millions de:)									
Importations ($)	14	270		0	37	22	343		
Importations (DH)	121	2298		0	312	187	2917		
Revenu Droits de Douane (DH)	89	1473		0	271	141	1973		
Subventionnes ONICL (DH millions)		576	1396				1972		
Importations		483					483		
Commercialisation		93	63				156		
Minoteries			1333				1333		

Modèle du Commerce Extérieur des Céréales au Maroc

ALT.wq1 Hypotheses d'un scenario alternatif

Scenario: **BASE**

POLITIQUES COMMERCIALES

	Commerce Exterieur	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Droits de Douane						
Tsp	specifique (DH)	**0**	**0**		**0**	**0**	**0**
Tav	ad valorem (%)	**0**	**0**		**0**	**0**	**0**
Pre	Prelevement variable (DH	111.5	86.65		149.1	83.25	78.1
		111.5	**86.65**		**149.1**	**83.25**	**78.1**
	Contingents d'Importation	800	17000		0	3250	1800
Io	fixe	**800**	**170000**		**0**	**3250**	**18000**
icq	regulation par q Q:						
	IC: Blé dur	**0.00**	0.00			0.00	0.00
	Blé tendre	**0.30**	**0.35**			0.00	0.00
	Orge	0.00	0.00			**0.00**	0.00
	Maïs	0.00	0.00			0.00	**0.00**
	Devise Etrangère	14	270		0	37	22
	Maximum ($ millions)	**400**	**2700**		**0**	**100**	**650**
	Contingents d'Exportation	**0**	**0**		**0**	**0**	**0**
	Taux de Change	8.50					
Tc	(DH/$)	**8.50**					
	Production		240.0				
Po	Prix de Soutien		**240.0**				
	Transformation des farines			FNBT			
	Contingent FNBT			10000			
Mct				**10000**			
	Prix Officiel FNBT			200.0			
PoF	(aux consommateurs)			**200.0**			
sFN	Subvention - sFN			133.3			

		Blé tendre	
	Subventions		
	Commercialisation sQc	13.0	6.3
sQc	(* Qc{BT})	**13.0**	**6.3**
	Importations sI	28.4	
sI	(* I{BT})	**28.4**	

MARCHE MONDIAL

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	
Prix Mondial ($/tonne FOB)	156	137		200	91	100	
	156	**137**		**200**	**91**	**100**	Pw
Prix Frontière (DH/QT CAF)	151.3	135.2		188.7	96.1	103.7	Pf
à la Minoterie	276.0	235.0		351.0	192.5	195.0	Pfmo

MARCHE LIBRE au Maroc

(Contingents non-contrainantes)

Prix à la Minoterie	276.0	235.0	255.0	351.0	192.5	195.0	base
	276.0	235.0	182.0	351.0	192.5	195.0	alternat
Prix au Producteur	271.0	230.0			187.5	190.0	base
	271.0	230.0			187.5	190.0	alternat
Prix au Consommateur	294.0	253.0	273.0	369.0	210.5	213.0	base
	294.0	253.0	200.0	369.0	210.5	213.0	alternat

MARGES des Producteurs, Minoteries et Consommateurs

Port à la Minoterie	13.2	13.2		13.2	13.2	13.2
	13.2	**13.2**		**13.2**	**13.2**	**13.2**
Producteur à la Minoterie	5.0	5.0			5.0	5.0
	5.0	**5.0**			**5.0**	**5.0**
Minoterie - coût net			15.3	24.6		
			15.3	**24.6**		
Minoterie au Consommate	18.0	18.0	18.0	18.0	18.0	18.0
	18.0	**18.0**	**18.0**	**18.0**	**18.0**	**18.0**

CONDITIONES INITIALES

	Prix à la Minoterie	276.0	235.0	182.0	351.0	192.5	195.0	base
Pmt		**276.0**	**235.0**	176.7	**351.0**	**192.5**	**195.0**	Pmt
Pro	au Producteur	271.0	230.0			187.5	190.0	Pro
Prt		**271.0**	**230.0**			**187.5**	**190.0**	Prt
Pct		294.0	253.0			210.5	213.0	Pct
	Production	15700	19400			23700	3800	base
Qt		**15700**	**19400**			**23700**	**3800**	Qt
dsQ		**0**	**0**			**0**	**0**	
	Stockage début	1700	3600			6500	200	base
St		**1700**	**3600**			**6500**	**200**	St

TAUX de CROISSANCE de POPULATION, REVENU et PRODUCTION (Ten

(% par an)		Urban	Rural				
	Population	**4.16**	**1.62**				
	Revenu par personne	**2.00**	**1.50**				
	Revenu	6.16	3.12				
		Blé dur	Blé tendre			Orge	Maïs
	Production (tendances)	**0.00**	**2.50**	0.00	0.00	**0.00**	**0.00**
Facteurs de Croissance							
	Production Q1/o	1.0000	1.0250	1.0000	1.0000	1.0000	1.0000
	Qt/o	0.0000	0.1038	0.0000	0.0000	0.0000	0.0000
		POP1/o	REV1/o		POPt/o	REVt/o	
	Consommation des vulnerables						
	Urbain	1.0416	1.0200		1.1771	1.0824	
	Rural	1.0162	1.0150		1.0664	1.0614	
	Consommation des autres						
	Urbain	1.0416	1.0200		1.1771	1.0824	
	Rural	1.0162	1.0150		1.0664	1.0614	

PARAMETRES des SIMULATIONS

			Monte Carlo	Static	Dynami	Year 1
Seed	seed	137				
Repetitions	nrpt	200	200	1	1	1
Annees par repetition	nyear	5	5	1	5	2
Stochastique(1) ou certaine(0)		1	1	0	0	0
ANNEE:		5	5	1	5	2
Tolerance	toler	0.001	0.001	0.0001	0.0001	0.0001

SEUIL des Prix et de Consommation (Initial)

Prix Bas %	10	thPb	
Prix Haut %	10	thPh	
Consom Bas %	5	thCb	
INCREMENT %	2.5	thinc	0.025

MACROs

[alt]r	Resoudre avec parametres donnes
[alt]s	Simulation statique - un an
[alt]d	Simulation dynamique
[alt]y	Simulation d'un an
[alt]m	Monte Carlo simulations

Modèle du Commerce Extérieur des Céréales au Maroc

MODELE.wq1 Resoudre le modele statique

PRIX

	Prix	Blé	Blé	Farines		Orge	Maïs	Animale
	Marché Libre (DH/QT)	dur	tendre	FNBT	Libre			(Indexe)
Pm	à la Minoterie	276.01	235	79.2506	350.99	192.53	195	1.0
Pr	au Producteur	271.0	230.0			187.5	190.0	1.0
Pc	au Consommateur	294.0	253.0	273.0	369.0	210.5	213.0	1.0
Po	Officiel (DH/QT)							
	au Producteur		240.0	182.0				
	au Consommateur			200.0				
Pw	Prix Mondial ($/tonne FOB)	156	137		200	91	100	
Pf	Frontière (DH/QT CAF)	151.3	135.2		188.7	96.1	103.7	
	+ politiques et mf	276.0	235.0		351.0	192.5	195.0	
PB	Indexe Alimentation Betail							1.00

CONSUMPTION IMPLEMENTATION

		Pi Qi					sum P Q	- Po Qo	
Revenu des cereales	4254.8	4533.5			4444.4	722	13954.65	0.7018121	
Price Indices & Subsistence Expend				Pi*Cis					PCs
Consommation des vulnerables		PBT	PB	Ble	Orge	Maïs	Animale	Reste	sum
Urbaine		293.73	251.61	598.3	24.4	1.9	18.9	1721.1	2364.6
Rurale		279.57	245.02	584.7	204.6	30.8	17.9	1569.3	2407.3
Consommation des autres									
Urbaine		297.06	261.95	4538.8	141.8	28.6	4019.1	22673.4	31401.7
Rurale		289.01	261.26	6022.8	1428.0	236.6	3579.8	6209.2	17476.4
LES Consommation		Y	Y- PCs	CB	Orge	Maïs	Animale	Reste	
Consommation des vulnerables									
Urbaine		6756	4391	2905	156	11	758	5232	
Rurale		6878	4471	3173	1593	214	718	5002	
Consommation des autres									
Urbaine		89719	58317	19611	774	149	11483	72904	
Rurale		49933	32456	27211	8426	1326	10228	30539	
CES	BLEs	CBd	CBt	FARINE	CFa	CFn	CFI		
Consommation des vulnerables									
Urbaine		565.76	2339.2		670.77	818.81	464.37		
Rurale		663.86	2508.9		588.59	1300.9	211.84		
Consommation des autres									
Urbaine		5720.5	13891		5778.9	2741.2	3373.5		
Rurale		9549.4	17662		6861.8	5139.1	3150.9		

QUANTITES (mille quintaux) de l'Offre et de la Demande

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs		
	OFFRE								
So	Stockage début	1700	3600			6500	200		
Q	Production	15700	19400			23700	3800		
	Contingents Importations	800	169811		0	3250	18000		
I	Importations	800	17001		0	3250	1800		
	DEMANDE								
B	Alimentation Betail	0	0			15999	3900		
Qc	Commercialisation ONICL	0	7150			0	0		
M	Minoteries Industrielles	0	22501	-10000	-7201	0	0		
	CONSOMMATION	Ble Dur	CFa	CFn	CFI	Orge	Maïs	Animale	Reste
	Consommation des vulnerables								
	Urbaine	565.76	670.77	818.805	464.37	156	11	758	5232
	Rurale	663.86	588.59	1300.88	211.84	1593	214	718	5002
	Consommation des autres								
	Urbaine	5720.5	5778.9	2741.21	3373.5	774	149	11483	72904
	Rurale	9549.4	6861.8	5139.09	3150.9	8426	1326	10228	30539
C	Consommation	16499	13900	10000	7201	10950	1700	23187	113677
S	Stockage finale	1700	3600			6500	200		
	BALANCE	0.5147	0.0644	0.01668	0	1.503	-0.039		

CONDITIONES INITIALES (de l'annee precedente)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
Qt	Production	15700	19400	0	0	23700	3800
St	Stockage début	1700	3600	1E-06	1E-06	6500	200
Prt	au Producteur	271	230	1E-06	1E-06	187.5	190

WELFARE -- Equivalent income gain relative to base

Consommation des vulnerables	million DH	% of Yo	U/Uo %
Urbaine	-0	-0.00	-0.00
Rurale	0	0.00	0.00
Consommation des autres			
Urbaine	-0	-0.00	-0.00
Rurale	0	0.00	0.00
TOTAL EqRev	0	0.00	

Welfare calculations

Pjo Cjs					PoCs	UoBo	PiP/Po	U1/Uo	Y@F
Ble	Orge	Maïs	Animal	Reste		Yo-SU	Product		
598.26574	24.35713182	1.8906	18.95	1721.14	2364.6	4391.4	1	1.00	6755.9
584.67947	204.556965604	30.78	17.95	1569.33	2407.3	4470.7	1	1.00	6878.(
4538.7524	141.81681384	28.599	4019.1	22673.4	31402	58317	1	1.00	89718.9
6022.8063	1427.83883389	236.56	3579.8	6209.19	17476	32456	1	1.00	49932.3

Modèle du Commerce Extérieur des Céréales au Maroc

RESOL.wq1 Resolution du dernier modele

Scenario: **BASE** Annee: 1

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	276.0	235.0	255.0	351.0	192.5	195.0
Pr	au Producteur	271.0	230.0			187.5	190.0
Pc	au Consommateur	294.0	253.0	273.0	369.0	210.5	213.0
Po	Officiel (DH/QT)						
	au Producteur		240.0				
	au Consommateur			200.0			
Pf	Frontière (DH/QT CAF)	151.3	135.2		188.7	96.1	103.7
Pw	Mondial ($/tonne FOB)	156	137		200	91	100
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			79.3			
dd	Droit de Douane Implicite (	74	64		79	87	75

QUANTITES (mille quintaux) de l'Offre et de la Demande

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	1700	3600			6500	200	12000
Q	Production	15700	19400			23700	3800	62600
I	Importation	800	17001		0	3250	1800	22851
	DEMANDE							
B	Alimentation Betail	0	0			15999	3900	19899
M	Minoteries Industrielles	0	22501	-10000	-7201	0	0	5300
Qc	Commercialisation ONICL	0	7150			0	0	7150
			Artis	FNBT	Libre			
C	Consommation	16499	13900	10000	7201	10950	1700	60250
	Consommation des vulnerables							
Cuv	Urbain	566	671	819	464	156	11	2687
Crv	Rural	664	589	1301	212	1593	214	4572
	Consommation des autres							
Cua	Urbain	5720	5779	2741	3374	774	149	18537
Cra	Rural	9549	6862	5139	3151	8426	1326	34453
S	Stockage finale	1700	3600			6500	200	12000

REVENU ET DEPENSES (millions DH)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
REVENU des Agriculteurs des Cér								
Commercialsation		1716					1716	
du Marché Libre	4255	2818			4444	722	12239	
Total	4255	4534			4444	722	13955	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	166	170	224	171	33	2	766	11.34
Rural	195	149	355	78	335	46	1158	16.84
Consommation des autres								
Urbain	1682	1462	748	1245	163	32	5332	5.94
Rural	2808	1736	1403	1163	1774	282	9166	18.36
Total	4851	3517	2730	2657	2305	362	16422	10.71
DEVISES ETRANGERS (millions de:)								
Importations ($)	14	270		0	37	22	343	
Importations (DH)	121	2298		0	312	187	2918	
Revenu Droits de Douane (DH)	89	1473		0	271	141	1973	
SUBVENTIONNES ONICL (DH millions)		576	1396				1972	
Importations		483					483	
Commercialisation		93	63				156	
Minoteries			1333				1333	

BIEN d'ETRE -- Utilite et Revenu Equivalent (relative au base) des Consommateurs, Revenu des Agriculteurs, Droits de Douane, et Subventions ONICL

(Difference du scenarlo BASE)

Consommation des vulnerables	U/Uo (%)	EqRev	/Revenu (%)	Revenue des Agriculteurs	Droits Douane	ONICL Subvention (Reduction)
Urbain	-0.00	-0	-0.00			
Rural	0.00	0	0.00			
Consommation des autres						
Urbain	-0.00	-0	-0.00			
Rural	0.00	0	0.00			
Total		0	0.00	1	0	-0

COMPARISON à la Base **(% Difference du scenario BASE)**

Scenario: **BASE** Annee: 1

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	0.0	0.0	0.0	-0.0	0.0	-0.0
Pr	au Producteur	0.0	0.0			0.0	-0.0
Pc	au Consommateur	0.0	0.0	0.0	-0.0	0.0	-0.0
Po	Officiel (DH/QT)						
	au Producteur		0.0				
	au Consommateur			0.0			
Pf	Frontière (DH/QT CAF)	0.0	0.0		0.0	0.0	0.0
Pw	Mondial ($/tonne FOB)	0.0	0.0		0.0	0.0	0.0
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			0.0			
dd	Droit de Douane Implicite (	0.0	0.0		-0.0	0.0	-0.0

QUANTITES de l'Offre et de la Demande (% Difference du scenario BASE)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	0.0	0.0			0.0	0.0	0.0
Q	Production	0.0	0.0			0.0	0.0	0.0
I	Importation	0.0	0.0		0.0	0.0	-0.0	0.0
	DEMANDE							
B	Alimentation Betail	0.0	0.0			-0.0	0.0	-0.0
M	Minoteries Industrielles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Qc	Commercialisation ONICL	0.0	-0.0			0.0	0.0	-0.0
			Artis	FNBT	Libre			
C	Consommation	-0.0	0.0	-0.0	0.0	-0.0	0.0	-0.0
	Consommation des vulnerables							
Cuv	Urbain	-0.0	0.0	0.0	0.0	-0.0	-0.0	0.0
Crv	Rural	-0.0	0.0	0.0	0.0	-0.0	0.0	-0.0
	Consommation des autres							
Cua	Urbain	-0.0	0.0	0.0	0.0	-0.0	-0.0	0.0
Cra	Rural	-0.0	0.0	-0.0	0.0	-0.0	0.0	-0.0
S	Stockage finale	-0.0	-0.0			-0.0	0.0	-0.0

REVENU ET DEPENSES (% Difference du scenario BASE)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
REVENU des Agriculteurs								
Commercialsation		-0.0					-0.0	
du Marché Libre	0.0	0.0			0.0	-0.0	0.0	
Total	0.0	0.0			0.0	-0.0	0.0	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	-0.0	0.0	0.0	0.0	0.0	-0.0	0.0	0.0
Rural	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Consommation des autres								
Urbain	-0.0	0.0	0.0	0.0	0.0	-0.0	0.0	0.0
Rural	-0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0
Total	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DEVISES ETRANGERS (millions de:)								
Importations ($)	0.0	0.0		0.0	0.0	-0.0	0.0	
Importations (DH)	0.0	0.0		0.0	0.0	-0.0	0.0	
Revenu Droits de Douane (DH)	0.0	0.0		0.0	0.0	-0.0	0.0	
SUBVENTIONNES ONICL (DH millions)		0.0	-0.0				0.0	
Importations		0.0					0.0	
Commercialisation		-0.0	-0.0				-0.0	
Minoteries			0.0				0.0	

Modèle du Commerce Extérieur des Céréales au Maroc

STOCHdat.wq1 Donnes pour les simulations Monte Carlo

BASE

PRIX et MARGES

Pmo	276.0	235.0	255.0	351.0	192.5	195.0	
PmTh	276.0	235.0	255.0	351.0	192.5	195.0	
Pmt	276.0	235.0	176.7	351.0	192.5	195.0	
Pro	271.0	230.0	0.0	0.0	187.5	190.0	
Prt	271.0	230.0	0.0	0.0	187.5	190.0	
Pco	294.0	253.0	273.0	369.0	210.5	213.0	
Pw	156.0	137.0	0.0	200.0	91.0	100.0	
af	22.0	22.0	0.0	22.0	22.0	22.0	
Pf	151.3	135.2	0.0	188.7	96.1	103.7	
VarPF	1428.501	674.4804	743.5932	405.3085	495.5598		
	674.4804	470.4129	482.0426	235.7465	301.7838		
	743.5932	482.0426	742.8298	142.5921	275.4091		
	405.3085	235.7465	142.5921	259.2823	220.0131		
	495.5598	301.7838	275.4091	220.0131	303.9831		
Pfm	276	235	0	351	192.5	195	
mf	13.2	13.2	0	13.2	13.2	13.2	
mp	5	5	0	0	5	5	
mcn	0	0	15.3	24.6	0	0	
mc	18	18	18	18	18	18	
tco	8.5						
tc	8.5						
PBo	251.6099	245.0216	261.9439	261.2596			
PBTo	293.7329	279.5657	297.059	289.0145			

QUANTITES

So	1700	3600	0	0	6500	200	
St	1700	3600	0	0	6500	200	
Qo	15700	19400	0	0	23700	3800	
Qt	15700	19400	0	0	23700	3800	
qlo	800	17000	0	0	3250	1800	
B	0	0	0	0	16000	3900	
M	0	22500	-10000	-7200	0	0	
Qc	0	7150	0	0	0	0	
CuvTh	565.7625	670.7653	818.8053	464.3727	156.3611	11.0262	2687.093
CrvTh	663.8606	588.5861	1300.883	211.8444	1592.994	214.0887	4572.257
CuaTh	5720.478	5778.903	2741.209	3373.542	774.3718	148.7738	18537.28
CraTh	9549.39	6861.833	5139.086	3150.862	8426.012	1326.115	34453.3

ELASTICITIES et PARAMETRES

Eqp	0.70	0.20	0.00	0.00	0.00	0.00
	0.30	0.90	0.00	0.00	0.00	0.00

	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.55	0.00	
	0.00	0.00	0.00	0.00	0.00	1.00	
elq	0.60	0.80	0.00	0.00	0.70	0.60	
VarQ	11200000	10900000	17800000	2030000			
	10900000	14800000	18600000	1780000			
	17800000	18600000	45700000	3870000			
	2030000	1780000	3870000	819000			
Eab	-1	-1	0	0	-0.5	-0.3	
Eqcp	0	-2.5	0	0	0	0	
Eqcq	1	1.2	0	0	1	1	
Esp	-0.15	-0.15	0	0	-0.25	-0.25	
Esq	1	0.4	0	0	1	0.5	
Emi	0.799444	0.030208	0	0	0.001949	0.000104	0.168295
	0.767739	0.043107	0	0	0.029253	0.003315	0.156586
	0.861336	0.010259	0	0	0.000363	5.3E-05	0.127988
	0.749618	0.033472	0	0	0.010657	0.001414	0.204839
ECis	1721.137	2377.751	0	0	115.7108	8.876091	18.95
	1569.333	2386.236	0	0	971.7671	144.5093	17.95
	22673.43	17327.2	0	0	673.7141	134.2684	4019.05
	6209.193	23052.96	0	0	6783.082	1110.619	3579.8
sigb	2.5	2	3	2			
dbd	0.607328	0.548868	0.744369	0.666645			
dbt	1.070518	1.014615	1.010894	0.891226			
aPb	1.209114	1.346676	1.173422	1.398046			
sigf	1.3	1.8	2.5	3			
dfa	0.329504	0.404406	0.599692	0.638761			
dfn	0.414503	0.677969	0.480187	0.625936			
dfl	0.362163	0.334317	0.705208	0.718721			
aPbt	1.401253	1.518459	1.489247	1.4057			
UoBo	4391.4	4470.7	58317.35	32455.8			
Yo	6756	6878	89719	49932			
tx	1	1	0.8	0.72	1	1	
El	15	15	0	15	15	15	

POLITIQUES COMMERCIALES

Tsp	0	0	0	0	0	0
Tav	0	0	0	0	0	0
PreV	111.5	86.65	0	149.1	83.25	78.1
eqlo	800	170000	0	0	3250	18000
qicq	0	0	0	0	0	0
	0.3	0.35	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0
	0	0	0	0	0	0

	0	0	0	0	0	0
qlc	800	169811.3	0	0	3250	18000
DEo	14.24	270.3	0	0	36.725	21.96
DEmax	4000	27000	0	0	1000	6500
Exmax	0	0	0	0	0	0
sQc	0	13	6.3	0	0	0
sFN	133.3					
sI	28.4					
Poo	240					
Po	240					
PoFNBT	200					
Mct	10000					
Mcto	10000					
seed	137					
toler	0.0001					
nrpt	1					
nyear	1					
thPb	0.9	0.875	0.85	0.825	0.8	
thPh	1.1	1.125	1.15	1.175	1.2	
thCb	0.95	0.925	0.9	0.875	0.85	
istoch	0					
CANo	23187					
RENTo	79.25064					
Q1o	1	1.025	1	1	1	1
POP1o	1.0416	1.0162	1.0416	1.0162		
REV1o	1.02	1.015	1.02	1.015		
RevCER	0	0.12107	0	0.87893		
RevCERo	13953.95					

Modèle du Commerce Extérieur des Céréales au Maroc

STOCHrlt.wq1 Resultats des Simulations Monte Carlo (Stochastique)

MOYENS				BASE			
		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL
PRIX (Dh/quintaux)								
Pw	Mondial ($/tonne FOB)	157.09	136.90		200.11	90.59	99.67	129.33
Pf	Frontière (DH/QT CAF)	152.2	135.1		188.8	95.7	103.4	128.6
	Marché Libre (DH/QT)							
Pm	à la Minoterie	298.7	236.4	272.0	352.9	283.6	197.9	266.7
QUANTITES (mille quintaux)								
S	Stockage	1747	3738			7075	200	12761
Q	Production	16198	21738			26069	3888	67892
I	Importation	550	18676		0	2075	2215	23515
B	Alimentation Betail					16690	4317	21007
M	Minoteries Industrielles		24185	-10000	-8413			
C	Consommation	16741	16171	10000	8413	11357	1786	64467
REVENU ET DEPENSES (millions DH)								
REVENU des Agriculteurs		4577	5089			5826	744	16236
DEPENSES des Consommat		5148	4131	2900	3134	3248	386	18947
EQUIVALENT REVENU des Consommateurs								1859
DEVISES ETRANGERS								
Importations ($)		10	296		0	23	27	357
Droits de Douane (DH)		61	1622		0	174	174	2031
SUBVENTIONNES ONICL			639	1396				2035

ECARTS-TYPE

BASE

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL
PRIX (Dh/quintaux)								
Pw	Mondial ($/tonne FOB)	38.32	22.27		27.80	16.35	17.98	21.29
Pf	Frontière (DH/QT CAF)	32.6	18.9		23.6	13.9	15.3	18.1
Pm	Marché Libre (DH/QT) à la Minoterie	54.3	8.2	25.5	11.4	440.5	7.1	90.1
QUANTITES (mille quintaux)								
S	Stockage	423	391			2642	29	3259
Q	Production	3527	5311			7447	1007	15237
I	Importation	340	8301		0	1429	943	10032
B	Alimentation Betail					3944	334	4113
M	Minoteries Industrielles		2018	0	1453			
C	Consommation	2996	2687	0	1453	1028	58	3004
REVENU ET DEPENSES (millions DH)								
REVENU des Agriculteurs		352	1168			1999	170	2245
DEPENSES des Consommat		282	800	255	624	3947	20	4649
EQUIVALENT REVENU des Consommateurs								17250
DEVISES ETRANGERS								
Importations ($)		66	1382		0	166	121	1612
Droits de Douane (DH)		43	835		0	125	84	997
SUBVENTIONNES ONICL			200	0				200

PROBABILITIES d'etre aux SEUILS (%)

SEUILS des PRIX et de la CONSOMMATION **BASE**

PRIX	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
Prix Bas (-10.0%)	15.1	0.4	3.6	0.4	22.7	0.3	
(-12.5%)	10.6	0.4	1.0	0.4	20.1	0.3	
(-15.0%)	7.8	0.4	0.4	0.4	18.5	0.2	
(-17.5%)	6.3	0.2	0.4	0.2	16.9	0.2	
(-20.0%)	3.7	0.1	0.4	0.1	15.2	0.0	
Prix Haut (+10.0%)	40.0	0.2	35.8	0.1	43.5	1.0	
(-12.5%)	37.1	0.0	28.5	0.0	41.9	0.0	
(-15.0%)	31.9	0.0	20.7	0.0	40.6	0.0	
(-17.5%)	28.6	0.0	15.1	0.0	38.8	0.0	
(-20.0%)	24.6	0.0	9.7	0.0	37.2	0.0	
CONSOMMATION Bas (-5.0%)	59.4	39.5	100.0	40.7	55.4	43.5	49.9
(-7.5%)	53.4	31.8	100.0	34.0	43.1	22.3	33.7
(-10.0%)	47.3	26.0	100.0	27.7	30.6	3.5	18.1
(-12.5%)	41.4	20.6	0.0	22.0	22.5	0.3	0.4
(-15.0%)	36.4	14.6	0.0	16.6	14.1	0.3	0.1
CONTINGENTS et QUOTAS							
Importations	58.2	0.0		100.0	52.7	0.0	
Devises Etrangers (max)	0.0	0.0		100.0	0.0	0.0	
Exportations	21.3	0.8		100.0	24.9	0.4	
FNBT			100.0				

PROBABILITIES d'etre aux SEUILS de CONSOMMATION Bas par Groupe(%)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
des Vulnerables								
Urbain	(-5.0%)	67.8	50.0	82.0	49.9	73.4	71.6	10.7
	(-7.5%)	61.9	44.3	70.1	44.5	67.6	60.1	0.3
	(-10.0%)	55.4	37.4	55.0	37.7	57.6	43.4	0.0
	(-12.5%)	51.4	29.9	40.9	30.1	48.1	36.8	0.0
	(-15.0%)	44.5	22.6	26.5	22.8	38.7	20.2	0.0
Rural	(-5.0%)	53.5	29.8	96.9	30.2	55.8	42.6	9.8
	(-7.5%)	47.1	21.3	46.4	21.4	47.8	23.7	4.7
	(-10.0%)	40.9	12.7	1.1	13.1	39.3	8.9	1.8
	(-12.5%)	36.1	6.8	0.3	7.1	34.9	1.8	0.5
	(-15.0%)	31.3	3.9	0.3	4.2	29.0	0.4	0.3
des Autres								
Urbain	(-5.0%)	66.9	45.4	98.3	45.4	72.3	62.3	19.1
	(-7.5%)	61.6	41.8	92.1	42.0	61.9	60.0	9.9
	(-10.0%)	55.5	35.8	77.4	35.8	49.2	40.0	2.1
	(-12.5%)	51.1	29.2	57.2	29.3	35.5	27.6	0.0
	(-15.0%)	45.5	24.4	37.2	24.7	25.0	20.0	0.0
Rural	(-5.0%)	53.7	28.3	96.5	28.6	51.5	36.1	0.3
	(-7.5%)	45.8	21.9	88.2	22.4	37.4	12.9	0.2
	(-10.0%)	40.7	16.1	57.4	16.7	26.5	1.0	0.2
	(-12.5%)	34.3	10.5	33.7	11.2	17.4	0.3	0.2
	(-15.0%)	29.3	7.1	10.9	7.4	9.2	0.2	0.1

MOYENS (Comparison a la BASE) BASE

(% Difference du Scenario BASE)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL
PRIX (Dh/quintaux)								
Pw	Mondial ($/tonne FOB)	0.70	-0.07		0.06	-0.45	-0.33	
Pf	Frontière (DH/QT CAF)	0.61	-0.06		0.05	-0.36	-0.27	
	Marché Libre (DH/QT)							
Pm	à la Minoterie	8.22	0.60	6.65	0.56	47.33	1.50	
QUANTITES (mille quintaux)								
S	Stockage	2.79	3.85			8.85	-0.03	6.3
Q	Production	3.17	12.05			9.99	2.30	8.5
I	Importation	-31.21	9.86		0.00	-36.17	23.04	2.9
B	Alimentation Betail					4.31	10.69	5.6
M	Minoteries Industrielles		7.49	0.00	16.85			
C	Consommation	1.46	16.34	-0.00	16.85	3.72	5.05	7.0
REVENU ET DEPENSES (millions DH)								
REVENU des Agriculteurs		7.6	12.3			31.1	3.0	16.4
DEPENSES des Consommat		6.1	17.5	6.2	18.0	40.9	6.5	15.4
EQUIVALENT REVENU des Consommateurs								1.2
DEVISES ETRANGERS								
Importations ($)		-30.6	9.7		0.0	-36.5	22.4	3.9
Droits de Douane (DH)		-32.1	10.1		0.0	-35.8	23.8	2.9

STOCHAST Simulation Results

BASE

Pw	157.08868	136.90165	1E-06	200.11411	90.588141	99.670514	129.328824
Pf	152.22538	135.0664	1E-06	188.79699	95.69992	103.41994	128.6295
Pm	298.67928	236.41181	271.96812	352.94974	283.60362	197.93079	266.697221
S	1747.3875	3738.4863	1E-06	1E-06	7075.3514	199.94454	12761.1699
Q	16197.791	21737.967	1E-06	1E-06	26068.63	3887.5289	67891.9171
I	550.30258	18675.812	0	0	2074.5829	2214.7019	23515.3991
B	1E-06	1E-06	1E-06	1E-06	16689.78	4317.0945	21006.8746
M	0	24185.149	-10000	-8413.313	0	0	5771.83622
C	16740.689	16170.682	9999.9938	8413.3129	11356.895	1785.9163	64467.4891
dsQ	0.001873	0.007585	0	0	0.012374	0.006324	0
dsPf	-0.069234	-0.029519	0	-0.019596	-0.040495	-0	0
drnd	0.028805	-0.049679	0.004821	-0.055358	-0.019781	0	0
Revenu	4577.3761	5089.0114	0	0	5826.2474	743.57428	16236.2092
Dep C	5147.7722	4131.3578	2900	3134	3248	385.667	18946.5711
Dev $	98.851215	2964.8577	0	0	233	268.85265	3565.77516
Droits	60.602361	1622.166	0	0	173.74119	174.10805	2030.6176
ONICL	0	639.07359	1396.000	0.000	0.000	0	2035.07355
Pw	38.31542	22.269376	0	27.796434	16.350208	17.97947	21.289923
Pf	32.568107	18.92897	0	23.626969	13.897677	15.282549	18.096435
Pm	54.264485	8.175283	25.492824	11.354559	440.50028	7.062387	90.134072
S	422.56862	390.7402	0	0	2641.9379	28.769197	3259.15437
Q	3527.0508	5311.4974	0	0	7447.363	1007.3755	15236.6745
I	340.34729	8301.0031	0	0	1428.6202	943.42195	10031.6635
B	0	0	0	0	3943.7844	333.97652	4112.86601
M	0	2018.0266	0	1452.9819	0	0	565.044745

C	2995.6106	2687.0685	0.164931	1452.9819	1028.3128	67.793433	3003.80368
dsQ	0.210366	0.196629	0	0	0.282622	0.232055	0
dsPf	0.347641	0.182023	0	0.147941	0.207158	0.210922	0
drnd	1.013756	0.968576	1.04162	0.969399	1.017143	0	0
Revenu	352.35073	1168.4083	0	0	1998.8658	170.29712	2245.06334
Dep C	282.39005	800.2304	254.92657	624.01471	3946.5678	20.019733	4649.35018
Dev $	66.268874	1382.1741	0	0	165.87796	121.00905	1611.84802
Droits	42.827051	835.29019	0	0	124.61075	84.068284	996.95367
ONICL	0	200.34439	0	0	0	0	200.344378
PrixBas	15.1	0.4	3.6	0.4	22.7	0.3	
PrixBas	10.6	0.4	1	0.4	20.1	0.3	
PrixBas	7.8	0.4	0.4	0.4	18.5	0.2	
PrixBas	6.3	0.2	0.4	0.2	16.9	0.2	
PrixBas	3.7	0.1	0.4	0.1	15.2	0	
PrixHa	40	0.2	35.8	0.1	43.5	1	
PrixHa	37.1	0	28.5	0	41.9	0	
PrixHa	31.9	0	20.7	0	40.6	0	
PrixHa	28.6	0	15.1	0	38.8	0	
PrixHa	24.6	0	9.7	0	37.2	0	
C Bas	59.4	39.5	100	40.7	55.4	43.5	49.9
C Bas	53.4	31.8	100	34	43.1	22.3	33.7
C Bas	47.3	26	100	27.7	30.6	3.5	18.1
C Bas	41.4	20.6	0	22	22.5	0.3	0.4
C Bas	36.4	14.6	0	16.6	14.1	0.3	0.1
Cuv Ba	67.8	50	82	49.9	73.4	71.6	10.7
Cuv Ba	61.9	44.3	70.1	44.5	67.6	60.1	0.3
Cuv Ba	55.4	37.4	55	37.7	57.6	43.4	0
Cuv Ba	51.4	29.9	40.9	30.1	48.1	36.8	0
Cuv Ba	44.5	22.6	26.5	22.8	38.7	20.2	0
Crv Bas	53.5	29.8	96.9	30.2	55.8	42.6	9.8

Crv Bas	47.1	21.3	46.4	21.4	47.8	23.7	4.7
Crv Bas	40.9	12.7	1.1	13.1	39.3	8.9	1.8
Crv Bas	36.1	6.8	0.3	7.1	34.9	1.8	0.5
Crv Bas	31.3	3.9	0.3	4.2	29	0.4	0.3
Cua Ba	66.9	45.4	98.3	45.4	72.3	62.3	19.1
Cua Ba	61.6	41.8	92.1	42	61.9	60	9.9
Cua Ba	55.5	35.8	77.4	35.8	49.2	40	2.1
Cua Ba	51.1	29.2	57.2	29.3	35.5	27.6	0
Cua Ba	45.5	24.4	37.2	24.7	25	20	0
Cra Ba	53.7	28.3	96.5	28.6	51.5	36.1	0.3
Cra Ba	45.8	21.9	83.2	22.4	37.4	12.9	0.2
Cra Ba	40.7	16.1	57.4	16.7	26.5	1	0.2
Cra Ba	34.3	10.5	33.7	11.2	17.4	0.3	0.2
Cra Ba	29.3	7.1	10.9	7.4	9.2	0.2	0.1
Imp Qu	58.2	0	100	100	52.7	0	
DEmax	0	0	100	100	0	0	
FNBT	0	0	100	0	0	0	
Exmax	21.3	0.8	100	100	24.9	0.4	
vmCV	113.39528	237.19413	881.2813	627.36654	1859.2373		
vmCV e	425.09878	649.09615	8445.7242	7882.3492	17250.445		
Qt	16303.725	22889.409	1E-06	1E-06	26817.282	3911.2897	69921.7056
St	1753.1914	3810.6405	1E-06	1E-06	7251.688	199.95337	13015.4733
Prt	302.87604	232.18326	279.97989	354.0212	260.23011	194.52406	234.142451
Pm	313.84261	237.6288	287.59501	354.64	353.51562	202.1695	248.575259

Appendix C. ASCII Files Linking FORTRAN and QUATTRO Model Components

This appendix lists the contents of ASCII files used to link the FORTRAN equilibrium solver with the QUATTRO Workspace. "Stochast.dat" contains inputs passed from QUATTRO to the FORTRAN solver. "Stochast.rlt" contains outputs passed from the FORTRAN solver to QUATTRO. "Stochast.out" is a file used to debug the FORTRAN program.

STOCHAST.DAT

This file contains the inputs passed from the QUATTRO Workspace to the Fortran equilibrium solver. This file is in an ASCII format required by the FORTRAN program. This file may be edited directly, as long as the format required of the FORTRAN program is respected -- columns of data cannot be moved or made either wider or narrower. Use of the QUATTRO Workspace to create this file will insure that this format is maintained. The contents of this file are as follows:

```
BASE
PRIX et MARGES
Pmt          276.0     235.0     255.0     351.0     192.5     195.0
PmTh         276.0     235.0     255.0     351.0     192.5     195.0
Pmt          276.0     235.0     176.0     351.0     192.5     195.0
Prc          271.0     230.0       0.0       0.0     187.5     190.0
Prt          271.0     230.0       0.0       0.0     187.5     190.0
Pcc          294.0     253.0     273.0     369.0     210.5     213.0
Pwo          156.0     137.0       0.0     200.0      91.0     100.0
Af            22.0      22.0       0.0      22.0      22.0      22.0
Pf           151.0     135.2       0.0     188.7      96.1     103.7
VarPF     1428.501 674.4804 743.5932 405.3085 495.5598
          674.4804 470.4129 482.0426 235.7465 301.7838
          743.5932 482.0426 742.8298 142.5921 275.4091
          405.3085 235.7465 142.5921 259.2823 220.0131
          495.5598 301.7838 275.4091 220.0131 303.9831
Pfm          276       235         0       351     192.5       195
mf          13.2      13.2         0      13.2      13.2      13.2
mp             5         5         0         0         5         5
mcn            0         0      15.3      24.6         0         0
mc            18        18        18        18        18        18
Tco          8.5
Tp           8.5
PBc       251.6099 245.0216 261.9439 261.2596
PBTp      293.7129 279.5657  297.059 289.0145
QUANTITIES
Qc           1700      3600         0         0      6500       200
Qt           1700      3600         0         0      6500       200
Qc          15700     19400         0         0     23700      3800
Qt          15700     19400         0         0     23700      3800
Qto           800     17000         0         0      3250      1800
Q             0         0         0         0     16000      3900
M             0     22100    -10000     -7200         0         0
Q             0     7150         0         0         0         0
QuTh      565.7775 670.7553 818.8015 464.3656  156.366  11.0262 2687.092
QtTh      663.8729 568.5762 1300.661 211.6408 1533.061 214.3879 4572.319
VaTh      5720.64 5774.761 2741.198 3373.456  774.364 148.7738 18537.22
VaTo      4547.554 4661.287 2121.1[illegible] 2151.770 4421.191 1326.712 34453.44
QUANTITIES et PARAMETRES
Eqc          0.00      0.00      0.00      0.00      0.00      0.00
Eqt          0.00      0.00      0.00      0.00      0.00      0.00
Eqq          0.00      0.00      0.00      0.00      0.00      0.00
Eqp          0.00      0.00      0.00      0.00      0.00      0.00
             0.00      0.00      0.00      0.00      0.55      0.00
             0.00      0.00      0.00      0.00      0.00      1.00
Eiq          0.60      0.80      0.00      0.00      0.70      0.60
VarQ      11200000 10900000 17800000  2030000
          10900000 14800000 18600000  1730000
          17800000 16600000 45700000  3870000
           2030000  1730000  3870000   819000
Eap             -1        -1         0         0      -0.5      -0.3
Eqcp             1      -1.5         0         0         0         0
Eqcq             1       1.2         0         0         1         1
Eqp          -0.15     -0.15         0         0     -0.25     -0.25
```

Esq	1	0.4	0	0	1	0.5	
Em1	0.799444	0.030208	0	0	0.001949	0.000104	0.168295
	0.767739	0.043107	0	0	0.029253	0.003315	0.156586
	0.861336	0.010259	0	0	0.000363	5.3E-05	0.127988
	0.749618	0.033472	0	0	0.010657	0.001414	0.204839
EC1s	1721.137	2377.751	0	0	115.7108	8.876091	18.95
	1569.333	2386.236	0	0	971.7671	144.5093	17.95
	22673.43	17327.2	0	0	673.7141	134.2684	4019.05
	6209.193	23052.96	0	0	6783.082	1110.619	3579.8
sigb	2.5	2	3	2			
dbd	0.607328	0.548868	0.744369	0.666645			
dbt	1.070518	1.014615	1.010894	0.891226			
aPb	1.209114	1.346676	1.173422	1.398046			
sigf	1.3	1.8	2.5	3			
dfa	0.329504	0.404406	0.599692	0.638761			
dfn	0.414503	0.677969	0.480187	0.625936			
dfl	0.362163	0.334317	0.705208	0.718721			
aPbt	1.401253	1.518459	1.489247	1.4057			
UoBo	4391.4	4470.7	58317.35	32455.8			
Yo	6756	6878	89719	49932			
tx	1	1	0.8	0.72	1	1	
Et	100	100	0	100	100	100	
POLITIQUES COMMERCIALES							
Tsp	0	0	0	0	0	0	
Tav	0	0	0	0	0	0	
PreV	111.5	86.65	0	149.1	83.25	78.1	
eqIo	800	170000	0	0	3250	18000	
qicq	0	0	0	0	0	0	
	0.3	0.35	0	0	0	0	
	0	0	0	0	0	0	
	0	0	0	0	0	0	
	0	0	0	0	0	0	
	0	0	0	0	0	0	
qic	800	50314.47	0	0	3250	18000	
DEo	14.24	270.3	0	0	36.725	21.96	
DEmax	4000	8000	0	0	1000	6500	
Exmax	0	0	0	0	0	0	
sQc	0	13	6.3	0	0	0	
sFN	133.3						
si	28.4						
Poo	240						
Po	240						
PoFNBT	200						
Mct	10000						
Mcto	10000						
seed	91						
toler	1E-06						
nrpt	1						
nyear	1						
thPb	0.9	0.875	0.85	0.825	0.8		
thPh	1.1	1.125	1.15	1.175	1.2		
thCb	0.95	0.925	0.9	0.875	0.85		
istoch	0						
CANo	23187						
RENTo	79.24854						
Qio	1	1.025	1	1	1	1	
POPio	1.0416	1.0162	1.0416	1.0162			
REVio	1.02	1.015	1.02	1.015			
RevCER	0	0.12107	0	0.87893			
RevCERo	13953.95						

STOCHAST.RLT

This files contains outputs passed from the FORTRAN equilibrium solver to the QUATTRO workspace. Its format is set so that the "Import" function may be used in QUATTRO to retrieve these results. Outcomes are saved in appropriate cells so that they may be references in other worksheets. For example, the third row of the file contains equilibrium mill prices. These are referenced in "Modele.wq1" for the equivalent equilibrium outcome using the worksheet. That step permits passing only partial results between the tow model components as well as model verification by comparing outcomes using the two separate solvers. The first column of this file indicates variable names, with the seven subsequent columns generally pertaining to the six goods in the model and then Totals. File contents are:

"BASE	"							
"Pw	",	156.000001,	137.000001,	.000001,	200.000001,	91.000001,	100.000001,	128.207932,
"Pf	",	151.300001,	135.150001,	.000001,	188.700001,	96.050001,	103.700001,	127.676742,
"Pm	",	275.999502,	235.000068,	254.998627,	350.988983,	192.500010,	194.999962,	239.270465,
"S	",	1700.000470,	3599.999845,	.000001,	.000001,	6499.999920,	200.000011,	12000.000248,
"Q	",	15699.999995,	19400.000000,	.000001,	.000001,	23700.000000,	3800.000000,	62599.999998,
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"dsPf	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"drnd	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
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"Pf	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Pm	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"S	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Q	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"I	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"B	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"M	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"C	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"dsQ	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"dsPf	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"drnd	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Revenu	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Dep C	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Dev $	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
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"PrixHa	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	
"PrixHa	",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	

"PrixHa ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	
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"C Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"C Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"C Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Cuv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Cuv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Cuv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Cuv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Cuv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Crv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
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"Crv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Crv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Crv Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
"Cua Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
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"Cua Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
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"Cra Bas ",	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,	.000000,
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"Imp Quot ",	.000000,	.000000,	100.000000,	100.000000,	100.000000,	.000000,	
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"vmCV et ",	.000000,	.000000,	.000000,	.000000,	.000000,		
"Qt ",	15700.000000,	19400.000000,	.000000,	.000000,	23700.000000,	3800.000000,	62600.000000,
"St ",	1700.000001,	3600.000001,	.000001,	.000001,	6500.000001,	200.000001,	12000.000006,
"Prt ",	271.000001,	230.000001,	.000001,	.000001,	187.500001,	190.000001,	222.239513,
"Pm ",	275.999502,	235.000068,	254.998627,	350.988983,	192.500010,	194.999962,	227.239543,

STOCHAST.OUT

This file contains outputs generated by the FORTRAN equilibrium solver used for model debugging only. Inputs are output as read to verify that errors in entering data are not made. Information generated as the equation solution process proceeds is then reported, followed by the contents of Stochast.rlt. Various write statements in the FORTRAN program may be suppressed (by making them comments) or activated, changing the contents of this file as needed to debug the program. Since the contents of this file are variable, no listing is provided here. The beginning of the file should be identical to "stochast.dat", while the end will be like "stochast.rlt". What comes in between depend on which write statements are activated. For distribution, a minimum of such statements are in use.

Appendix D. Spreadsheets from the Example Alternative Scenarios

This appendix presents the QUATTRO spreadsheets from the example alternative scenarios presented in this guide. Only those spreadsheets relevant to specific scenarios are presented. The spreadsheets presented here are:

Alternative policy assumptions --	revised Alt.wq1	**altnew.wq1**
Static Impacts --	revised resol.wq1	**static.wq1**
One-year Impacts --	revised resol.wq1	**one_year.wq1**
Five-year Impacts --	revised resol.wq1	**fiveyear.wq1**
Monte Carlo Simulations --	revised stochrlt.wq1	**stochnew.wq1**

Modèle du Commerce Extérieur des Céréales au Maroc

ALT.wq1 Hypotheses d'un scenario alternatif

Scenario: **ALT NEW**

POLITIQUES COMMERCIALES

	Commerce Exterieur	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Droits de Douane						
Tsp	specifique (DH)	**0**	**0**		**0**	**0**	**0**
Tav	ad valorem (%)	**75**	**90**		**0**	**33**	**50**
Pre	Prelevement variable (DH	111.5	86.65		149.1	83.25	78.1
		0	**0**		**0**	**0**	**0**
	Contingents d'Importation	800	17000		0	3250	1800
Io	fixe	**800**	**170000**		**0**	**3250**	**18000**
icq	regulation par q Q:						
	IC: Blé dur	**0.00**	0.00			0.00	0.00
	Blé tendre	**0.30**	**0.35**			0.00	0.00
	Orge	0.00	0.00			**0.00**	0.00
	Maïs	0.00	0.00			0.00	**0.00**
	Devise Etrangère	14	270		0	37	22
	Maximum ($ millions)	**400**	**2700**		**0**	**100**	**650**
	Contingents d'Exportation	**0**	**0**		**0**	**0**	**0**
	Taux de Change	8.50					
Tc	(DH/$)	**9.00**					

	Production	240.0	
Po	Prix de Soutien	**260.0**	
	Transformation des farines		FNBT
	Contingent FNBT		10000
Mct			**25000**
	Prix Officiel FNBT		200.0
PoF	(aux consommateurs)		**333.3**
sFN	Subvention - sFN		-0.0

		Blé tendre	
	Subventions		
	Commercialisation sQc	13.0	6.3
sQc	(* Qc{BT})	**0.0**	**0.0**
	Importations sI	28.4	
sI	(* I{BT})	**0.0**	

MARCHE MONDIAL	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	
Prix Mondial ($/tonne FOB)	156	137		200	91	100	
	150	**112**		**200**	**85**	**95**	Pw
Prix Frontière (DH/QT CAF)	154.8	120.6		199.8	96.3	105.3	Pf
à la Minoterie	284.1	242.3		213.0	141.3	171.2	Pfmo

MARCHE LIBRE au Maroc		(Contingents non-contraignantes)					
Prix à la Minoterie	276.0	235.0	255.0	351.0	192.5	195.0	base
	284.1	242.3	315.3	213.0	141.3	171.2	alternat
Prix au Producteur	271.0	230.0			187.5	190.0	base
	279.1	237.3			136.3	166.2	alternat
Prix au Consommateur	294.0	253.0	273.0	369.0	210.5	213.0	base
	302.1	260.3	333.3	231.0	159.3	189.2	alternat

MARGES des Producteurs, Minoteries et Consommateurs						
Port à la Minoterie	13.2	13.2		13.2	13.2	13.2
	13.2	**13.2**		**13.2**	**13.2**	**13.2**
Producteur à la Minoterie	5.0	5.0			5.0	5.0
	5.0	**5.0**			**5.0**	**5.0**
Minoterie - coût net			15.3	24.6		
			15.3	**24.6**		
Minoterie au Consommate	18.0	18.0	18.0	18.0	18.0	18.0
	18.0	**18.0**	**18.0**	**18.0**	**18.0**	**18.0**

CONDITIONES INITIALES

	Prix à la Minoterie	284.1	242.3	315.3	213.0	141.3	171.2	base
Pmt		**276.0**	**235.0**	310.1	**351.0**	**192.5**	**195.0**	Pmt
Pro	au Producteur	271.0	230.0			187.5	190.0	Pro
Prt		**271.0**	**230.0**			**187.5**	**190.0**	Prt
Pct		294.0	253.0			210.5	213.0	Pct
	Production	15700	19400			23700	3800	base
Qt		**15700**	**19400**			**23700**	**3800**	Qt
dsQ		**0**	**0**			**0**	**0**	
	Stockage début	1700	3600			6500	200	base
St		**1700**	**3600**			**6500**	**200**	St

TAUX de CROISSANCE de POPULATION, REVENU et PRODUCTION (Ten

(% par an)		Urban	Rural				
	Population	**4.16**	**1.62**				
	Revenu par personne	**2.00**	**1.50**				
	Revenu	6.16	3.12				
		Blé dur	Blé tendre			Orge	Maïs
	Production (tendances)	**0.00**	**2.50**	0.00	0.00	**0.00**	**0.00**
Facteurs de Croissance							
	Production Q1/o	1.0000	1.0250	1.0000	1.0000	1.0000	1.0000
	Qt/o	0.0000	0.1038	0.0000	0.0000	0.0000	0.0000
		POP1/o	REV1/o		POPt/o	REVt/o	
	Consommation des vulnerables						
	Urbain	1.0416	1.0200		1.1771	1.0824	
	Rural	1.0162	1.0150		1.0664	1.0614	
	Consommation des autres						
	Urbain	1.0416	1.0200		1.1771	1.0824	
	Rural	1.0162	1.0150		1.0664	1.0614	

PARAMETRES des SIMULATIONS

			Monte Carlo	Static	Dynami	Year 1
Seed	seed	**137**				
Repetitions	nrpt	**200**	**200**	**1**	**1**	**1**
Annees par repetition	nyear	**5**	**5**	**1**	**5**	**2**
Stochastique(1) ou certaine(0)		1	1	0	0	0
ANNEE:		5	5	1	5	2
Tolerance	toler	0.001	0.001	0.0001	0.0001	0.0001

SEUIL des Prix et de Consommation (Initial)

Prix Bas %	**10**	thPb	
Prix Haut %	**10**	thPh	
Consom Bas %	**5**	thCb	
INCREMENT %	**2.5**	thinc	0.025

MACROs

[alt]r	Resoudre avec parametres donnee
[alt]s	Simulation statique - un an
[alt]d	Simulation dynamique
[alt]y	Simulation d'un an
[alt]m	Monte Carlo simulations

Modèle du Commerce Extérieur des Céréales au Maroc

RESOL.wq1 Resolution du dernier modele

Scenario: **STATIC** Annee:

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	298.3	242.0	318.5	360.7	191.8	172.3
Pr	au Producteur	293.3	237.0			186.8	167.3
Pc	au Consommateur	316.3	260.0	336.5	378.7	209.8	190.3
Po	Officiel (DH/QT)						
	au Producteur		260.0				
	au Consommateur			333.3			
Pf	Frontière (DH/QT CAF)	154.8	120.6		199.8	96.3	105.3
Pw	Mondial ($/tonne FOB)	150	112		200	85	95
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			0.7			
dd	Droit de Douane Implicite (	84	90		74	85	51

QUANTITES (mille quintaux) de l'Offre et de la Demande

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	1700	3600			6500	200	12000
Q	Production	15700	19400			23700	3800	62600
I	Importation	800	16611		0	3250	1983	22644
	DEMANDE							
B	Alimentation Betail	0	0			15988	4041	20030
M	Minoteries Industrielles	0	20252	-7120	-8174	0	0	4959
Qc	Commercialisation ONICL	0	8106			0	0	8106
			Artis	FNBT	Libre			
C	Consommation	16520	15775	7120	8174	10956	1736	60280
	Consommation des vulnerables							
Cuv	Urbain	576	706	680	489	156	11	2618
Crv	Rural	684	653	1040	236	1596	222	4431
	Consommation des autres							
Cua	Urbain	5701	6447	1941	3776	774	150	18790
Cra	Rural	9559	7969	3458	3673	8430	1352	34440
S	Stockage finale	1680	3584			6506	206	11976

REVENU ET DEPENSES (millions DH)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
REVENU des Agriculteurs des Cér								
Commercialsation		2108					2108	
du Marché Libre	4604	2676			4427	636	12344	
Total	4604	4784			4427	636	14451	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	182	183	229	185	33	2	815	12.06
Rural	216	170	350	89	335	42	1202	17.48
Consommation des autres								
Urbain	1803	1676	653	1430	162	29	5753	6.41
Rural	3023	2072	1164	1391	1769	257	9675	19.38
Total	5225	4101	2396	3095	2299	330	17445	11.38
DEVISES ETRANGERS (millions de:)								
Importations ($)	14	223		0	35	23	294	
Importations (DH)	124	2003		0	313	209	2649	
Revenu Droits de Douane (DH)	93	1803		0	103	104	2104	
SUBVENTIONNES ONICL (DH millions)		0	0				0	
Importations		0					0	
Commercialisation		0	0				0	
Minoteries			0				0	

BIEN d'ETRE -- Utilite et Revenu Equivalent (relative au base) des Consommateurs, Revenu des Agriculteurs, Droits de Douane, et Subventions ONICL

(Difference du scenario BASE)

Consommation des vulnerables	U/Uo (%)	EqRev	/Revenu (%)	Revenue des Agriculteurs	Droits Douane	ONICL Subvention (Reduction)
Urbain	-1.49	-65	-0.97			
Rural	-0.32	-14	-0.21			
Consommation des autres						
Urbain	-0.67	-394	-0.44			
Rural	-0.34	-111	-0.22			
Total		-584	-0.38	497	130	1972

COMPARISON à la Base **(% Difference du scenario BASE)**

Scenario: **STATIC** Annee: 1

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	8.1	3.0	24.9	2.8	-0.4	-11.6
Pr	au Producteur	9.2	3.0			-0.4	-11.9
Pc	au Consommateur	7.6	2.8	23.3	2.6	-0.3	-10.7
Po	Officiel (DH/QT)						
	au Producteur		8.3				
	au Consommateur			66.7			
Pf	Frontière (DH/QT CAF)	2.3	-10.8		5.9	0.3	1.5
Pw	Mondial ($/tonne FOB)	-3.8	-18.2		0.0	-6.6	-5.0
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			-99.1			
dd	Droit de Douane Implicite (	14.2	39.9		-6.5	-1.4	-32.1

QUANTITES de l'Offre et de la Demande (% Difference du scenario BASE)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	0.0	0.0			0.0	0.0	0.0
Q	Production	0.0	0.0			0.0	0.0	0.0
I	Importation	0.0	-2.3		0.0	0.0	10.2	-0.9
	DEMANDE							
B	Alimentation Betail	0.0	0.0			-0.1	3.6	0.7
M	Minoteries Industrielles	0.0	-10.0	-28.8	13.5	0.0	0.0	-6.4
Qc	Commercialisation ONICL	0.0	13.4			0.0	0.0	13.4
			Artis	FNBT	Libre			
C	Consommation	0.1	13.5	-28.8	13.5	0.1	2.1	0.0
	Consommation des vulnerables							
Cuv	Urbain	1.8	5.2	-16.9	5.4	-0.2	2.1	-2.6
Crv	Rural	3.0	11.0	-20.0	11.2	0.2	3.9	-3.1
	Consommation des autres							
Cua	Urbain	-0.3	11.6	-29.2	11.9	-0.0	1.1	1.4
Cra	Rural	0.1	16.1	-32.7	16.6	0.0	1.9	-0.0
S	Stockage finale	-1.2	-0.4			0.1	3.2	-0.2

REVENU ET DEPENSES (% Difference du scenario BASE)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
REVENU des Agriculteurs								
Commercialsation		22.8					22.8	
du Marché Libre	8.2	-5.0			-0.4	-11.9	0.9	
Total	8.2	5.5			-0.4	-11.9	3.6	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	9.5	8.1	2.4	8.2	-0.6	-8.8	6.3	6.3
Rural	10.8	14.0	-1.4	14.1	-0.2	-7.2	3.8	3.8
Consommation des autres								
Urbain	7.2	14.6	-12.7	14.9	-0.4	-9.7	7.9	7.9
Rural	7.7	19.3	-17.1	19.6	-0.3	-8.9	5.6	5.6
Total	7.7	16.6	-12.2	16.5	-0.3	-8.8	6.2	6.2
DEVISES ETRANGERS (millions de:)								
Importations ($)	-3.4	-17.7		0.0	-5.3	5.7	-14.2	
Importations (DH)	2.3	-12.8		0.0	0.3	11.9	-9.2	
Revenu Droits de Douane (DH)	4.1	22.4		0.0	-61.8	-25.7	6.6	
SUBVENTIONNES ONICL (DH millions)		-100.0	-100.0				-100.0	
Importations		-100.0					-100.0	
Commercialisation		-100.0	-100.0				-100.0	
Minoteries			-100.0				-100.0	

Modèle du Commerce Extérieur des Céréales au Maroc

RESOL.wq1 Resolution du dernier modele

Scenario: **ONE YEAR** Annee: 2

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	301.3	242.7	319.4	361.7	210.6	174.9
Pr	au Producteur	296.3	237.7			205.6	169.9
Pc	au Consommateur	319.3	260.7	337.4	379.7	228.6	192.9
Po	Officiel (DH/QT)						
	au Producteur		260.0				
	au Consommateur			333.3			
Pf	Frontière (DH/QT CAF)	154.8	120.6		199.8	96.3	105.3
Pw	Mondial ($/tonne FOB)	150	112		200	85	95
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			0.7			
dd	Droit de Douane Implicite (	86	90		74	105	54

QUANTITES (mille quintaux) de l'Offre et de la Demande

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	1680	3584			6506	206	11977
Q	Production	16096	20086			23685	3618	63486
I	Importation	800	17398		0	3250	2388	23836
	DEMANDE							
B	Alimentation Betail	0	0			16052	4237	20288
M	Minoteries Industrielles	0	21047	-7382	-8510	0	0	5155
Qc	Commercialisation ONICL	0	8385			0	0	8385
			Artis	FNBT	Libre			
C	Consommation	16857	16389	7382	8510	11042	1776	61955
	Consommation des vulnerables							
Cuv	Urbain	596	743	716	515	160	12	2741
Crv	Rural	694	672	1070	242	1592	228	4499
	Consommation des autres							
Cua	Urbain	5885	6792	2045	3979	801	157	19658
Cra	Rural	9682	8182	3551	3773	8489	1380	35057
S	Stockage finale	1720	3632			6348	201	11901

REVENU ET DEPENSES (millions DH)

REVENU des Agriculteurs des Cér	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
Commercialsation		2180					2180	
du Marché Libre	4770	2782			4869	615	13035	
Total	4770	4962			4869	615	15215	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	190	194	242	196	37	2	860	12.73
Rural	222	175	361	92	364	44	1258	18.29
Consommation des autres								
Urbain	1879	1771	690	1511	183	30	6064	6.76
Rural	3092	2133	1198	1433	1940	266	10062	20.15
Total	5383	4273	2491	3231	2524	343	18244	11.90
DEVISES ETRANGERS (millions de:)								
Importations ($)	14	233		0	35	28	310	
Importations (DH)	124	2098		0	313	252	2787	
Revenu Droits de Douane (DH)	93	1888		0	103	126	2210	
SUBVENTIONNES ONICL (DH millions)		0	0				0	
Importations		0					0	
Commercialisation		0	0				0	
Minoteries			0				0	

BIEN d'ETRE -- Utilite et Revenu Equivalent (relative au base) des Consommateurs, Revenu des Agriculteurs, Droits de Douane, et Subventions ONICL

(Difference du scenario BASE)

Consommation des vulnerables	U/Uo (%)	EqRev	/Revenu (%)	Revenue des Agriculteurs	Droits Douane	ONICL Subvention (Reduction)
Urbain	1.41	62	0.92			
Rural	3.27	146	2.12			
Consommation des autres						
Urbain	2.32	1353	1.51			
Rural	3.39	1101	2.21			
Total		2662	1.74	1261	237	1972

COMPARISON à la Base **(% Difference du scenario BASE)**

Scenario: **ONE YEAR** Annee: 2

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	9.2	3.3	25.3	3.1	9.4	-10.3
Pr	au Producteur	9.4	3.4			9.6	-10.6
Pc	au Consommateur	8.6	3.1	23.6	2.9	8.6	-9.4
Po	Officiel (DH/QT)						
	au Producteur		8.3				
	au Consommateur			66.7			
Pf	Frontière (DH/QT CAF)	2.3	-10.8		5.9	0.3	1.5
Pw	Mondial ($/tonne FOB)	-3.8	-18.2		0.0	-6.6	-5.0
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			-99.1			
dd	Droit de Douane Implicite (	16.9	40.9		-5.8	21.1	-28.9

QUANTITES de l'Offre et de la Demande (% Difference du scenario BASE)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	-1.2	-0.4			0.1	3.2	-0.2
Q	Production	2.5	3.5			-0.1	-4.8	1.4
I	Importation	0.0	2.3		0.0	0.0	32.7	4.3
	DEMANDE							
B	Alimentation Betail	0.0	0.0			0.3	8.6	2.0
M	Minoteries Industrielles	0.0	-6.5	-26.2	18.2	0.0	0.0	-2.7
Qc	Commercialisation ONICL	0.0	17.3			0.0	0.0	17.3
			Artis	FNBT	Libre			
C	Consommation	2.2	17.9	-26.2	18.2	0.8	4.5	2.8
	Consommation des vulnerables							
Cuv	Urbain	5.3	10.7	-12.6	10.9	2.4	6.7	2.0
Crv	Rural	4.5	14.2	-17.7	14.4	-0.1	6.5	-1.6
	Consommation des autres							
Cua	Urbain	2.9	17.5	-25.4	18.0	3.4	5.5	6.0
Cra	Rural	1.4	19.2	-30.9	19.8	0.7	4.0	1.8
S	Stockage finale	1.2	0.9			-2.3	0.4	-0.8

REVENU ET DEPENSES (% Difference du scenario BASE)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
REVENU des Agriculteurs								
Commercialsation		27.0					27.0	
du Marché Libre	12.1	-1.3			9.6	-14.9	6.5	
Total	12.1	9.4			9.6	-14.9	9.0	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	14.4	14.1	8.0	14.2	11.2	-3.4	12.2	12.2
Rural	13.5	17.6	1.7	17.8	8.5	-3.6	8.6	8.6
Consommation des autres								
Urbain	11.7	21.1	-7.8	21.4	12.3	-4.5	13.7	13.7
Rural	10.1	22.9	-14.6	23.2	9.4	-5.8	9.8	9.8
Total	11.0	21.5	-8.8	21.6	9.5	-5.4	11.1	11.1
DEVISES ETRANGERS (millions de:)								
Importations ($)	-3.4	-13.7		0.0	-5.3	27.3	-9.8	
Importations (DH)	2.3	-8.7		0.0	0.3	34.7	-4.5	
Revenu Droits de Douane (DH)	4.1	28.2		0.0	-61.8	-10.5	12.0	
SUBVENTIONNES ONICL (DH millions)		-100.0	-100.0				-100.0	
Importations		-100.0					-100.0	
Commercialisation		-100.0	-100.0				-100.0	
Minoteries			-100.0				-100.0	

Modèle du Commerce Extérieur des Céréales au Maroc

RESOL.wq1 Resolution du dernier modele

Scenario: **FIVE YEAR** Annee: 5

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	313.7	243.8	320.9	363.2	256.5	180.9
Pr	au Producteur	308.7	238.8			251.5	175.9
Pc	au Consommateur	331.7	261.8	338.9	381.2	274.5	198.9
Po	Officiel (DH/QT)						
	au Producteur		260.0				
	au Consommateur			333.3			
Pf	Frontière (DH/QT CAF)	154.8	120.6		199.8	96.3	105.3
Pw	Mondial ($/tonne FOB)	150	112		200	85	95
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			0.8			
dd	Droit de Douane Implicite (	94	91		75	153	59

QUANTITES (mille quintaux) de l'Offre et de la Demande

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	1769	3802			6372	196	12139
Q	Production	16830	24201			25413	3489	69933
I	Importation	800	18560		0	3250	3345	25955
	DEMANDE							
B	Alimentation Betail	0	0			17038	4922	21960
M	Minoteries Industrielles	0	23981	-8351	-9751	0	0	5880
Qc	Commercialisation ONICL	0	10365			0	0	10365
			Artis	FNBT	Libre			
C	Consommation	17612	18671	8351	9751	11521	1913	67818
	Consommation des vulnerables							
Cuv	Urbain	646	876	844	608	177	13	3164
Crv	Rural	716	742	1181	268	1635	248	4789
	Consommation des autres							
Cua	Urbain	6319	8073	2430	4732	895	178	22626
Cra	Rural	9931	8980	3896	4144	8814	1474	37239
S	Stockage finale	1787	3911			6476	195	12369

REVENU ET DEPENSES (millions DH)

REVENU des Agriculteurs des Cér	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
Commercialsation		2695					2695	
du Marché Libre	5196	3304			6391	614	15506	
Total	5196	5999			6391	614	18201	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	214	229	286	232	49	3	1013	14.99
Rural	237	194	400	102	449	49	1432	20.82
Consommation des autres								
Urbain	2096	2114	823	1804	246	36	7118	7.93
Rural	3295	2351	1320	1580	2419	293	11259	22.55
Total	5842	4888	2830	3717	3163	381	20822	13.58
DEVISES ETRANGERS (millions de:)								
Importations ($)	14	249		0	35	39	336	
Importations (DH)	124	2238		0	313	352	3027	
Revenu Droits de Douane (DH)	93	2014		0	103	176	2387	
SUBVENTIONNES ONICL (DH millions)		0	0				0	
Importations		0					0	
Commercialisation		0	0				0	
Minoteries			0				0	

BIEN d'ETRE -- Utilite et Revenu Equivalent (relative au base) des Consommateurs, Revenu des Agriculteurs, Droits de Douane, et Subventions ONICL

(Difference du scenario BASE)

Consommation des vulnerables	U/Uo (%)	EqRev	/Revenu (%)	Revenue des Agriculteurs	Droits Douane	ONICL Subvention (Reduction)
Urbain	10.53	462	6.84			
Rural	16.42	734	10.68			
Consommation des autres						
Urbain	11.68	6810	7.59			
Rural	16.90	5484	10.98			
Total		13491	8.80	4247	413	1972

COMPARISON à la Base **(% Difference du scenario BASE)**

Scenario: **FIVE YEAR** Annee: 5

PRIX		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs
	Marché Libre (DH/QT)						
Pm	à la Minoterie	13.7	3.8	25.8	3.5	33.3	-7.2
Pr	au Producteur	13.9	3.8			34.1	-7.4
Pc	au Consommateur	12.8	3.5	24.1	3.3	30.4	-6.6
Po	Officiel (DH/QT)						
	au Producteur		8.3				
	au Consommateur			66.7			
Pf	Frontière (DH/QT CAF)	2.3	-10.8		5.9	0.3	1.5
Pw	Mondial ($/tonne FOB)	-3.8	-18.2		0.0	-6.6	-5.0
	Rente Quota FNBT et Droits de Douane Implicite						
RMct	Rente du Quota FNBT			-98.9			
dd	Droit de Douane Implicite (	27.7	42.3		-4.8	76.1	-21.3

QUANTITES de l'Offre et de la Demande (% Difference du scenario BASE)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
	OFFRE							
So	Stockage début	4.0	5.6			-2.0	-2.0	1.2
Q	Production	7.2	24.7			7.2	-8.2	11.7
I	Importation	0.0	9.2		0.0	0.0	85.9	13.6
	DEMANDE							
B	Alimentation Betail	0.0	0.0			6.5	26.2	10.4
M	Minoteries Industrielles	0.0	6.6	-16.5	35.4	0.0	0.0	10.9
Qc	Commercialisation ONICL	0.0	45.0			0.0	0.0	45.0
			Artis	FNBT	Libre			
C	Consommation	6.7	34.3	-16.5	35.4	5.2	12.6	12.6
	Consommation des vulnerables							
Cuv	Urbain	14.2	30.6	3.1	30.9	13.1	22.0	17.8
Crv	Rural	7.8	26.0	-9.2	26.4	2.7	15.7	4.7
	Consommation des autres							
Cua	Urbain	10.5	39.7	-11.4	40.3	15.5	20.0	22.1
Cra	Rural	4.0	30.9	-24.2	31.5	4.6	11.1	8.1
S	Stockage finale	5.1	8.6			-0.4	-2.3	3.1

REVENU ET DEPENSES (% Difference du scenario BASE)

	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES	
REVENU des Agriculteurs								
Commercialsation		57.0					57.0	
du Marché Libre	22.1	17.3			43.8	-15.0	26.7	
Total	22.1	32.3			43.8	-15.0	30.4	
DEPENSES des Consommateurs aux Céréales								Depenses Cereales /Revenu (%)
Consommation des vulnerables								
Urbain	28.8	35.2	28.0	35.2	47.5	14.0	32.2	32.2
Rural	21.7	30.4	12.7	30.5	33.9	8.1	23.6	23.6
Consommation des autres								
Urbain	24.6	44.6	10.0	44.9	50.7	12.1	33.5	33.5
Rural	17.3	35.4	-5.9	35.9	36.4	3.8	22.8	22.8
Total	20.4	39.0	3.7	39.9	37.2	5.1	26.8	26.8
DEVISES ETRANGERS (millions de:)								
Importations ($)	-3.4	-8.0		0.0	-5.3	78.2	-2.0	
Importations (DH)	2.3	-2.6		0.0	0.3	88.7	3.8	
Revenu Droits de Douane (DH)	4.1	36.8		0.0	-61.8	25.3	20.9	
SUBVENTIONNES ONICL (DH millions)		-100.0	-100.0				-100.0	
Importations		-100.0					-100.0	
Commercialisation		-100.0	-100.0				-100.0	
Minoteries			-100.0				-100.0	

Modèle du Commerce Extérieur des Céréales au Maroc

STOCHrlt.wq1 Resultats des Simulations Monte Carlo (Stochastique)

MOYENS — **STOCHNEW**

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL
PRIX (Dh/quintaux)								
Pw	Mondial ($/tonne FOB)	151.09	111.90		200.11	84.59	94.67	106.59
Pf	Frontière (DH/QT CAF)	155.8	120.5		199.9	95.9	105.0	115.7
	Marché Libre (DH/QT)							
Pm	à la Minoterie	311.0	242.2	318.8	360.9	283.8	175.9	272.4
QUANTITES (mille quintaux)								
S	Stockage	1778	3752			7098	200	12828
Q	Production	16562	22021			25834	3653	68070
I	Importation	571	17782		0	2798	2671	23822
B	Alimentation Betail					17064	4494	21558
M	Minoteries Industrielles		22312	-7806	-9039			
C	Consommation	17119	17429	7806	9039	11478	1831	64702
REVENU ET DEPENSES (millions DH)								
REVENU des Agriculteurs		4886	5633			5629	619	16766
DEPENSES des Consommat		5473	4521	2625	3425	3254	354	19653
EQUIVALENT REVENU des Consommateurs								2843
DEVISES ETRANGERS								
Importations ($)		9	235		0	29	31	304
Droits de Douane (DH)		64	1901		0	87	138	2190
SUBVENTIONNES ONICL			0	0				

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STOCHNEW

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL
PRIX (Dh/quintaux)								
Pw	Mondial ($/tonne FOB)	38.32	22.27		27.80	16.35	17.98	20.53
Pf	Frontière (DH/QT CAF)	34.5	20.0		25.0	14.7	16.2	18.5
Pm	Marché Libre (DH/QT) à la Minoterie	67.3	38.0	47.5	52.8	538.2	24.2	111.1
QUANTITES (mille quintaux)								
S	Stockage	431	405			2684	32	3303
Q	Production	3609	5373			7371	1029	15194
I	Importation	332	8606		0	1017	1054	9899
B	Alimentation Betail					4244	417	4426
M	Minoteries Industrielles		2794	914	1191			
C	Consommation	3125	2257	914	1191	1112	89	3302
REVENU ET DEPENSES (millions DH)								
REVENU des Agriculteurs		753	1402			2236	179	2681
DEPENSES des Consommat		733	825	469	666	4851	39	5728
EQUIVALENT REVENU des Consommateurs								19014
DEVISES ETRANGERS								
Importations ($)		59	1154		0	116	120	1320
Droits de Douane (DH)		40	935		0	34	54	1008
SUBVENTIONNES ONICL			0	0				0

PROBABILITIES d'etre aux SEUILS (%)

SEUILS des PRIX et de la CONSOMMATION — **STOCHNEW**

PRIX	Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
Prix Bas (-10.0%)	27.9	27.2	25.9	25.5	37.8	19.8	
(-12.5%)	23.5	22.1	21.2	20.5	36.2	14.4	
(-15.0%)	18.9	18.5	16.3	15.8	34.2	11.2	
(-17.5%)	15.5	14.4	13.0	12.5	30.6	8.5	
(-20.0%)	12.2	10.4	9.0	8.6	26.6	5.2	
Prix Haut (+10.0%)	35.4	28.0	26.8	26.3	45.5	29.0	
(-12.5%)	31.6	21.9	20.9	20.5	43.6	22.3	
(-15.0%)	26.9	17.4	15.8	15.0	41.5	17.7	
(-17.5%)	23.3	12.8	11.9	11.5	39.8	12.6	
(-20.0%)	20.8	10.3	9.2	8.7	38.7	9.8	
CONSOMMATION Bas (-5.0%)	56.4	46.4	46.3	49.5	49.8	43.6	48.1
(-7.5%)	50.1	39.5	37.5	40.3	40.4	23.6	31.1
(-10.0%)	44.0	30.6	29.4	33.4	31.3	8.5	14.9
(-12.5%)	40.0	22.9	20.0	26.5	22.7	1.6	2.9
(-15.0%)	34.1	16.3	13.6	17.4	14.3	0.3	0.3
CONTINGENTS et QUOTAS							
Importations	61.5	0.0		100.0	78.7	0.0	
Devises Etrangers (max)	0.0	0.0		100.0	0.0	0.0	
Exportations	19.3	1.2		100.0	8.1	0.1	
FNBT			0.0				

PROBABILITIES d'etre aux SEUILS de CONSOMMATION Bas par Groupe(%)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	CEREALES
des Vulnerables								
Urbain	(-5.0%)	64.1	56.6	57.0	57.0	69.7	70.1	12.5
	(-7.5%)	58.2	49.2	49.6	49.5	61.5	58.8	5.2
	(-10.0%)	53.0	41.1	40.5	40.8	52.9	46.9	1.4
	(-12.5%)	46.9	33.3	34.3	34.2	42.7	33.5	0.2
	(-15.0%)	41.9	25.7	26.4	26.4	35.0	21.9	0.0
Rural	(-5.0%)	51.3	35.9	36.0	35.9	51.4	44.9	9.2
	(-7.5%)	45.2	25.0	24.3	24.4	44.9	29.5	4.6
	(-10.0%)	40.6	15.9	14.7	14.4	39.8	16.6	1.7
	(-12.5%)	35.5	8.2	7.3	7.4	34.8	6.6	0.6
	(-15.0%)	30.8	3.4	2.8	2.7	30.1	2.3	0.4
des Autres								
Urbain	(-5.0%)	62.7	52.7	52.7	53.1	70.9	67.8	20.1
	(-7.5%)	57.9	47.4	48.6	48.9	59.1	56.0	11.5
	(-10.0%)	52.2	40.8	41.1	41.0	46.3	41.2	4.5
	(-12.5%)	46.8	35.3	35.2	35.5	32.9	29.6	0.6
	(-15.0%)	42.4	28.8	29.5	29.8	21.2	16.2	0.0
Rural	(-5.0%)	49.8	37.3	37.9	37.6	47.1	37.6	1.3
	(-7.5%)	44.1	26.4	27.6	27.8	36.4	18.0	0.2
	(-10.0%)	38.6	17.4	17.1	17.5	26.8	4.1	0.2
	(-12.5%)	32.4	11.8	10.9	11.2	17.8	0.4	0.2
	(-15.0%)	27.2	6.0	4.9	5.3	9.3	0.3	0.2

MOYENS (Comparison a la BASE) STOCHNEW

(% Difference du Scenario BASE)

		Blé dur	Blé tendre	Farines FNBT	Libre	Orge	Maïs	TOTAL
PRIX (Dh/quintaux)								
Pw	Mondial ($/tonne FOB)	-3.15	-18.32		0.06	-7.05	-5.33	
Pf	Frontière (DH/QT CAF)	2.96	-10.83		5.94	-0.13	1.26	
	Marché Libre (DH/QT)							
Pm	à la Minoterie	12.67	3.04	25.01	2.83	47.41	-9.78	
QUANTITES (mille quintaux)								
S	Stockage	4.57	4.23			9.20	0.01	6.9
Q	Production	5.49	13.51			9.00	-3.87	8.7
I	Importation	-28.64	4.60		0.00	-13.90	48.37	4.3
B	Alimentation Betail					6.65	15.24	8.3
M	Minoteries Industrielles		-0.83	-21.94	25.54			
C	Consommation	3.75	25.39	-21.94	25.54	4.82	7.71	7.4
REVENU ET DEPENSES (millions DH)								
REVENU des Agriculteurs		14.8	24.2			26.7	-14.3	20.2
DEPENSES des Consommat		12.8	28.6	-3.8	28.9	41.2	-2.2	19.7
EQUIVALENT REVENU des Consommateurs								1.9
DEVISES ETRANGERS								
Importations ($)		-33.7	-13.2		0.0	-20.0	39.5	-11.4
Droits de Douane (DH)		-28.6	29.1		0.0	-67.8	-1.9	11.0
SUBVENTIONNES ONICL			-100.0	-100.0				-100.0

Appendix E. Installation and Use on a PC

This model consists of two components -- the spreadsheet interface or workspace and the FORTRAN program. The spreadsheet interface includes six QUATTRO (.wq1) files presented in Appendix B and an ASCII file which defines the workspace (ECHANGE.WSP). To run the model, the executable file for the Fortran equilibrium solver (STOCHAST.exe) must be contained in the same directory as the QUATTRO files, in addition to the files listed in Appendix C which are used to link the Fortran program to the spreadsheet interface. These are all the files needed to run this model on a PC with QUATTRO 4.0 installed

The diskette on which the model is distributed also includes the Fortran program source code in six files:

STOCHAST.FOR
COMDEF.FOR
QFP.FOR
DATA.FOR
RSLT.FOR
PRGAUX.FOR

The contents of these files were briefly discussed in the model implementation section of this document. The interested user may examine these ASCII file using any text editor or word processor to understand how the Fortarn model is implemented. These files are not required to run the model, but must be modified if any changes are made to the spreadsheet version of the model which require consistency with this Fortran program.

To use this model on a PC, the user must first create a directory on his hard disk, say "C:\MAROCMOD\". All Quattro, Fortran and interface files should be copied to this directory, saving the original files on diskette in case original files on the hard drive become modified and subsequently need to be restored. To run the model, the user starts Quattro 4.0, changes the default directory to the directory containing this model, and loading the workspace echange.wsp. Keystrokes for this are as follows:

q<return>	*starts Quattro 4.0*
/fdc:\marocmod<return>	*sets default directory to "C:\MAROCMOD"*
/fc	*closes blank worksheet*
/fwechange.wsp<return>	*loads workspace "echange.wsp"*

The user is now running Quattro with all six worksheets loaded and accessible, and may use **/wp** *(Window - Pick)* or equivalently <F6> to navigate between worksheets. All macros which link the workspace and the Fortran program are contained in and must be run from the window **"alt.wq1"**.

The experienced Quattro user may modify, save and replace files as s/he wishes to generate the desired analyses and to most effectively utilize the model. Any changes in the equations of the Quattro workspace will **not** be automatically incorporated into the Fortran program, however.

The directory containing this model should appear roughly as follows initially (There are several additional files -- source code, object code, listing files, etc. -- as well, which are not necessary to use this model):

```
 Volume in drive A is MAROCMOD
 Directory of A:\

MAKEFILE            471 03-09-94   1:16p
STOCHAST DAT       5973 06-10-94  12:52p
ECHANGE  WSP        226 06-10-94  12:50p
DIR      PRN       2058 06-10-94  12:58p
STOCHAST EXE     139368 04-25-94  10:18a
COMDEF   FOR       5726 03-09-94   1:09p
DATA     FOR       8787 03-09-94   1:12p
PRGAUX   FOR      19564 04-25-94  10:17a
QFP      FOR       4988 04-18-94   1:48p
RSLT     FOR      13596 04-15-94   3:18p
STOCHAST FOR       4169 04-25-94  10:07a
STOCHAST OUT      18188 06-10-94  12:52p
STOCHAST RLT       9680 06-10-94  12:52p
ALT      WQ1      18823 06-10-94  12:52p
BASE     WQ1      53867 06-10-94  12:52p
MODELE   WQ1      39424 06-10-94  12:53p
RESOL    WQ1      55889 06-10-94  12:53p
STOCHDAT WQ1      19705 06-10-94  12:52p
STOCHRLT WQ1      39998 06-10-94  12:52p
DATA     OBJ      18820 04-15-94   4:58p
PRGAUX   OBJ      25714 04-25-94  10:17a
QFP      OBJ      15970 04-18-94   1:48p
RSLT     OBJ      45029 04-15-94   4:58p
STOCHAST OBJ      10660 04-25-94  10:07a
       25 file(s)     576901 bytes
                      872960 bytes free
```

Appendix F. Revisions from Abbott-Imrani Model

This model has been in development in collaborations with DPAE/MARA for several years. A recent version was documented in the M.S. thesis of Hamid Imrani, supervised by Philip Abbott. That project suggested several significant revisions to this model which are been implemented here and are listed below:

1) LES/CES Demand System -- In the earlier model, constant elasticity demand functions were utilized. To calculate welfare impacts of policy changes and to insure consistent, theoretically valid and empirically plausible demand behavior, the consumer demand system now is based on a linear expenditure system (LES), with wheat and flour substitution captured by constant elasticity of substitution (CES) functions nested below the LES. Explicit welfare measures are calculated in the results reports, taking into account price changes, income changes, and other policy impacts.

2) Endogenous Cereals Income -- An important linkage omitted earlier was the effect of price change for cereals changing framer income, hence their demand for cereals. Now as prices change, and given cereals production levels determined in the model, income of each region/income group is adjusted according to its share of cereals revenue.

3) Exogenous trends -- The way in which exogenous trends shift demand were altered to accommodate the new demand system, since income is now a direct component of that system. These trends are used in one year and dynamic simulations, but not base year or Monte Carlo simulations.

4) Production -- The production model was altered to incorporate cross-price effects (production substitutions between cereals) in addition to own price effects.

5) Endogenous quotas -- The endogenous quota (regulation by quantity trade regime) is now calculated for a given cereal based on production deviations for all cereals. This permits BW imports to take into account shortfalls in durum (DW) as well as BW production. The user sets these proportions for each cereal.

6) Thresholds -- Several consumption and price threshold levels may now be set by the user and are kept track of in Monte Carlo simulations to more fully describe the distributions of these variables in a single run. The thresholds are in percentage deviations from a static equilibrium solution for the scenario simulated rather than from base values to compensate for mean shifts of these variables in the alternative simulated. This is more likely to describe distributions around their actual mean.

7) Cereals Consumption Thresholds - Probabilities of surpassing threshold limits are determined of total cereals consumption of each region/income group as well as for each individual cereal.

8) Solution via Fortran Program -- All simulation options are now solved using the Fortran equilibrium solver and its fixed point algorithm. This avoids the problem that the Quattro solver, which was formerly used to find static and dynamic solutions often failed.