

# Negociatrix Policy Game

## Building Capacities in Trade Policy Analysis

### Draft one

Jean Balié, Food and Agriculture Organization of the United Nations<sup>1</sup>

Roel Jongeneel, Wageningen University

Guido Van Hofwegen, Wageningen University

Niek Koning , Wageningen University

### *Summary*

The Negociatrix Policy Game is a tool for training in multilateral negotiation, which has been developed through a partnership between FAO and the University of Wageningen in the Netherlands. This tool is a software based on a quantitative model and a simulation that consents to underline the importance of analytical capacities in negotiations and to demonstrate the importance of consistency of the strategies of negotiation. This software is applied to the multilateral trade negotiations for agriculture. It is inspired by the simulation called Negociatrix ([www.fao.org/tc/tca/negotiation](http://www.fao.org/tc/tca/negotiation)) that FAO developed at an earlier stage (2005) and that has been presented at the Harvard PON/IRENE conference in November 2005 in Paris. The software allows simulating several successive rounds of negotiation and notably revealing after each round the impact of the agreement concluded to the previous round. In that sense, the strategy of negotiation adopted can be more directly evaluated. The software is conceived like a tool to support the preparation of decisions and negotiations. This article presents the structure of the software, explains how it works, comments the first application modalities and proposes the conditions of use.

### *Résumé*

Le Negociatrix Policy Game est un outil de formation à la négociation multilatérale développé, en partenariat entre la FAO et l'Université de Wageningen aux Pays Bas. Cet outil se présente comme un logiciel basé sur un modèle quantitatif et une simulation qui permet de souligner à la fois l'importance des capacités d'analyse en négociation et de démontrer l'importance de la cohérence des stratégies de négociation. Ce logiciel est appliqué aux négociations commerciales multilatérales sur l'agriculture et il s'inspire de la simulation appelée Negociatrix ([www.fao.org/tc/tca/negotiation](http://www.fao.org/tc/tca/negotiation)) que la FAO a développé antérieurement (2005) et qui a été présenté lors de la conférence Harvard PON/IRENE de novembre 2005 à Paris. Le logiciel permet notamment de simuler plusieurs cycles successifs de

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<sup>1</sup> The views expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Food and Agriculture Organization of the United Nations.

négociation en révélant l'impact de l'accord conclu lors du cycle précédent. Ainsi la stratégie de négociation adoptée peut être plus directement évaluée.

Le logiciel est conçu comme un outil pour soutenir la préparation de décision et de négociations. Cet article présente la structure du logiciel, explique son fonctionnement, commente les résultats des premières applications ainsi que des propositions de modalités et conditions d'utilisation.

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# 1 Introduction

As economics has become more and more technical over time and the complexity, intensity and interdependence of (international) economic relations increase, the use of games provides an important connection between theories and the key features of the markets and institutions that are studied. Since the 1960s economists have experimented with incorporating computerized economic simulations into their classes (Porter, Riley and Ruffer, 2004). Examples in micro economics classes are optimization exercises (students maximize utility or profits given some fixed parameters) and market simulations (with endogenously determined prices and exogenous ‘shift’-variables). The games used in macro economics all involve students selecting policy variables to try to control inflation, unemployment and other variables (economic growth, consumption, balance of trade surplus).

From a quick scan of the literature it appears that teachers who use these tools are usually very positive about it, although there have been only a few controlled studies of the effectiveness of the use of games. However, where done these studies emphasized the positive contribution of games in the student’s learning process (Gremmen and Potter, 1997). At a course given at the University of Amsterdam, for example, the failure rate was reduced by 50% in the year following the introduction of a required series of laboratory exercises (Holt, 1999: 609).

Many instructors are hesitant to use games for fear of losing control or of obtaining anomalous results that will be difficult to explain. Others object that games are too much time-consuming or difficult to use in large classes. Indeed, the game outcomes might be unpredictable, in particular when the underlying models are complex. For the macro economic policy analysis games, however, the patterns and evolution of the game will be recognizable in particular for the experienced teachers. The need to improvise during the lectures when explaining results is therewith strongly reduced.

An important argument mentioned in favour of using games is that they excellently fit in with a Socratic teaching approach. In this approach students are made thinking about the subject

they want to learn and encouraged to ask good questions. If the games they play involve (small) groups, students start to learn from each other. Moreover, they come with questions where they lack knowledge. This enables the teacher-trainer to address these questions or issues which bother the students. It is important in the Socratic education philosophy not to go too straight to the final answer but to take incorrect answers seriously and to ask follow-up questions, or to suggest new experiments which might provide further insight (Holt, 1999: 610).

The Negociatrix policy game, which is the focus of this paper, is used as a complementary tool to the simulations used in the capacity building workshops on negotiation proposed by FAO. It also builds upon the experience acquired with AgriPOL, a computer game used in Wageningen University in agricultural and trade policy courses. The so-called Negociatrix Policy Game has been jointly developed by FAO and University of Wageningen. The main objectives of the Negociatrix Policy Game is to train high level policy makers of the developing world by developing both negotiation skills and capacities in analysing trade policy impacts. The Negociatrix Policy Game aims at:

- Improving the knowledge and competence on negotiation
- Sharing experiences and know how
- Developing awareness of crucial role of policy analysis

With this Negociatrix policy game, the Project on Negotiation for Agriculture at FAO addresses its second specific objective, which is to demonstrate the usefulness of analytical capacities, in addition to negotiation skills, to conduct successful negotiations.

Moreover, this activity focuses on one major difficulty of any negotiation, namely the need to deal with both content and process at the same time.

The Negociatrix Policy Game emphasizes this major constraint as the participants/trainees are invited to develop the analysis component of each negotiation.

The Negociatrix policy game is presented like a software to build capacities in agricultural policy analysis. The model is developed in reference to the context described in the Negociatrix simulation. It features the same countries and actors but focuses on the impact analysis of each agreement. For each country a policy context and a virtual economy has been created. The players run several rounds and the software shows, at a glance and after each

round, what kind of welfare effect an agreement would have on certain economic variables (government expenditure, consumer surplus, producer surplus, etc.) by modifying, as a result of the negotiation, some policy instruments (e.g. halving of tariffs or capping of certain supports). The interest lies with the fact that this exercise has to be related to the dynamics of preparing, conducting and analysing a negotiation.

This communication is ordered as follows.

In the first section the game-specifications are discussed. The second section introduces key elements of economics and trade policy that were considered to create, structure and close the model.

The third section discusses the results of the first application of this tool as well as some consideration of the possible conditions of use.

## **2 Specifications of the Negociatrix-Policy-Game**

The objective of the Policy game for each player or negotiator is to raise the national welfare under the constraints that twelve countries are pursuing the same objective. Countries are supposed to directly and indirectly negotiate changes on nine policy instruments (see affecting three commodities:

- A cash crop which is called tonco in the simulation and presents most of the cotton characteristics.
- A basic food crop which is called zor in the simulation and is very similar to rice.
- A processed crop called casuc in the simulation and is a mix of the sugar and coffee market specificities.

Each country is producer or/and consumer of at least two products and sometimes of the three.

The outcome of the game (negotiation) will depend, to a large extent, on the negotiation strategy (the cooperation/ competition paradigm) adopted by each player as well as on the analysis of the situation of agriculture in his/her country and in other countries.

As the Negociatrix-Policy-Game has been specifically developed to strengthen analytical capacities, it includes more detailed policy instruments than what had been initially the case

in the Negociatrix simulation which is however used as a reference in designing the policy game. The following set of policy instruments is proposed:

- import tariff and export subsidy
- maximum production ceilings (quota)
- preferential market access via tariff rate import quota
- (decoupled) direct income payments
- deficiency payments
- structural investments
- intervention mechanism
- set-aside
- food aid
- financial aid

Since the environment of the model is mostly virtual, information is needed about the database. For each country a profile has been prepared including the following sections:

- **General information** (global share of agricultural production, consumption and trade, level of production of each commodity, influence on world market and on agriculture and food in other countries and other market effects)
- **Agricultural Policy** (general objective, main instruments used such as price support, direct payments, production quotas, area set-aside or intervention storage, other relevant policy affecting the agricultural sector such as structural policy)
- **Welfare function** (description of the main component of the welfare function according to the society or the national context, issues like farm incomes with respect to the national or regional political framework, government expenditure for agriculture, the weight of the agricultural trade balance, food consumption per capita)

The effect of the negotiation after each round is measured according to the impact on the following five variables:

- Farm income
- Per capita food consumption
- Government spending on agriculture
- Agricultural trade balance

- Gross domestic product (GDP)

Moreover, the Negociatrix-Policy-Game is used through a friendly, intuitive website interface allowing an input/output structure ([http://resilience-foundation.nl/negociatrix\\_website](http://resilience-foundation.nl/negociatrix_website)).

On the website the inputs or decisions made by the negotiators are introduced as new policy instrument package for each round. Several screens using both text and graphics supply information about:

- the performance score as determined in a social welfare function for each round
- country information
- the policies used by all countries
- market information

## 3 Economics and policy

### 3.1 Model description

The game consists of a partial equilibrium multiple market-multiple country model. Markets are distinguished for three product categories: a product representing cash crops (Tonco which is similar to cotton), a product representing processed crop (Casuc, which is a mix of coffee and sugar), and a product representing food crops (Zor, which is equal torice). Besides these products eleven countries are distinguished, notably Benglapal (combination of Thailand and Viet-Nam), Esperantia (Brazil), Federatio (USA), Imperia (China), Ketanya (combination of Tanzania and Kenya), Insula (Mauritius), Mabu-Fabe (combination of Mali, Burkina Faso, Benin), Neosaxy (Autralia), Osterland (Japan), Pali (Haiti), Uniona (EU). In order to span the world market as a whole, a twelfth ‘country’ called the rest of the world (ROW) was added. The latter country takes care of the model closure: i.e. this the net production and demand for the three commodities exercised by the ROW is defined as the difference between world production less total supply or demand made up by the eleven pre-specified countries respectively. Each country is producer or/and consumer of at least two products and sometimes of the three.

### 3.1.1 Supply and demand

Each country's producer and consumer behaviour is represented by a supply and demand framework. Supplies and demands are a function of their own price and a number of shift variables (like income for consumer demand and technological for supply). As regards supply, this is also a function of the fertilizer price (variable input) and quasi-fixed inputs land and capital. An important characteristic of these supply and demand functions is their sensitivity to price changes (price elasticities), income changes (income elasticities) and dynamic shifters. In order to approach reality as much as possible, the quantities supplied and demanded are based on a stylized presentation of the underlying countries' supply and demand patterns for the early 2000s, whereas the price and income elasticities are best-estimates based on the literature (see further details below). The game leader could use different elasticities if he would like so. The price responses are inelastic<sup>2</sup>, reflecting that in general farmers do not strongly change their supply and consumers do not strongly change their demand when prices change.

Nevertheless, elasticities vary from one country to another. For instance, in a poor country like Ketanya, consumers more strongly increase their consumption of food when prices decrease than in Unionia or Federatio,, where the demand for food is highly satisfied.

### 3.1.2 Shift variables and dynamics

As already indicated, other factors than price also cause changes in demand or supply. In the model, growth in population and incomes shift the demand curve to the right over the rounds. This growth conforms to trends that are taken from other studies and usually described in the literature. Besides, there is an endogenous feedback effect from agricultural growth on income growth (this is explained below.) The supply curve is shifted to the right by technical change and changes in the capital stock of a sector. Technical change conforms to trends

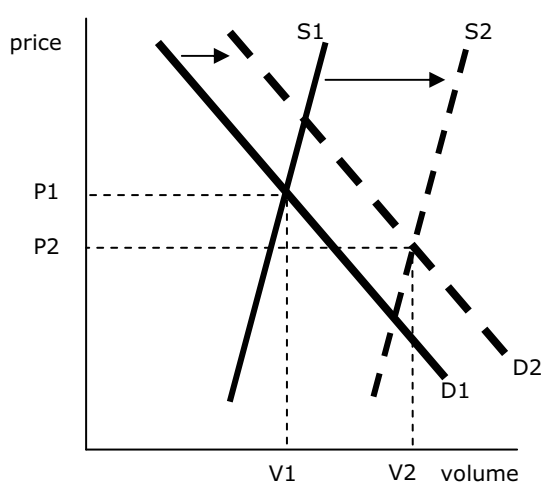
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<sup>2</sup> Because food/feed is a necessity for life, an increase in price does not generate a proportional decrease in the quantity demanded. This kind of response to price occur in general for most industrial goods but not for agricultural products for which demand varies little whether price is high or low, food/feed is price inelastic meaning that for any percentage decrease in price the quantity demanded increases by a smaller percentage. For example, a price elasticity of aggregate demand for agricultural products of 0.25 means that a 10 percent decrease in the index of agricultural prices would increase the quantity demanded all agricultural products by 2.5 percent.

taken from other studies. Capital stocks are diminished by depreciation, but increased by farmer investment if farm incomes exceed certain levels. Besides, governments can increase the capital stock of their agriculture by structural policies (this is explained below).

In the agriculture of developed countries, the shift in supply tends to exceed that in demand (Schultz 1945). This is also reflected in the Negociatrix model. On the one hand, the shift in

**Figure 1: shifts in demand and supply**



demand is slow because population growth has declined and income growth causes little increase in a demand that is already satisfied (low income elasticity). On the other hand, technical progress rapidly increases the productivity of labour, land and capital in the farm sector. The more rapid shift of the supply function lowers the price of farm products, the more because the elasticity of both functions is low. Thus in Figure 1, the price  $P_1$  of the first round is

reduced to  $P_2$  in the second round. As a result, farm incomes are squeezed. According to basic economic theory, this should trigger an outflow of production factors that moderates the shift in the supply function and allows a cost-price reducing reorganisation. However, in agriculture, this outflow is slowed because much labour is self-employed. For some economists this is an argument for income support: in a free market, farm incomes would be chronically depressed which would cause social problems and hamper farm progress (QUOTE). Others think that income support is unnecessary and would only exacerbate the problem, because it would further reduce the outflow of labour (Gardner, 1992).

### 3.1.3 Agriculture in the macro-economy

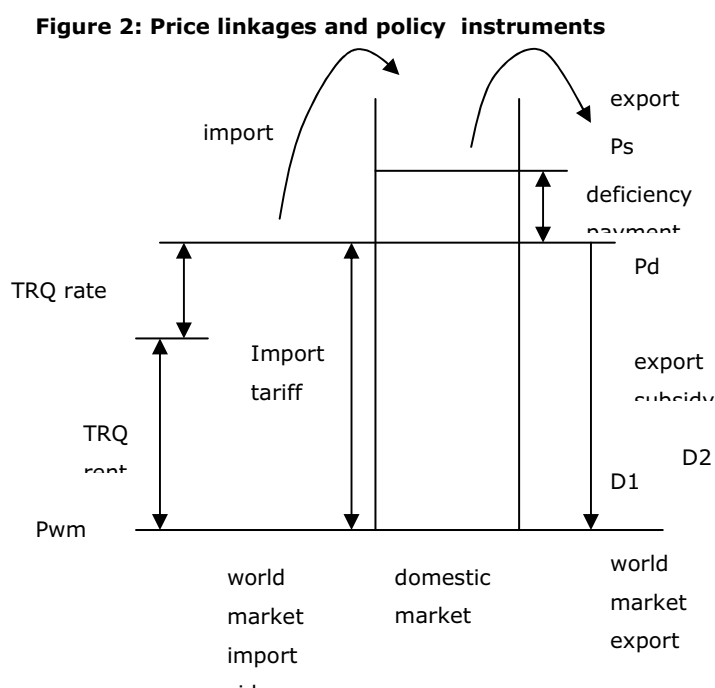
In the real economy, agricultural markets also interact with non-agricultural markets. General equilibrium models accounts with the interactions between all markets of an economy. However, the Negociatrix policy game is a partial equilibrium model that focuses on direct effects in the three commodity markets that are considered. Nevertheless, one important interaction between agriculture and the wider economy is included in the model. If output of

agriculture grows faster (slower) than the national economy, the product of this difference and agriculture's share in the national income is added to (subtracted from) the growth of the latter.

### 3.1.4 Policy I: price wedges and price linkages

The national markets for casuc, tonco and zor are connected through the world markets for these products. The equilibrium price (WMP = world market price) is the price where the world market demand equals the world market supply. National prices are based on this equilibrium price, taking

into account a country's specific policy mix (tariffs, subsidies, etc.). The price linkages are policy-dependent, as is illustrated by Figure 2. If a country protects its domestic agriculture, depending on its net trade position, its internal price level will be equal to the world market price plus the import tariff (in case of a net importer)

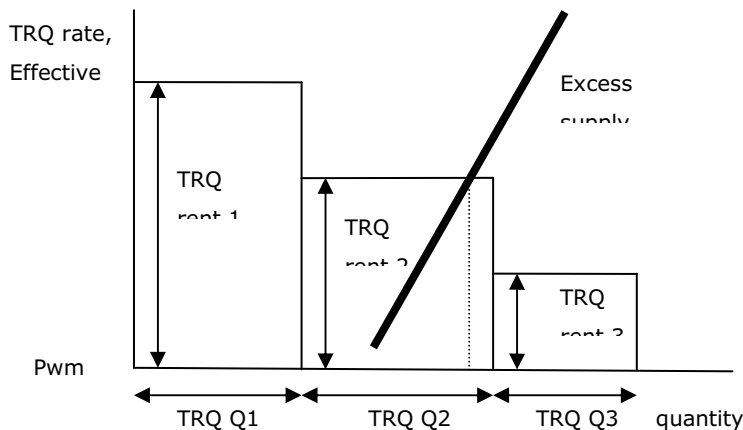


or the export subsidy (in case of a net exporter). The high internal price level  $P_d$  is the general price level prevailing in the economy, in particular for consumers. A country's government could differentiate prices between consumers and producers by applying a deficiency payment. The producer price  $P_s$  is then equal to price  $P_d$  plus the deficiency payment (producer subsidy). A country can allow another country a preferential tariff, which holds within a certain quota (a so-called tariff rate quota TRQ). The foreign country exporting to the domestic country (see left part of Figure 2) that no longer receives price  $P_d$  less the import tariff for its product, but the higher price  $P_d$  less the TRQ rate (which is by definition smaller than the import tariff).

### 3.1.5 Policy II: quantity constraints

The policy instruments are not limited to price wedges, but also comprise quantity constraints.

**Figure 3: TRQ privileges granted to an exporting country**



By the set-aside instrument the policy maker of a country can impose a constraint on the land quantity that is allowed to be used as an input for crop production (supply management). Moreover, as already touched upon before, a TRQ consists of a specific quota (import quantity constraint) and a

special in-quota tariff (price wedge). A country can use the Tariff Rate Quote (TRQ) instrument to ensure a certain minimum market access in case the general import tariffs are prohibitive. Exporting countries can get TRQ privileges from several trade partners. This situation is further illustrated in Figure 3 where three TRQ quantities are allocated to the exporting country by three different (importing) trade partners. Along the horizontal axes the TRQ-quantities are given, whereas the vertical axes denotes the TRQ-rents the exporting country can earn, where the latter are ranked according to attractiveness. It is assumed that the exporting country will fill the TRQs according to attractiveness. Depending on the export-capacity a country may fill one, some, or all TRQs. In this case, where the exporting country's excess supply curve crosses the effective price line associated with TRQ Q2, this TRQ Q2 quota is partly filled. The TRQ earnings for a country partly go to government and the remaining part goes to the farmers. The Negotiatrix policy game, the game leader can fix the shares the government and farmers get. The money given to farmers, translates for them as an effective price increase, or product premium and thus will induce a supply response.

### 3.1.6 Policy III: remaining instruments

Finally, there are four additional policy instruments that should be mentioned. Firstly, the policy maker can make lump sum transfers to farmers (direct payments, which are decoupled

from production). Secondly, the government can invest money into agriculture. This so-called structural policy includes investments in infrastructure, human capital, extensions services. In the model, the investments lead to an increase in the capital stock used as an input for agriculture. As such it increases the production capacity (implying a policy-induced shift of the supply curve to the right). Thirdly, the government of a donor country can decide to give food aid to a certain country. This food is bought by the government of the donor country and operates like an additional increase in domestic demand in this country. This food is subsequently donated to the recipient country. In the recipient country, it is assumed that part of the food aid will go to poor and hungry consumers (urgent relief aid which is assumed to have no substitution effects), whereas the other part will be added to the local market as additional supply. This operation impacts the domestic market by creating a downward pressure on food prices. The game leader can determine which fraction is going to the poor, and which fraction is going to compete on the local food market. Fourthly, the government can intervene in markets by stockpiling. The government then acts as an additional demanding party in the local market. The government can buy as well as sell intervention stocks. The food aid instrument is connected to the intervention instrument in that it operates similarly on the domestic market. The only difference is that there is no stockpiling in the case of food aid as the government donates the products bought to a recipient country.

### 3.1.7 Policy aims

The aim of the “Negociatrix” country governments is to maximise their national welfare. It is assumed that each country has four welfare goals: increase farm income; increase per capita food consumption; limit government spending on agriculture; and increase the agricultural trade balance (exports minus imports).

Four indices reflect the extent to which these goals are attained:

- farm income index: farm income per agricultural worker in the current round / farm income per agricultural worker in round 0 \* 100;
- per capita food consumption index: per capita food consumption in Calories in the current round / per capita food consumption in Calories in round 0 \*100;

- index of limitation of government spending in agriculture:  $([\text{government spending on casuc, tonco and zor policies in round 0} + \text{Agricultural GDP}^3 \text{ in round 0}] / \text{Agricultural GDP in round 0}) / ([\text{government spending on casuc, tonco and zor policies in current round} + \text{Agricultural GDP in current round}] / \text{Agricultural GDP in current round}) * 100$ ;
- agricultural trade balance index:  $(\text{value of domestic supply} / \text{value of domestic demand in current round}) / (\text{value of domestic supply} / \text{value of domestic demand in round 0}) * 100$ ;
- GDP index:  $(\text{GDP}_t - \text{GDP}_0) / \text{GDP}_0 . 100$ .

The national welfare function in Negociatrix is a weighed addition of these four aims, with the weights reflecting the diverging policy priorities of the countries. Players can see the weights by clicking on ‘scores’ or on ‘country information’ entries in the Negociatrix main page on the website.

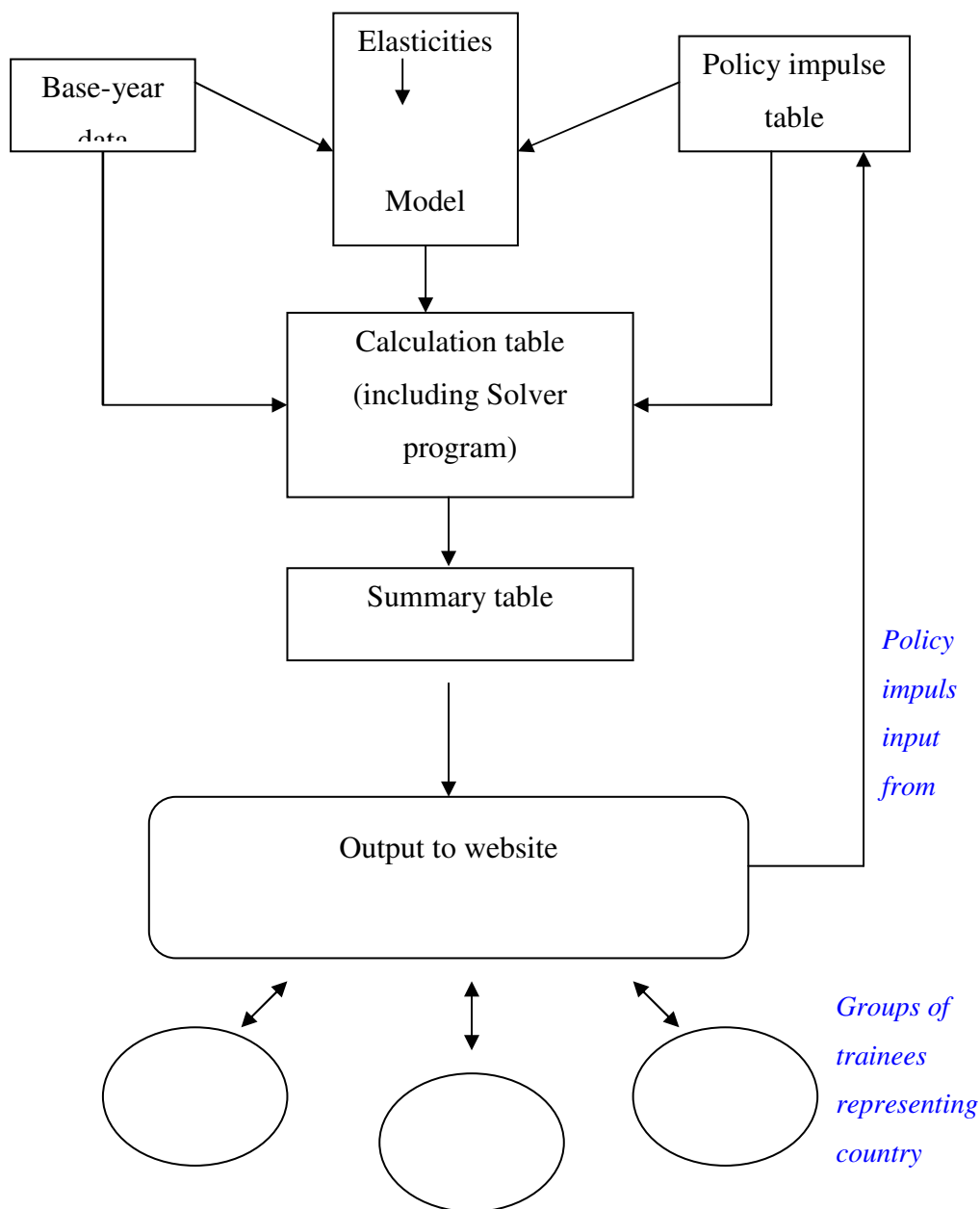
In reality, establishing the welfare function of a country is not a simple question. The priorities of populations are difficult to assess and not always consistent. The priorities of governments may be clearer, but governments are not always democratically elected and when they are, their priorities do not always reflect those of their people. The welfare functions in Negociatrix are seen as reflecting government priorities (See Annex A for a table providing the policy weights currently used). Ordinary Ketanyans, for example, might well disagree with the Ketanyan welfare function where reducing government spending on agriculture weights much more than increasing farm income or per capita food consumption. The idea, however, is that economising on agricultural spending is important for the political survival of the government, because it needs money to pay the salaries of the public sector employees that have been given to political supporters (Bates, 1982).

Although establishing national welfare functions is a tricky issue, economists need such functions to examine the welfare effects of policies. The only welfare criterion that does not depend on such functions is the Pareto principle, which states that a policy is welfare increasing if some people gain while nobody loses. In practice, however, all policies have losers as well as winners. A policy where the winners gain more than the losers lose leads to a

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<sup>3</sup> Agricultural GDP (gross domestic product) is approximated by the value of the production of the three crops (evaluated at world market prices).

**Figure 4: Model structure**

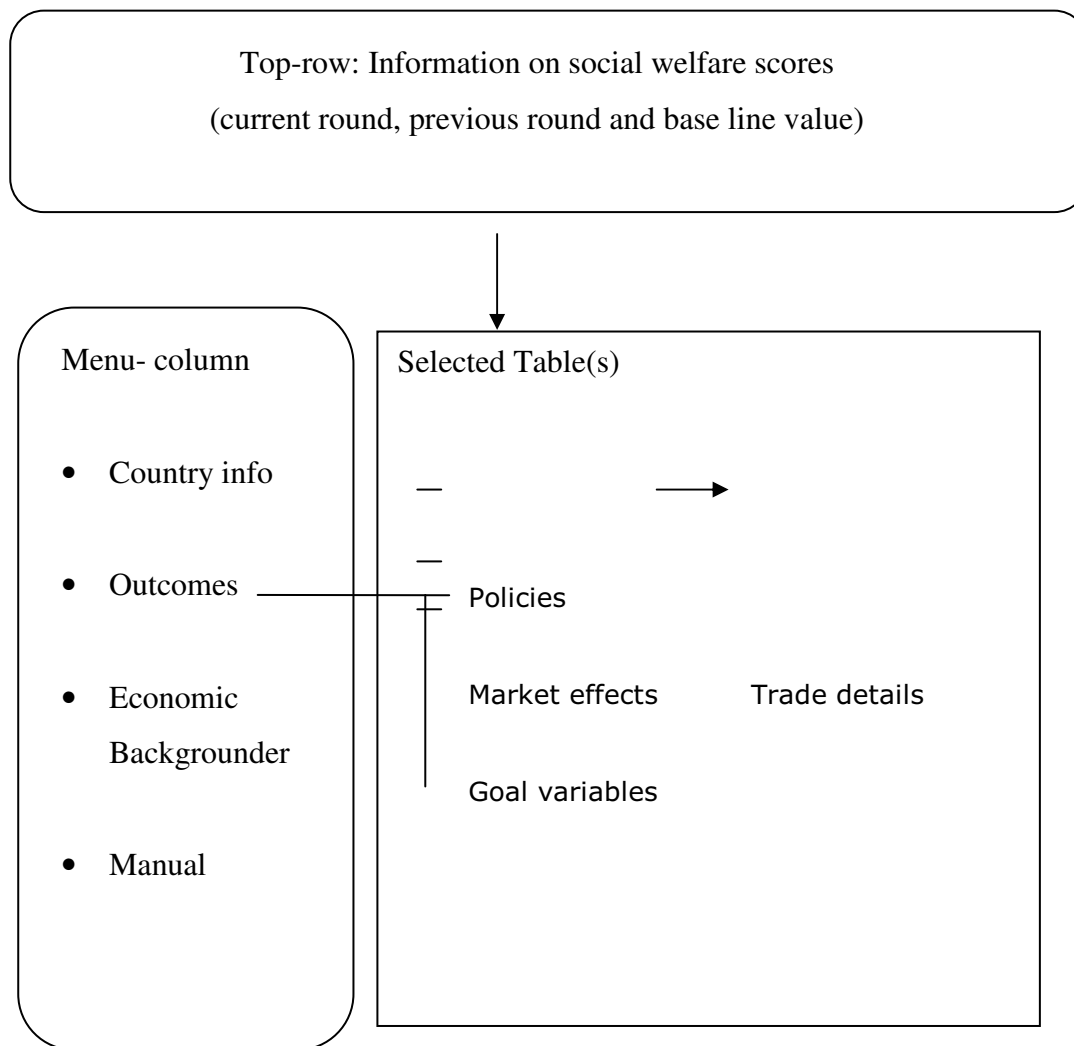


potential Pareto improvement, because the former could compensate the latter and still retain some gain. However, a potential Pareto improvement only becomes a real improvement if this compensation is realised. Many economists think that a potential Pareto improvement means an improvement in economic efficiency irrespective of whether the losers are compensated, but should be interpreted as a misunderstanding. ‘Efficiency’ is an attribute of the relation between aims and means, but in the reasoning of these economists, what the aim is remains entirely unclear (Jongeneel & Koning, 1999).

### **3.2 Structure of the Model**

The basic model structure is provided in Figure 4. It consists of an Excel spreadsheet program, including various worksheets, which are structured as denoted in the figure. There is a worksheet which comprises all the base year data (prices, quantities, quasi fixed inputs capital and land, consumer income, state of technology, values of all the policy variables). Besides, there is a worksheet containing information on price and income responses (elasticity tables) of supply and demand, as well as on quasi-fixed inputs and technology. This worksheet also includes a big table providing elasticities and information from the base-year data that are used to calibrate the behavioural functions. In a subsequent sheet the reader can see all the calculations. This sheet firstly includes a table with the values that are submitted as pursued policies. These policy signals determine different price wedges, financial flows, and quantity constraints. In the next table of the calculation sheet, the policy information is combined with the earlier calibrated supply and demand for each commodity. Alongside with this worksheet a Solver routine is programmed, which exploits the policy information and the calibrated supplies and demands for all countries. The solver uses this information to find a market equilibrium, where world demand equals world supply. If this equilibrium condition is met the prices and quantities of the model are in equilibrium. All derived indicators like quantities supplied and demanded, farm income, food consumption per capita, budget expenditure, trade balance, etc. are calculated and are therefore endogenous. A summary table-worksheet comprises the output results ordered and structured in transparent tables. Moreover, the website has an interface that the game leader can use to upload the information regarding these summary sheets and project it in various tables on the website.

Figure 5: Web site structure



The structure of the website is as indicated in Figure 5. In the top row information is provided about the over-all scores of all countries by means of a thermometer-performance indicator. Not only the score of the current round, but also information about last round and the base line value are provided by the three cylinders respectively in red, pink and grey.

At the left side of the website page there is a Menu-column, with the entries as indicated in Figure 5. The players can click and then obtain more detailed Tables or information. This will then show-up at the Selected Table block. The entries contain the following information:

**Country information:** a short sheet with information on the history of the country, agricultural policy (including the weights of the social welfare function).

**Outcomes:** This entry discloses all the information about the outcome all the negotiation rounds on policies, market effects, goal variables and government expenditure ordered in a number of transparent Tables. These tables are structured as follows:

- **Policies:** Provides an overview of the policies pursued, not only for own country, but also provides similar information for all other countries.

- **Market effects:** Provides the market data (supply, demand, net export, prices, etc.). If a country is a net exporter getting TRQ-privileges from one or more countries, then one can click on the net-export number after which a Figure pops-up which is similar to the Figure 3 presented before.
- **Goal variables:** This sheet provides information about the scores on the goal variables in a rather detailed way (as much as possible decomposed over products).
- **Government expenditure:** This sheet provides detailed information about the financial flows of public spending on agriculture. This is decomposed into several categories like direct payments, price support, food aid, etc.

**Economic Backgrounder:** Contains economic background information, which closely follows the structure of the game and includes a lot of informative graphs, which explain the working of all the policy instruments, within the context of the demand-supply framework.

**Manual:** Provides information about the use of the website and also some more technical information about several model relationships.

The tables presenting the outcomes of the play round, not only gives the numbers for the current round, but it also (below these numbers and in brackets) gives the percentage changes as compared to the previous round. Because the players see also the information of other countries they can try to make a full and integral assessment of what happened during the last round. Because, the outcomes are not only resulting from their own policies, but also affected by international conditions and in that way indirectly by the policies pursued by other players, players may find an interest in starting negotiations to understand how they could create value through trade overall and then share this value among countries (Fisher, Ury, Patton, 1982).

Further below in the Menu column, the players can submit their country name and password. This allows them to display a policy submission sheet. This sheet shows all the policy instruments, their past values, a bound range within which players can freely choose their preferred instrument levels, and a column where the values for the next round should be inserted. After having filled the policy submission sheet, the policy options can be submitted and the values are automatically uploaded for the next round. If all countries have submitted their policy sheets, the game leader can temporary block the policy submission procedure (no longer allowing revisions or submissions) and run the model.

### 3.3 Calibration

As already noted in a previous section, the backbone of the partial equilibrium model is the combination of the demand and supply functions. For these functions constant elasticity specifications are chosen. These functional forms have the advantage that they are asymptotic to the x- and y-axes and guarantee a smooth behaviour during simulations. The general form of the constant elasticity function is

$$Q_i = c_i \cdot P_i^{\varepsilon_p} \cdot Z_i^{\varepsilon_z} \quad (1)$$

where  $Q_i$  stands for the dependent quantity variable (demand or supply),  $c_i$  represents a constant,  $P_i$  represents the relevant own price and  $Z_i$  stands for a shift variable. The values of the quantity, price and z-variables used for the calibration are obtained from the base year data (see Annex B for an overview of the values currently used). Rather than one, there can be a number of Z variables (examples are income, technology, fertilizer price, land, and capital). The elasticities, both for the price and z-variables are directly known from the elasticity tables (see discussion in previous paragraph about calibration worksheet). The elasticities are best estimates based on the literature, complemented with best estimates from the authors, where no information could be found (see Annex C for an overview of these estimates). Regarding the literature, much use has been made of the SWOPSIM database (Sullivan et al, 1992). The values of the quantity, price and z-variables used for the calibration are obtained from the base year data. Included in the base year data are also the base year's policy variables (price wedges and quantity constraints).

The base year data have a stylized character presenting the situation for the early 2000s. Price and quantity data were mainly based on FAO statistics. A three year weighted average around year 2000 was first constructed, and then rounded numbers close to these three year weighted averages were chosen. For casuc, data for coffee (both Arabica and Robusta) and sugar (both beet and sugar cane) have been taken and aggregated. For tonco, lint cotton is used instead of cottonseed and a mean conversion coefficient between lint and cottonseed of 0,32 (kg lint cotton/ kg cottonseed). Data is derived from FAO Stat in the same way as casuc. For zor, in the model rice paddy equivalent is used. Data was derived from FAO Stat in the same way as tonco. No distinction has been made between indica and japonica rice varieties. The world market price is set to be equal to market price of the most competitive producer. For zor for example, the world market price was set equal to the Brazilian price.

Given the information discussed above, the only unknown coefficient is the constant  $c_i$ , which now however can easily be determined by.

$$c_i = \frac{Q_i}{P_i^{\varepsilon_p} \cdot Z_i^{\varepsilon_z}} \quad (2)$$

As a check on the calibration procedure, the game is solved for its base-year values of the policy instruments and taking into account all the calibrated behavioural relationships, the price linkage relationships, and the market equilibrium conditions. The model then should reproduce base-year quantities and prices.

## 4 Implications of the first application and experiences for conditions of use

As previously stated, the purpose of the Negociatrix simulation as well as the Negociatrix policy game is to simulate a multilateral negotiation similar to the one held in the WTO, to develop the capacities of negotiators or policy makers involved in International Multilateral Negotiations. The simulation is presented like a formal conference whereas the policy game takes the form of an on going process of informal negotiation. The focus of each tool is different but they complement each other.

The Negociatrix simulation created in 2004 has been used in several occasions by FAO as well as other institutions like IRENE or InWEnt<sup>4</sup>. The simulation allows addressing the following issues:

- Managing the process of international complex negotiations
- Dealing with power asymmetry
- Building and using coalitions
- Overcoming deadlocks and dealing with special processes
- Managing information and communication channel

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<sup>4</sup> Internationale Weiterbildung und Entwicklung, Strengthening capacities and international development.

The Negociatrix policy game was first used in Wageningen University for a limited group of staff members and students. Moreover, its twin, the Agripol-policy game, was used for students following the curriculum of agricultural economics. This resulted in a number of useful experiences. Whereas the Agripol game consists of seven countries, Negociatrix features eleven countries. For the purpose of testing the latter, it was decided to simplify the Negociatrix environment by reducing the number of countries to five instead of eleven. Such an option for the dry run, made the model less complex and therefore easier to understand<sup>5</sup>.

The feed back provided by the staff members and students and the observations made by the trainers allowed to draw the following findings:

- the policy game creates a high degree of involvement. Participants were enthusiastic, liked this way of learning and demonstrated creative behaviour;
- game use encourages the participants, who acted in small groups representing a country, to learn from each other in a highly interactive way;
- the virtual environment does not prevent the participant from understanding how complex the linkages between policy making and the real negotiations can be. this refers to the difficulty of pursuing multiple objectives that are sometimes conflicting and managing a policy process and taking into consideration the interdependencies among countries and the resulting uncertainty in assessing the overall impacts of policies;
- the economic and political importance of countries vary. Small players (countries) have limited means to influence the world market equilibrium; large players have market power. It generally costs time (several plays) for the participants 'to discover' this and therefore adapt their strategy accordingly<sup>6</sup>;
- even when the focus of the exercise is on content with great emphasis on few variables to measure the outcome, process and relationship matter and significantly influence the result.

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<sup>5</sup> Based on this experience, it was decided to include a country aggregation module in the software which allows the game leader to limit the number of countries to numbers smaller than 11 and larger or equal to two.

<sup>6</sup> As such the Negociatrix policy simulation game better reflects most of the power distributions of the real world than the Agripol simulation game. In the latter the countries and participant groups are acting more on an equal footing.

- strategy as well as communication have to be consistent the more so when the possibilities of interacting with others parties are limited to exchanges of numbers and figures;

Moreover, the experience has shown that it is important to link up the use of the policy game to a training seminar on negotiation skills. It appears that players that have been exposed to the basics of negotiation tend to appreciate the connections between strategy and outcome more easily. In the context of the policy game, it is of paramount importance to capture rapidly the linkages between changes in national policy measures and the impact of these changes at global level through the adjustments on markets and the new equilibrium.

In addition, by linking training on negotiation skills with this tool on policy analysis capacities it is likely that players will adopt a cooperative approach more rapidly than in cases trainees are left to their intuitive approach to negotiation. Experiences with the Agripol game, where students were missing a training on negotiation skills confirm this. In about 80% of the cases then participants directly or after a few plays adopted non-cooperative behaviour, which in the end negatively affected the performance of all (e.g. the prisoners dilemma or social dilemma game). More remarkably, although participants/countries were preparing their policy submissions in one single classroom and could easily interact, this option was scarcely used. As already mentioned earlier, it is critical for the Negociatrix policy game that players decide to interact with each other at some stage in order to identify creative options that can satisfy their interests. It is therefore useful that players know how to identify interests and options that could satisfy the highest possible number of players. The earlier this interaction materializes the better the outcome of the game in terms of overall value creation as well as value sharing.

The ideal scenario for full fledged training seminars consists in two modules. The first module should focus on basic tools and concepts on negotiation. It can be designed for two to three days. The second module then consists in running first the Negociatrix simulation and then the Negociatrix policy game. The simulation ideally requires two days and the policy game one day. It means that overall one week is required to address the objectives of the Project on Negotiation at FAO for acquisition of both negotiation skills and policy analysis capacities.

Another finding points to the need of good understanding of trade, sufficient analytical capacities and basic knowledge about policy instruments. It is actually important that few prerequisites along these lines be checked before running the policy game in order for the players to be able to come up with new policy mix proposals for each round.

More generally, there is a need for embedding the Negociatrix policy game in a training or education programme that also emphasizes trade economics on the one hand and enabling skills on the other hand. It means that it is advisable to use this tool to focus on strengthening capacities in policy analysis in the framework of a wider curriculum touching upon negotiation skills and communication as well. From an educational point of view, we experienced that it pays to use as much as possible a general interpretation framework. For this, the demand and supply framework (see also Figures in section 3) was chosen. As much as possible it was tried to rephrase the informative and analytical questions asked during the trainings by the participants in terms of this backbone-framework. Extensively using one such framework provides the participants with a basic way of thinking with ‘universal’ applicability. Moreover, it helps them to create linkages between various problem-issues and policy instruments.

Lastly regarding the complexity of the game (several countries, several policy instruments which may be used in a mixed way to achieve multiple goals), can initially be rather confusing to participants. Therefore, it helps if the trainers can provide a heuristic (replicable method or approach for directing one's attention in learning, discovery, or problem-solving) to understand the impact of the policies pursued by various players on the world and local market equilibriums (interpreting policy simulation results). Moreover, in order to facilitate a structured way of thinking, it is useful to fill-in sheets with in rows the policy instruments and in columns the policy objectives (including their weights). This type of table helps the participants better understand the relationships between goal and instruments as well as the usefulness of developing policy packages in reference to. The optimal policy theory developed by Tinbergen in 1963.

## 5 Concluding remarks

This communication describes the main characteristics of the Negociatrix policy game, its relation to the Negociatrix simulation, as well as a number of first experiences. It appears that several of the advantages of using games in economics trainings coming from the literature are reflected in our first experiences. In general they emphasize the positive contribution games make as compared to more traditional training methods. Whereas complexity and uncertainty characterize the real world, it also appears that a relatively simple game as the Negociatrix policy game (consisting of three markets with no more than ten policy instruments per market, and social welfare being an aggregate of no more than five variables) is perceived by trainees as tool reflecting a similar complexity. This not only creates ‘realism’ but at the same time underscores the need to take care of the learning curve and the educational objectives of the game. The extent to which the Negociatrix policy game is consistently included in an overall training programme is of paramount importance. Moreover, an active role of the trainer to provide information about content in a convenient way by making use of simplified frameworks, heuristics, instrument-goal sheets, etc. is essential. FAO and the University of Wageningen are already committed to providing this type of comprehensive training. In the case of FAO it is for example through series of workshops and through Easypol which is on-line, interactive multilingual repository of downloadable resource materials for capacity development in policy making ([www.fao.org/easypol](http://www.fao.org/easypol)). In the case of the University of Wageningen, this is achieved through more traditional medium and long term curricula for students and trainees coming from both developed and developing countries.

Bargaining and negotiation skills on agricultural policy issues cannot be dealt with in an isolated way. Exploring and understanding economic mechanisms, the functioning of policy instruments either alone or in packages will improve the value added of the acquired skills. First experiences tend to show that as such the Negociatrix policy game can contribute to an improved understanding of the actual WTO negotiations on agriculture both from the negotiation and analytical perspectives.

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## Annex A Table country-specific policy weights matrix

<b>weights</b>	<b>Bengal</b>	<b>Pal</b>	<b>Esperantia</b>	<b>Federatio</b>	<b>Imperia</b>	<b>Insula</b>	<b>Ketanya</b>	<b>Mabu-Fabi</b>	<b>Neosaxy</b>	<b>Pali</b>	<b>Osterland</b>	<b>Uniona</b>
Farm income	0.17	0.21	0.23	0.06	0.00	0.16	0.30	0.14	0.14	0.14	0.05	0.25
Per capita food consumption	0.22	0.28	0.21	0.12	0.23	0.06	0.10	0.15	0.22	0.22	0.08	0.25
Limiting government spending	0.11	0.07	0.08	0.27	0.04	0.14	0.01	0.11	0.24	0.24	0.10	0.09
Agricultural trade balance	0.32	0.35	0.41	0.51	0.60	0.53	0.38	0.34	0.35	0.35	0.57	0.13
GDP	0.17	0.09	0.07	0.03	0.13	0.11	0.21	0.27	0.05	0.21	0.21	0.29
<b>Total</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>

Annex B Base year data used in Negociatrix

Product	Variable	Bengal	lappal	Esperanti	Federatio	Imperia	Insula	Ketanya	Mabu-Fab	Neosaxy	Pali	Osterland	Uniona	ROW	WORLD
<b>Casuc</b>	AreaHarvested (1000 Ha)	1,757	7,471	1,411	1,862	192	529	11	417	72	91	2,171	20,779	36,76	
<b>Casuc</b>	CapitalStock(bil \$)	27,637	15,491	15,331	1,742	5,780	908	4	48	1,253	814	3,722	10,014	36,30	
<b>Casuc</b>	Demand (1000 Ton)	4,057	66,930	37,020	15,054	12	2,339	93	1,716	857	12,818	78,994	126,856	346,74	
<b>Casuc</b>	Exports(1000 Ton)	19,127	48,789	3,689	419	571	2,045	7	3,510	60	144	69,598	35,402	(	
<b>Casuc</b>	Fertiliser Consumption (1000 ton)	1,251	240	4,326	2,169	4	0	1	3	1	440	227	1,884	10,54	
<b>Casuc</b>	Imports(1000Ton)	0	0	32,984	1,833	33	66	40	1,318	118	12,155	125,491	9,324	(	
<b>Casuc</b>	Price(Cons-\$/ton)	1,028	733	2,974	2,801	4,995	1,527	3,744	1,684	1,212	6,824	1,595	733	73	
<b>Casuc</b>	Price(Prod-\$/ton)	1,028	733	2,974	2,801	4,995	1,527	3,744	1,684	1,212	6,824	1,595	733	73	
<b>Casuc</b>	Production(1000 Ton)	20,294	64,724	6,123	11,005	620	2,577	86	3,226	776	511	21,688	133,808	265,43	
<b>Casuc</b>	StockChange(1000 Ton)	-90	-14,805	-216	-1,766	70	-1,317	26	-683	-5	22	-1,413	23,416	3,23	
<b>Casuc</b>	Stocks(1000Ton)	2,799	36,191	1,386	869	0	423	0	0	19	318	0	42,542	84,54	
<b>Tonco</b>	AreaHarvested (1000 Ha)	45	768	5,029	4,184	0	450	1,275	224	4	0	475	19,337	31,79	
<b>Tonco</b>	CapitalStock(bil \$)	81	189	56,993	3,273	0	65	156	26	3	0	814	19,996	32,29	
<b>Tonco</b>	Demand (1000 Ton)	515	671	1,605	5,016	9	64	43	173	1	275	664	7,791	16,82	
<b>Tonco</b>	Exports(1000 Ton)	32	110	2,281	155	0	3	532	446	0	0	296	0	(	
<b>Tonco</b>	Fertiliser Consumption (1000 ton)	10	22	88	299	0	21	6	1	0	0	42	675	1,16	
<b>Tonco</b>	Imports(1000Ton)	530	68	96	514	9	1	0	0	0	275	589	1,773	(	
<b>Tonco</b>	Price(Cons-\$/ton)	495	239	250	1,599	495	133	604	466	112	1,112	545	245	24	
<b>Tonco</b>	Price(Prod-\$/ton)	495	239	250	1,599	0	133	604	466	112	1,112	545	245	24	
<b>Tonco</b>	Production(1000 Ton)	18	713	3,800	4,650	0	66	575	619	0	0	371	6,017	16,82	
<b>Tonco</b>	StockChange(1000 Ton)	0	0	-54	267	0	0	18	26	0	0	64	544	86	
<b>Tonco</b>	Stocks(1000Ton)	5	358	2,104	1,672	0	9	172	519	0	0	359	0	9,75	
<b>Zor</b>	AreaHarvested (1000 Ha)	8,802	3,146	9,988	28,509	0	337	437	150	52	1,688	398	94,186	147,69	
<b>Zor</b>	CapitalStock(bil \$)	17,693	775	113,196	22,300	0	50	33	17	48	15,140	682	46,588	90,21	
<b>Zor</b>	Demand (1000 Ton)	47,838	10,678	24,332	176,085	0	2,188	789	1,651	104	11,049	2,357	283,572	560,64	
<b>Zor</b>	Exports(1000 Ton)	3	0	1,586	13	0	5	3	134	0	0	2	0	(	
<b>Zor</b>	Fertiliser Consumption (1000 ton)	1,196	92	4,007	2,037	0	0	1	1	0	418	35	1,644	9,43	
<b>Zor</b>	Imports(1000Ton)	0	221	0	0	0	0	1	0	0	0	42	1,481	(	
<b>Zor</b>	Price(Cons-\$/ton)	168	92	85	141	422	219	217	149	234	1,861	290	85	8	
<b>Zor</b>	Price(Prod-\$/ton)	168	92	85	141	0	219	217	149	234	1,861	290	85	8	
<b>Zor</b>	Production(1000 Ton)	47,841	10,457	25,918	176,097	0	2,193	790	1,785	104	11,049	2,316	282,091	560,64	
<b>Zor</b>	StockChange(1000 Ton)	-3,825	0	139	245	0	-1,503	75	-494	0	62	290	22,357	17,34	
<b>Zor</b>	Stocks(1000Ton)	885	728	1,635	10,806	0	27	11	103	4	670	191	13,575	34,63	
<b>General</b>	GDP growth %	2.1%	1.3%	1.1%	3.5%	1.5%	1.8%	4.0%	3.3%	0.5%	-0.1%	2.4%	1.6%	1.6%	
<b>General</b>	GDP US \$ (billion)	182	506	10,961	1,641	5	25	12	527	3	4,237	11,273	7,378	36,75	
<b>General</b>	GDP (1000\$)/ Capita	1	3	38	1	4	0	0	28	0	33	25	2	(	
<b>General</b>	Pop in Agr (1000)	58,917	28,281	27,248	853,771	137	52,896	23,985	877	4,986	4,920	27,331	1,490,107	2,573,45	
<b>General</b>	Pop in Agr (change)	-0.6%	-2.1%	1.3%	-0.2%	-2.3%	0.0%	2.2%	-0.7%	0.4%	-4.5%	-3.0%	0.5%	0.2%	
<b>General</b>	Total population (1000)	139,062	171,797	285,003	1,282,473	1,185	65,386	30,031	19,153	8,005	127,034	452,297	3,489,160	6,070,58	
<b>General</b>	Population growth	1.2%	1.2%	2.0%	0.7%	0.9%	1.2%	3.3%	0.9%	1.4%	0.1%	0.1%	1.6%	1.3%	
<b>General</b>	Price fertiliser \$/kg	0.8	0.8	0.8	0.8	0.8	0.8	1.2	0.8	0.8	0.8	0.8	0.8	0.8	

## Annex C Elasticity information used in Negociatrix

Elasticities		Benglal	Esperantia	Federatio	Imperia	Insula	Ketanya	Mabu-Fabe	Neosaxy	Pali	Osterland	Uniona	WORLD	ROW
Casuc supply	Price	0.45	0.60	0.50	0.15	0.15	0.12	0.12	0.50	0.30	0.45	0.15	0.37	0.37
Casuc supply	Price fertilizer	-0.10	-0.10	-0.10	-0.05	-0.10	-0.10	-0.10	-0.10	-0.10	-0.05	-0.05	-0.10	-0.10
Casuc supply	capital	1.20	0.80	0.80	0.80	1.20	1.20	1.20	0.80	1.20	0.80	0.80	1.20	1.20
Casuc supply	land	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Tonco Supply	Price	0.20	0.70	0.74	0.10	0.40	0.40	0.15	0.50	0.49	0.23	0.14	0.15	0.15
Tonco Supply	Price fertilizer	-0.10	-0.10	-0.10	-0.05	-0.10	-0.10	-0.10	-0.10	-0.10	-0.05	-0.05	-0.10	-0.10
Tonco Supply	capital	1.20	0.80	0.80	0.80	1.20	1.20	1.20	0.80	1.20	0.80	0.80	1.20	1.20
Tonco Supply	land	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Zor Supply	Price	0.50	0.40	0.40	0.15	0.30	0.30	0.30	0.60	0.58	0.50	0.35	0.22	0.22
Zor Supply	Price fertilizer	-0.10	-0.10	-0.10	-0.05	-0.10	-0.10	-0.10	-0.10	-0.10	-0.05	-0.05	-0.10	-0.10
Zor Supply	capital	1.20	0.80	0.80	0.80	1.20	1.20	1.20	0.80	1.20	0.80	0.80	1.20	1.20
Zor Supply	land	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Cauc demand	price	-0.60	-0.60	-0.24	-0.20	-0.30	-0.27	-0.27	-0.25	-0.30	-0.54	-0.50	-0.20	-0.20
Cauc demand	income	0.67	0.26	0.04	0.70	0.20	0.28	0.62	0.18	0.43	0.14	0.12	0.18	0.18
Cauc demand	population	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Tonco demand	price	-0.60	-0.60	-0.20	-0.20	-0.47	-0.47	-0.47	-0.20	-0.20	-0.30	-0.50	-0.13	-0.13
Tonco demand	income	1.18	0.45	0.40	1.10	0.50	0.83	1.10	0.23	0.68	0.36	0.20	0.13	0.13
Tonco demand	population	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Zor demand	price cereals	-0.30	-0.45	-0.25	-0.20	-0.27	-0.30	-0.30	-0.45	-0.65	-0.25	-0.50	-0.40	-0.40
Zor demand	income	0.65	0.27	0.14	0.44	0.20	0.56	0.72	0.24	0.36	0.00	0.21	0.35	0.35
Zor demand	population	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00