

Competitiveness and Social Inclusion within National Programme for Production and Use of Biofuels: negative feedbacks on profitability awareness in sharp Institutional Settlements in Brazil South Region concerning soybean oil.

André Luiz Miranda Silva Zopelari¹, Aldara da Silva César².

¹ National Institute for Spatial Research, São José dos Campos, Brazil

andre.zopelari@inpe.br

² Universidade Federal Fluminense, Volta Redonda, Brazil.

aldaracesar@id.uff.br

Abstract:

This paper intends to make some inferences about the relation of competitiveness and social inclusion, and interpret in an operational manner the success of South Region soybean familiar growers ascribed to the National Programme for Biofuels Production and Use. It inquires the hypothesis of sharp institutional arrangements acting as an interface in the social system through whose structure the interrelation between competitiveness and social inclusion might take place. The methodology include collected data, statistical treatment of series and modelling the system. The theoretical framework stemmed from Ulrich Beck's Risk Society, Garret Hardin's Tragedy of the Commons and Elinor Ostrom's Governing the Commons to Cesar's three-dimension analyses of governance towards competitiveness. The assessments confirmed that Institutional Settlements are suitable to preclude Risks, but it needs finer operationalization. The model helped to enlight that the most sensitive variable is profitability and if there are severe perturbations, then the negative feedbacks will trigger social vulnerability.

Key-words: Competitiveness – Social Inclusion – Soybean Oil – Biodiesel – Brazil

1. Introduction

This paper aims at inferring about the chances that enhancement of competitiveness among the cooperated soybean growers in south region of Brazil not be achieved through increased social vulnerability according to the criteria of National Programme for Production and Use of Biofuels. The hypothesis is that there is the necessity of a sharpened institutional

arrangement, so that it can bound both competitiveness and social inclusion for the local settlement of familiar growers. In order to verify this, it has been run a simulation for 10 years regarding the 'initial conditions' (site of production and contracted prices) as well as some 'boundary conditions', that was represented by an interval of figures that range within a determined mean and standard deviation values which account for profitability, and so to the volume of production. Thus, competitiveness stands for two important variables whose feedbacks were assessed: profitability and output. Social Inclusion is regarded as the enrollment of growers in the National Programme for the Enhancement of Family Agriculture {PRONAF}, once they are qualified in the Programme, they are able to contract with processor companies, that will purchase oil from them. Data was collected from official documents obtained with National Oil, Gas and Biofuels Authority, the Secretariat for Family Agriculture, Minsiter of Agrarian Development and Brazilian Statistics Institute. Treatment of the series were made to assess troubling aspects as stationarity, heteroskedasticity, residual autocorrelation, outliers and non-normal distribution. Once it is made, the model is structured so that the eligible figures can be input, thereby calibrating the model. It is important to notice that it matters least to be surgically precise with the accrued values than to be sure about the trends that are going to take place, since profitability is much too subjected to variabilities. It is also remarkable to notice that regarding competitiveness as being operationalized both by *market share* (volume of production) and *profitability*, this last one exerts a bigger weight on that variable, thus the negative feedbacks on profitability should be bore, because from there is expected to arise forcings against Social Inclusion. The model was set with a submodel and three sectors, as follows: the submodel aims to describe the complete path through which growers are supposed to go until they are qualified and how this process will end in social risk. Being a descriptive model, its yields do not suffice to meet the goals of the present study. The opposite should be expected for the sector's round. The first sector, designated as 'Profitability Towards Competition' holds all the figures and the feedbacks involved in modelling the role of profitability for competitiveness, with all its variability within. The following, 'Output Towards Competition' plays the same role as the previous, but for the volume of biodiesel from soybeans production and the last one, 'Integrating Competitiveness and Social Inclusion' stands for assessing how sensitive Social Inclusion is to initial conditions of competitiveness. For theoretical guidings it seems to be suitable Beck's Society of Risk, since he suggests a new model for understanding our times, a stage where the dynamics of individualization, globalization and risk undermine modernity and its foundations. In short, Beck claims that no-one appears to be responsible for the risk and

society stands for a huge laboratory, ranging from nuclear weapons research to madcow disease. Also, it is important to bring Hardin's Tragedy of the Commons paper, since he pointed out that the risks of an enhanced consumption pattern, the misuse of natural resources and a lack of a set of laws suitable for governing a complex, crowded and changeable world would lead to a great deprivation of common resources, specially the natural ones. Quite mandatory is to go through Ostrom's Governing the Commons, in which, centrally, she reasoned that unless a fine structure of governance is settled, the 'Tragedy' would be unavoidable, thereby suggesting and watching many sharpened institutional settlements. These three authors account for the theoretical framework within which this paper is produced. Futhermore, in order to to have a closer look at the process, Cesar's 3-dimensionality framework for governing those arrangements will fit best the analisis. For conclusion, what one can learn from the model is that competitiveness and social inclusion can be bounded through an interface known as institutional arrangements. Such settlements indicate that the risks for the Social Inclusion of the PNPB families dwells in the external forcings against profitability, since social risks are very sensitive to that variable. Also, the study supported the belief that applying 3-dimension framework to the arrangements will lead to the success in conservating the commons, competing and socially including the growers.

2. Problem

Concerning the interaction between Social System and Natural System, within which competitiveness and social inclusion are going to take place, is there room to include more soybean family farmers as cooperatives competitiveness increases?

3. Hypotheses

- For such goals to be met, there is a necessity to settle an institutional arrangement that consists of a governance structure that coordinates some competitiveness drivers, take advantages from the institutional environment so that producers can benefit from supplying contracts with processor companies granted by the Social Fuel Seal Certificate ('SCS').
- The major negative feedback that can undermine that social-economic system is on the profitability variable.

4. Objectives

The general objective is to delve under which conditions competitiveness can enhance the levels of social inclusion of familiar farmers.

4.1 Specific Objectives

Specific objectives are:

- to assess the feedbacks within the institutional arrangements
- to simulate the interactions between competitiveness and social inclusion for the next ten years
- to make inferences about the trends in biodiesel competitiveness and social risk

5. Literature Review and Theoretical Framework

To meet the objectives herein, it should be made clear under which circumstances the problem is being dealt with. Thus, concerning risks to the extent of social vulnerability of familiar growers, one needs more than traditional discussion involving agrarian reform and peasants settlements, it demands a broader conception that includes a global trend that threatens both society and the environment. There is a problem of interactions and crossed feedbacks from social systems to natural systems, that makes something become more complex, and this is the Earth System. To address some of the troubles of possible interactions man-environment, the Renewable Energy System has been set up. It is a man-made system whose boundaries intertwines with Earth's and has the purpose to recover energy from natural resources, thereby lowering pressure on planet. Their components, basically, are biomass and wind energy. Thus, the National Programme for Production and Use of Biofuels has been set up by the Government in order to meet clean energy generation and also to find room for familiar agriculture activities that could be suitable for their economic needs.

Viewing from this perspective, some theories and works would fit better the research, and they are: Ulrich Beck's Risk Society, the controversial paper "Tragedy of the Commons" of Garret Hardin, and, an attempt to be – to some extent – a counter-view of that, Elinor Ostrom's Governing the Commons.

Beck explains that the theory of risk society interprets the ways in which the set of states of interconnected processes, the end of nature and the end of tradition, have altered the epistemological and cultural status of science and the constitution of

politics. In the age of risk – he continues - society becomes a laboratory with nobody responsible for the outcomes of experiments. The private sphere's creation of risks means that it can no longer be considered apolitical. Indeed, a whole arena of hybrid subpolitics emerges in the realms of investment decisions, product development, plant management and scientific research priorities. In this situation, the conventional political forces and representations of industrial society have been sidelined. The notion of risk society clarifies a world characterized by the loss of a clear distinction between nature and culture. Beck points out that, nowadays, if we talk about nature, we talk about culture, and if we talk about culture we talk about nature. When we think of global warming, the hole in the ozone layer, pollution or food scares nature is inescapably contaminated by human activity. This common danger has a levelling effect that whittles away some of the carefully erected boundaries between classes, nations, humans and the rest of nature, between creators of culture and creatures of instinct, or to use an earlier distinction, between beings with and those without a soul. (1998:11). Beck states that the Risk Society begins where nature ends, the notion of risk society clarifies a world characterized by the loss of a clear distinction between nature and culture, since we live in a hybrid world which transcends old theoretical distinctions, as Bruno Latour has convincingly argued. Risks are man-made hybrids. They include and combine politics, ethics' mathematics mass media, technologies cultural definitions and precepts. In risk society, modern society becomes reflexive, that is, becomes both an issue and a problem for itself. Yet risk society, in opposition to the image of the term, captures a world which is much more open and contingent than any classical concept of modern society suggests - and is so precisely because of and not in spite of the knowledge that we have accumulated about ourselves and about the material environment. In his opinion, the notion of risk moves through two stages. In the first instance, risk seems no more than a part of an essential calculus, a means of sealing off boundaries as the future is invaded. Risk makes the unforeseeable foreseeable, or promises to do so. In this initial form, risk is a statistical part of the operation of insurance companies. They know a lot about the secrets of risk which changes society, even though nothing has yet happened. This is risk in a world where much remains as 'given', as fate, including external nature and those forms of social life coordinated by tradition. As nature becomes permeated by industrialization and as tradition is dissolved, new types of incalculability emerge. We move then into the second stage of risk, which Giddens and Beck have called manufactured uncertainty.

Here the production of risks is the consequence of scientific and political efforts to control or minimize them.

The current discussion about risk produced by both human beings and nature, as posed to some extent by Beck, seems to lay down roots in controversial, and somewhat alarmist, paper of Garret Hardin. For this author, although the problem remains a sort of contest for food, given the population size, there is more to be discussed. He points out that population growth is related to a category of problems whose solution is not a technical one, at all. He comes up later in his paper to drive the attention to the matter of acquisition of energy, and clears the question by referring to atomic energy, which is said to be infinite. He states that:

“however, given an infinite source of energy, population growth still produces an inescapable problem. The problem of the acquisition of energy is replaced by the problem of its dissipation.”

(1968: 1243)

With such a sentence he inaugurates a path to discuss a greater problem that does not have to do with possession and deprivation of goods, especially common goods. The matter now is not whether a group or an individual is going to own something that might belong to all others, but what they can do that harm that space. The common pool of resources is the nature itself. So he ascribe the pollution to the matter of the risk of further incapability of the environment to render benefits to the human societies. Inspired by a 1833 pamphlet that stood for a first rebuttal to the “invisible hand” in population control, Hardin then sets the expression “Tragedy of the Commons”, and his thought is depicted as a pasture open to all, consequently, it expected that each herdsman will try to keep as many cattle as possible on the [site] commons. He argues that such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy. He keeps on to explain that as a rational being, each herdsman seeks to maximize his gain. To a certain extent, he [herdsman] asks, “What is the utility to me of adding one more animal to my herd?” This utility has one negative and one positive component. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional

animal, the positive utility is nearly +1. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsman, the negative utility for any particular decision-making herdsman is only a fraction of - 1. Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another (. . .). But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit—in a world that is limited. Hardin keeps the pace and apply this same logic to the oceans and national parks, regarding species, animals, fishes and whales. But pollution seems to be the core preoccupation of his framework. Hardin reasons that in a reverse way, the tragedy of the commons reappears in problems of pollution, however it is not a question of taking something out of the commons, but of putting something in—sewage, or chemical, radioactive, and heat wastes into water; noxious and dangerous fumes into the air, and distracting and unpleasant advertising signs into the line of sight. The calculations of utility are much the same as before. The rational man finds that his share of the cost of the wastes he discharges into the commons is less than the cost of purifying his wastes before releasing them. Since this is true for everyone, we are locked into a system of “fouling our own nest,” so long as we behave only as independent, rational, free-enterprisers. The tragedy of the commons as a food basket is averted by private property, or something formally like it. But the air and waters surrounding us cannot readily be fenced, and so the tragedy of the commons as a cesspool must be prevented by different means, by coercive laws or taxing devices that make it cheaper for the polluter to treat his pollutants than to discharge them untreated. Hardin blames “our particular concept of private property” that deters us from exhausting the positive resources of the Earth, favors pollution. (1968: 1243).

Summing up, *Tragedy of the Commons* dwells in a matter of controlling, but this has to do with culture, legal systems, consciousness and mutual coercion, if any of these fails, then the Tragedy takes place.

Should it all be like that? Will be no room for less rigid frameworks to prevent societies from risk, especially, those risks that are not related to technical solutions? Maybe.

The key that arises in all this fatalist spirits is the expression “Governance of the Commons”. So, likewise in recent past, when Boserup went on to find out that technological shifts in agriculture would refuse Malthus thesis of another tragedy, so did Professor Elinor Ostrom in her book “Governing the Commons”.

Ostrom opens up her work exactly by delving the picture of the wide pasture brought up by Hardin. She applies many possible solutions derived from the *Prisoner's Dillema*. Anyway, to pose what will oneforth underpin her thought, she attracts the attention to a fifth game, in which the herders themselves can make bidding contracts to commit themselves to a cooperative strategy that they themselves will work out. A bidding contract, she goes on to detail, is interpreted within noncooperative game theory that is unfailingly enforced by an external actor. Now, the herders must negotiate before placing animals in the meadow, during which they discuss several strategies for sharing the capacity of the meadow as well as the costs of enforcing their agreement. The great advantage of this is the fact that the players are not dependent on distant government information accuracy. The point is that all of them can control information, to the extent that if one of them suggests a strategy based on incomplete or biased information, another one can refuse to follow. In short, participants design their own contract based on the information they have at hand. Anyway, Ostrom recognizes that this is the light of theoretical framework, so she brings empirical alternatives and expose a case in which participants devised a solution: it took place in Alania, Turkey and the matter was about inshore fishery. In the early 1970s, two factors threatened the economic feasibility of fishery: hostility and violent conflict because of unrestrained fishery and the increment of production costs as a consequence of the competition for better fishery spots. After a decade of trials-and-errors, they settled down some rules that ranged from a list of eligible fishers with licensed ones, the distance among the sites so that the nets will not block the flux of fishes from one side to another, and a timetable for them to change their sites of fishery within Alanya. Ostrom settles the concept of CPR – Common Pool Resources – at finer scales to study the way they arrange and possible reasons for success or failure in governing CPRs. The term *Common Pool Resources* refers to a natural or man-made resource system that is sufficiently large to make it costly to exclude potential beneficiaries from obtaining benefits from its use. (1990:30). According to her, to understand the process of organizing and governing CPRs it is essential to distinguish between the resource systems and the flow of the resources unit produced

by the system, and recognize the dependence of one on the other; the former are best thought of as stock variables that are capable of maximizing a quantity of flow variables without harming the stock or the resource system itself. She later in the text points out that the distinction between the resource as a stock and the harvest of use units as a flow is specially useful in connection with renewable resources, where there is the possibility to define a replenishment rate. Throughout her work, the focus will be laid on Action. By the time she examines Interdependence, Independent Action and Collective Action, she comes up to remind that whenever multiple appropriators are dependent on a given CPR as a source of economic activity, they are jointly affected by almost everything they do, and unlike prisoners, they are not coerced into acting independently. But changing from independent to collective action is not trivial, and costs are quite high. The benefits are shared by all, and it is not proportionally to an individual deed or contribution. Thus, based on insights from the Theory of the Firm and the Theory of State, Ostrom highlights that to go through these circumstances or to find an explanation to why some succeed and others fail it should be noticed that collective action can be achieved by creating new institutional arrangements each.

5.1 Theoretical Framework

Although the revisited authors had done their best to show that there are paths to avoid an overexploitation of the common resources; be it through political and technical means, as seemingly is Beck's point-of-view, be it a struggle among members from which may emerge a power and enforcement authority, but not a technical solution for the scarcity, as Hardin, apparently, pointed out; and, finally, by the building of institutional arrangements as a feasible and experienced solution. For the case here, it all seems not to be enough to describe the success in conserving, competing and including familiar growers. There is the need to distinguish three devices, as follows:

- Drivers of Competitiveness
- Institutional Environment
- Structures of Governance

The first set consists of eight drivers that acted on the agriculture and the industrial sector of the eligible raw material: soybeans. They are: Sectoral Policies, Macroeconomic Factors, Technologies, Management, Productive Resources, Market Structure, Governance Structures and Infrastructure. The contribution of each one for the success were assessed by Survey along with Likert's Scale.

The second one comprises a long list of entities, but the most prominent are the economic environment (particularly the rate of exchange which affects the price of raw materials and interest rate, that influences the credit conditions), the technological environment (access to technological bundles and stimuli for Innovations), and the Competitive Environment (here, the firms and cooperatives that render renewable energy supplying services).

The last one can be mostly represented either by the spot market or by the contracts.

Accordingly to César, the economic scenario is slightly favourable since for the mills to accomplish with amounts to be added to the ordinary diesel, they usually get oils with more competitive prices, and that is the soybean's case and also is the unique commodity suitable for PNPB demand. Also, in spite of the variability of the prices of the vegetal oil, most companies make their strategic plans for the soybean, that's why management is important in the success. The market structure is also favourable because the production is not oriented for international trade, so the transportation from long distances is not a trouble. The governance structure is plausible as well since the contracts are not usually with individual but with cooperatives. Concerning the technological environment, the positive point is that the expenses with technical assistance are low, and Mills usually pay a premium price to the cooperatives so that they can assist their members. (2012:112-114).

This appears to be the most suitable reference to study and model the social inclusion vis-à-vis competitiveness under PNPB, since the settle of Institutional Arrangements and its correspondent structure of governance are going to take place.

6. Methodology

The methodology need to be built on a basis that allow the observation of interaction among certain variables and their feedbacks as well. Also, it should be made possible to assess some impacts on the whole system; but, above all, the techniques and proceedings must point a clear path to interpret the results beyond the absolute value of the figures.

Thus, a first step is to regard the familiar growers and their participation in the Programmes (Pronaf, PNPB) as a system; possibly, a Social System.

So, a first approach is that of Systems Dynamics and Complex Systems. The Social System is dynamic because competitiveness and inclusion, whatever their

values represent, vary along time. Also, the system is complex because there are many possible interactions among the variables involved within.

In order to operationalize such interactions, a device is going to be demanded, and it is a computational resource fit for system dynamics runs. However, before, setting up the programme, the series undergone a statistical treatment so as to assess the accuracy of them.

The series have been obtained through consultations to some official documents from authorities and governmental sources, thereby being regarded as primary sources. Another, secondary data, was supplied by previous academic works, such as papers, thesis and articles.

Also, by handling such data, and in order to settle the modelling software, it is necessary to establish the initial conditions, that is represented by the area of study, the eligible agents to be watched and the indicted prices. Furthermore, the boundary conditions will have to be settled.

6.1 Initial Conditions

For initial conditions, one may understand the circumstances from which the modeller will depart to treat the matter adequately, i.e., the conditions that act as primer forcings in the system so that it evolves straightly unless other extra forcings take place and disturb the trajectory of the system. Since it is neither usual nor practical for social systems, they are going to be looked at as a metaphor and “translated” into three entities: the area where the study is going to take place and who are the agents that are going to be considered in the research and the price.

6.1.1 Area of Study

The area of study is going to be the South Region of Brazil, although it is not going to be distinguished among its three states. It is going to be considered as one, likewise the documents of the Programme of Biofuels does.

6.1.2 Agents Considered

The agents that are going to be looked at in this research are those who not only dwells and take their jobs in the South Region, but also are regarded as familiar growers and is qualified in the National Programme for Strengthening the Familiar Agriculture (PRONAF) whether or not he is a member of any cooperative. Also, he needs to be qualified for PNPB programme.

6.1.3 Cooperatives

Although the cooperative membership is not a crucial criterion for qualifying in both programmes, both the competitiveness and the social inclusion will be regarded with focus on cooperatives, because they are the very players. According to official documents, less than 20% of suppliers are free ones.

6.1.4 The Commodity, the contract and the price.

The good that the growers have to provide is the oil from soybean, which then will undergo the transesterification industrial process so that it can turn into biodiesel. The contract is made through cooperatives and the price is arranged among them. Anyway, for modelling, there is going to be set a unique price, and a fixed number of producers, not cooperatives.

6.2 Boundary Conditions.

Here's another expression borrowed from differential equations from Math. By this methaphor, it is meant that the System might evolve in such a manner that it does not have more than a unique solution. For the case of this paper, this unique solution will be that competitiveness prevent farmers from leaving the markeplace due to unbearable losses, which, as it is going to be seen, will be a role for governance of Institutional Arrangements. Its operationalization will be within a interval of values for both profitability and output.

7. Analyses and Discussion

The model was run so as to assess whether competitiveness harms social inclusion. Thus, the results will depend on initial conditions as set above.

To begin with, the Social System is made of agents that comprehend farmers, governmental authorities, enterpreneurs, firms, cooperatives and the market itself, culture and tradition plays not a minor role. The stock variables will be basically represented by the farmers, the commodities, the mills, the devices, the knowledge and the fluxes will be portrayed as the finance, the contracts and the industrial processes.

The initial conditions for the system to run is that the farmers must all be qualified in the National Programme for Familiar Agriculture Strengthening

(PRONAF) which is a prerequisite for another qualification, this time in the National Programme for Production and Use of Biofuels (PNPB). Both arrangements aims at promoting the familiar agriculture production, but, particularly, the last one, with focus on crops that are suitable for biofuels production. The growers must also be settled in properties within the South Region of Brazil, that comprehends three states: Paraná, Santa Catarina and Rio Grande do Sul. All them – as far as the model is concerned – are supposed to be a member of any of the cooperatives enrolled in PNPB, which makes them able to contract with firms who purchase vegetal oil. To the extent of the present model, the vegetal oil that is going to be extracted and traded is soybean's.

Cooperatives then are the players in the marketplace and it is their joint capacity of delivering the oil that is the integral amount – or the potential stock – of the system. Thereby, the derivatives of each one volume of production stands for the market share. Furthermore, the level, constant or not, of received prices for sold volumes, is the profitability.

Both *share* and *profitability* are the considered variables with which competitiveness is going to be operationalized.

As it has been almost exhaustively discussed in the Review Section of this paper, there is something that can prevent either the *Tragedy of the Commons* or the failure of the *Governance of the Commons*. And such is the Institutional Arrangements. They are going to be regarded as the interface of the System; that is to say: that structure that is going to make feasible the interrelation between competitiveness and social inclusion, thereby giving birth to a social-economic system.

7.1 Modelling

Having structured the analysis to the circumstances to that system is ascribed, the conditions are set to run the model, that is going to delve if competitiveness can lead to social inclusion, that is, if there is going to be room for the system to absorb more familiar growers for a period length of ten years.

First, the inquiry will be to determine which of the two variables (share, represented by production and profitability, represented by the variability of revenue), competitiveness is more sensitive to.

Figure 1. Comparison between level of Competitiveness and Incremented Production.

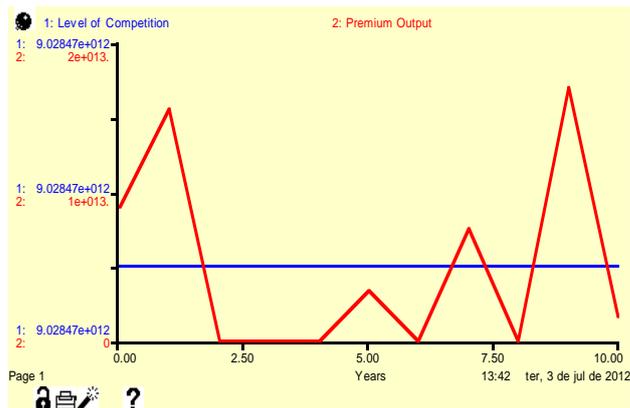


Figure 2. Comparison between level of Competitiveness and Profitability.

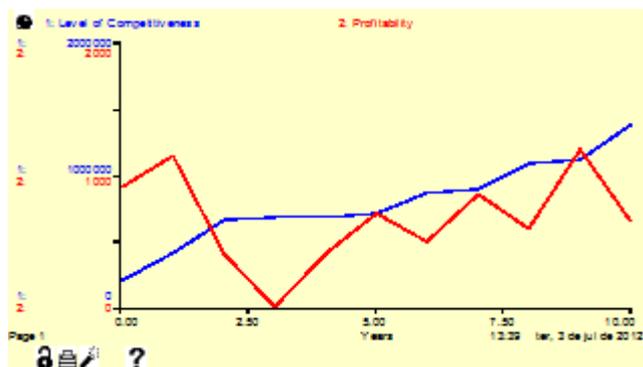
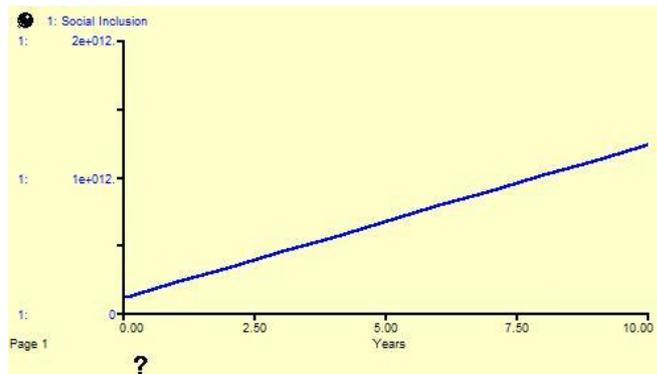


Figure 3. Social Inclusion Trend for 10 years.



Thus, the result is that competitiveness is much more sensitive to Profitability than to the production level.

Bearing this in mind, the model can finally go after the quest for the relation between competitiveness and social inclusion.

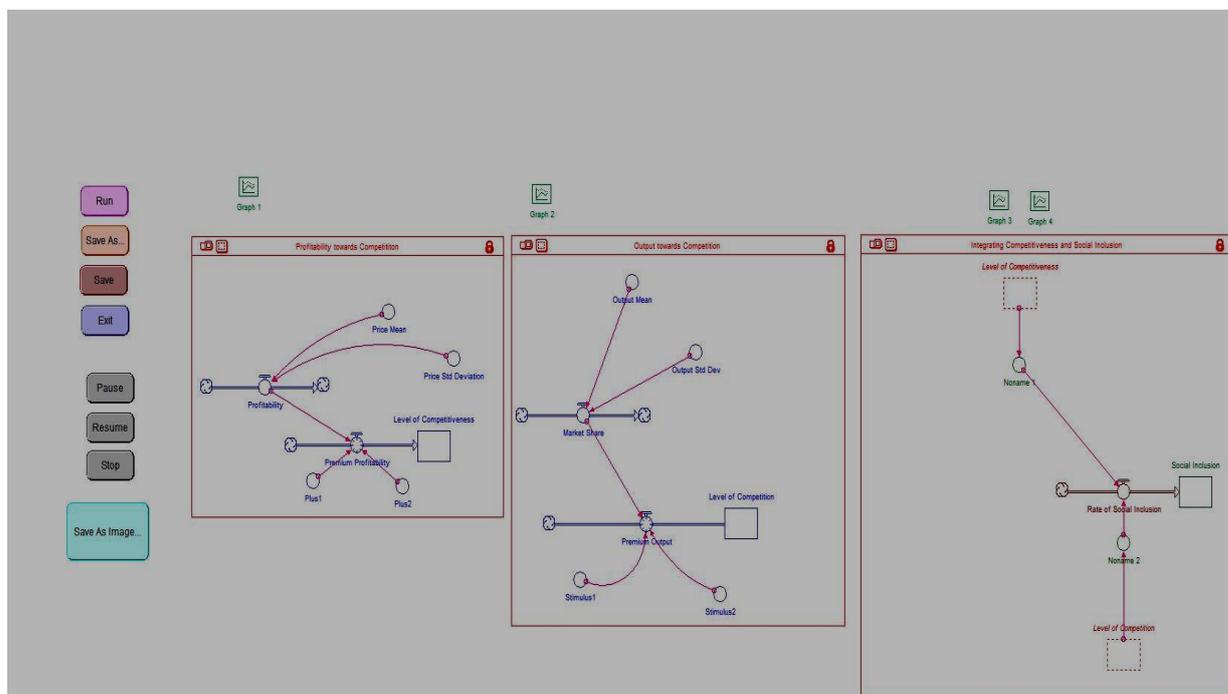
The model was divided in three sectors: Profitability towards Competition, Output towards Competition, and Integrating Competitiveness and Social Inclusion.

In order to run the first sector, Profitability was regarded as a flux, and so it has been connected to two other conveyors (Price Mean and Price Standard Deviation) and was programmed to vary according to an interval; then it was supposed to transfer this flux to another, Profitability Premium, that was programmed to add a ‘plus’ (kind of stimulus) according to values delivered during the running, so that it should fill in a stock, named ‘Level of Competitiveness’, that is, the amount to which a cooperative (stands for a number > 20 producers in the model) can be considered competitive. The second sector, Output towards Competition, the same thought has been applied to. **If** the capacity of delivering a certain amount of oil is obtained, **then** a premium is added to the volume, **else**, a smaller premium would be added to.

{IF(Market_Share <75067700) THEN Market_Share *(Stimulus1) ELSE Market_Share *(Stimulus2)}

Finally, the third sector is meant to integrate Competitiveness to Social Inclusion. The ten-year round fulfill the same line of thought. The competitiveness is a stock [level of Competiveness] as well as the social inclusion. The fluxes are intermediate to another “If-Then-Else” function, that intends to require more growers every time a certain level of competitiveness (Optimal Profitability + Optimal Output) is reached.

Figure 3. Three Sector Run



8. Findings:

For both describing and explaining the success in including familiar growers of soybeans in the South Region of Brazil hitherto, as the PNPB started in 2004, and to assess the relation between competitiveness and social inclusion, the most suitable technique involved was modelling. Modelling the relation above led to watch carefully the interaction between variables as well as following the net of feedbacks in the system. It was then possible to infer that there is a steady tendency to match competitiveness and social inclusion, since the ten-year round retrieved straight results in that sense. Finally, what one can learn from the model is that the most sensitive point in that social-economic system is the profitability, and unless the agents be much aware of an external forcing (e.g.: direct suppliers greater benefits), that is going to lead to negative feedbacks, such as descending prices, worse contract clauses, market concentration, the risk will be spurred.

Such model provided a good insight about that relation as well.

The overall analysis herein reinforced the belief that having an Institutional Settlement, that should be managed through a structure of governance that can profit from the best conditions and preclude threats found in the Institutional Environment; coordinate the development and accomplish with the competitiveness drivers, will diminish the risks of failure in social inclusion.

9. References

Beck, U. Politics of Risk Society, in: Franklin, Jane (ed.). **The Politics of Risk Society**. Cambridge, 1998. p. 9 -22.

BRASIL. Ministério do Desenvolvimento Agrário. **MDA lança cartilha sobre o Programa Nacional do Biodiesel**. Brasília, DF. Disponível em: http://www.mda.gov.br/portal/noticias/item?item_id=8790109. Acessado em: 20/05/2012.

César, Aldara da Silva. **A Competitividade da Produção de Biodiesel no Brasil: uma análise comparativa de mamona, dendê e soja**. Tese (Doutorado em Engenharia de Produção Agroindustrial), UFSCar. São Carlos, 2012.

Hardin, Garret. The Tragedy of the Commons. **Science**, v. 162. Washington, 1968, pp. 1243-1248.

Ostrom, Elinor. **Governing the commons: the evolution of institutions for Collective Action**. Indiana University. Cambridge University Press. 1990.