

BIOFUELS AND FOOD PRODUCTION A SYSTEMIC APPROACH TO STUDY THE RELATIONS AND IMPLICATIONS IN COMPLEX AGRICULTURE MARKETS

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ABSTRACT: During the last decade a great growth in biofuel industry all over the world has occurred. The last few years this tendency has been challenged due to new rules and pressure over the public questioning the sustainability of biofuels competition with food resources, food security and their capability to achieve environmental and social solutions. In general opinions and articles are based on incomplete studies lacking a systemic and holistic view of biofuels within agriculture markets all over the world. Many precatory measures are taken relying on forecast global models predictions of possible impacts in the future. The industry is now days in severe danger working with unpredictable future scenarios. In this paper a systemic approach is followed looking for real impact of this industry within very complex markets were co-products are a key factor. Results are based on traceable and public figures comparing them with forecast and projections made by equilibrium models all over the word. Results are based on a complete transformation chain analysis of Argentina case as the first biodiesel exporter country and one of the main actors in agricultural commodity markets. Prices, energy and carbon emissions balances are considered over real case studies covering different biofuels and feedstocks. The analysis confirm that forecast consequences are very far from real markets and land use behavior. Carbon emitions, food security effects and LUC and iLUC implications of first and second generation biofuels need to be revised and closely look at in order to compare them in a fair way.

Keywords: biofuel, biodiesel, modelling, agriculture, energy balance, policies

1 Introduction

Biofuels have been promoted on the last decade by governments in great part of the world. The reason of those decisions that are variable between countries rely on several drivers initially put forward and discussed in the latest years.

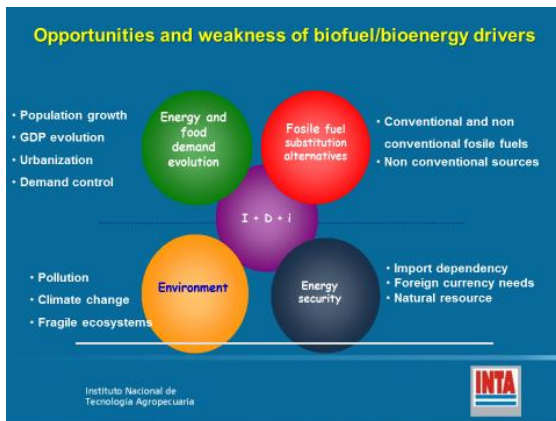


Figure 1 Principal promoting drivers of biofuels

Food feed and fuel are all different forms of energy. Modern societies uses all three very inefficiently and in this aspects relies the principal source of energy for the coming years. The challenge is to achieve development and economic growth to the whole world in a sustainable manner.



Figure 2 Rational use of energy in all its forms

From an analysis of the principal biofuels markets in the world with an increasing role on the last years, we find out that they are all inserted in complex agro industrial transforming chains with several products being produced and commercialized.

Rapid growth of biofuel production in the United States Brazil and Argentina over the past decade has increased interest in replicating this development in other nations of the Pan American region. However, the continuing production of food-based feedstock has been in debate changing public perception regarding sustainability although there are no field proofs of links to deforestation, food insecurity and increased greenhouse gas emissions. In general literature analysis lack of a holistic and systemic view of biofuels inserted in a very complex agroindustrial transforming chain.

Public perception is changed very rapidly in modern societies with plenty of media roads to reach people quickly. Different actors as oil and food companies, NGO, environmentalist publish certain reports of big impact in the general public. When the perception is changed political actors try to respond promoting changes in legislation, laws and commerce regulations.

This has been particularly strong on multipurpose crops as corn, sugarcane, soy, and others principally due that they are treated as pure energy crops not considering the rest of their end products.

Most arguments are based on results without a deep study on the methodology that was employed in order to establish if those figures or impacts are really comparable.

Food issue is one of the most delicate and generates public concern very rapidly. Positive correlations between commodity price rises and biofuel production were rapidly published but when markets tendency changed no publications or corrections were made.

The policy system asks scientist to give support for these changes in public perception based on scientific evidence. Universities and scientific institutes need time, testing and analysis of data in order to deliver this type of information. This causes great discrepancies in speeds and although changes in legislation and regulation goes pretty fast the scientific support behind them is very weak. This is represented by the turtle and the rabbit (fig 1) and the consequences for the near future are wrong decisions and possible controversies in international courts.

On the last five years plenty of different models were used in a single or combined way in order to predict possible effects of biofuels policy and production. Based on several results obtained from them precautionary measures were launched with very poor field test. The consequence on certain biofuels is that they are punished restricted or not promoted not by their real effects but based on possible changes that may or may not occur in the future.

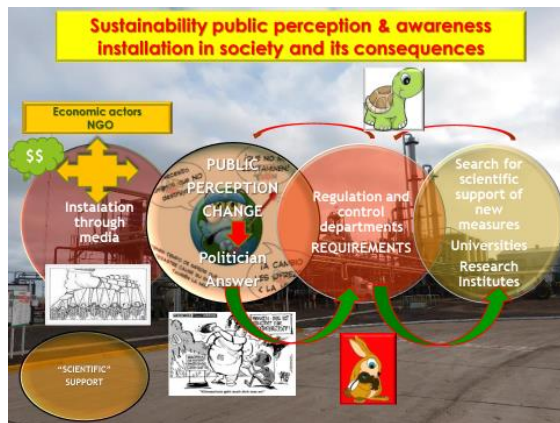


Figure 1 public perception on biofuels dynamics

In the literature review we find out that most of the studies are focused on biofuels production and final use lacking a systemic view of the whole complex were they are inserted. Biofuel chains use agronomical knowledge and experience, transportation and logistics development for inputs and outputs, industry knowhow and final delivery from well and mature chains for example: sugarcane/sugar, corn/cornmeal, soybean/soymeal/oil, forest/wood industry.

Analyzing this complex and mature systems we find out multiple interactions (fig 2) that produce uncountable effects on several industries with direct or indirect relationship with agriculture

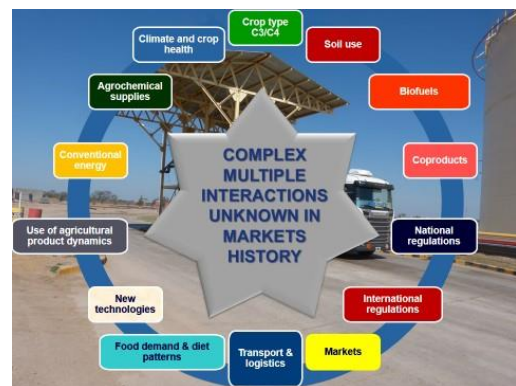


Figure 3 Interactions in transforming chains

During the last years the growth of biofuel production and commercialization and the continuous changes in domestic and foreign policies gives a good opportunity to demonstrate that conclusions and forecast of the studies made ten years ago, turn out to be very far away from what really occur since many interaction were not taken into account.

There are very few examples of studies comparing models predictions to real cases evolution along the last years were biofuels entered the international markets and policy driven policies changed several times.

This is especially important when land use is considered, farmers as principal actors in defining land use change are stimulated by end prices paid by their products without considering the final end use of them. Low prices of commodity products has always been a problem for this sector producing land abandon, low technology use etc.

When biofuels were introduced as a new end coproduct of certain crops the effect on prices caused an increase in land use and technology with a final increase of productivity since all the different chains received a new signal to invest and improve (breeders, genetics, fertilizers, agrochemical, logistics, farm machinery etc.).

The end result was an increase of food multipurpose crops production and more stable agro markets.

Bioenergy system decisions occur at all points along the supply chain (Fig 3) and at different scales, information about sustainability indicators can be used to inform those decisions. (1) Dale VH et al.

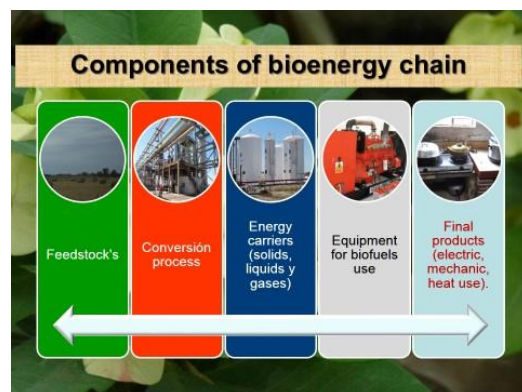


Figure 4 Components in bioenergy chain

The principal challenge in systemic approaches is finding the individual effect of the biofuels on the transforming chain and the behavior of different actors at local, region or state level. A way to approach this is

making local or regional studies and looking at changes that were produced after the appearance of biofuels in the market.

The production of biomass has several ending markets with different commercialization values and volumes. In general principal multipurpose crops share this ending destinations with variations according to commercial rules change and relative prices looking for the maximum revenues for the raw biomass material produces at farm level.

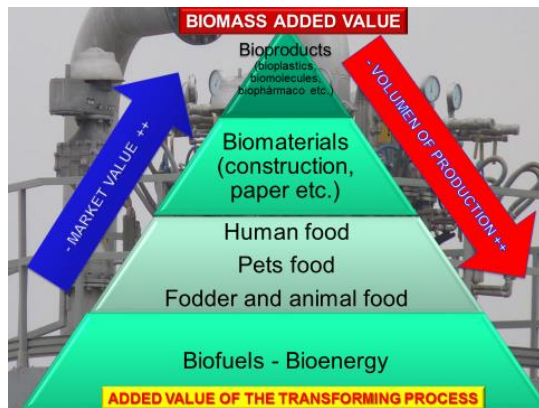


Figure 5 for prices and volumens of biomass

Biomass production has many possible final uses as food, feed, construction or fuel. Between them, the fuel final use usually has the lower end price. That is why looking at new costly technologies related to second-generation biofuels only high value byproducts will make them economically feasible.

There are some variables related to the specific production and use of biofuels that can be dimensioned in a rather precise way (construction and operation of transforming plants, transportations and final use). The complex effect on commodity increase demand and stability are very difficult to study but different scenarios can be proposed to find out the overall behavior of the system.

This has to be confronted with real case studies were increase and decrease in biofuel production must be analyzed with a series of parameters linked to resources use and markets prices.

The different consequences of biofuels introduction in the last 10 years can be of great help especially regarding specific country studies.

There are certain aspects regarding biofuels that should be considered:

- Relative low price of biofuel as a final product
- Foreign currency balance of the country
- Profit of the combination of products
- Added employment and value at local level
- Risk of local and foreign policy changes
- Changes in final product public perception
- Competitive use of feedstock's in present and future markets
- Impacts in the food prices at local regional and international level
- Working force and technology availability
- Transport & logistics

2. Resources and Soil use

Biomass production needs certain resources to be produced special attention should be paid to:



Figure 6 competence analysis of resources

Looking at this resources it is simple to trace direct impacts when dealing with a specific energy crop but there is a great challenge to allocate them when we are using a multipurpose crop, although there are possible ways of doing this there is a need to standardize the methods, criteria and boundaries.

There are many sort of projections for first and second-generation biofuels crops in order to comply mandatory or maximum targets enforced by different countries or regions. Many of this studies don't consider that the election of a crop is mainly based on the best economic alternative for that agro ecoregion. Added to this factor there are crop rotation needs and cultural factors that also have significant influence in the crop selection.

Farmers are conservative and they look for stable and well-known markets for their products. In the case of multipurpose crops they are not significantly affected by changes in the final use of the seed, this has been proven recently with great differences in biodiesel production in Argentina not affecting the area of soybean nor the final price of grains (Fig 4) being paid to the farmers although there were severe alterations in oil price differences between Argentinean ports and Chicago.

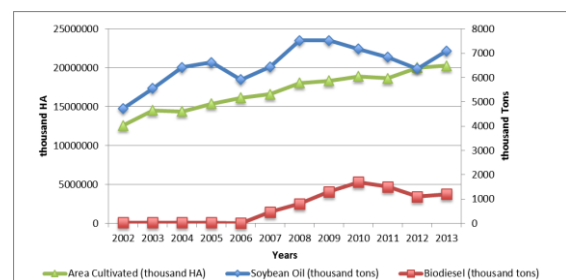


Figure 7 Argentine Soybean cultivated area with regards to its Biodiesel and oil production

New specific energy crops will have a higher risk component since any change in the final market of them will affect in a direct way the farmers.

An important attention must be paid to agricultural policy changes for different kinds of products, there are multiple examples of specific policies that can drastically change cattle or different crops production and this is also in many cases also consequence of climate change conditions in certain years. All his forces are significantly

larger than biofuel effects and they are difficult to introduce in predictive models.

Low policy internal market rises from meat that was maintained during several years in Argentina caused a great sold out of cattle by farmers decreasing the total number of cow heads by more than five million with long term enormous impact on meat availability and land use.



Figure 8 Example of internal policy effects on agro systems.

In the rich agricultural regions of the Americas, industrialized by the development of the agro-food industries of corn, wheat, meat, cotton, sugarcane and soybean, mechanization is extended and metallurgical engineering is required to serve in the elaboration of agricultural products. Argentina follow specific technological developments, as in the case of the biofuels sector. In Argentina, territories and stakeholders respond to challenges of renewable energy by deriving a part of biomass coproducts into fuels that reduce greenhouse gas emissions and promote a de-centralized energy supply. Mandatory blend have been increasing over the last years reaching at the end of 2014 10 % for bioethanol in gasoline and biodiesel in diesel fuels all over the country.

It is foreseeable that in the future, biomass increases its participation in energy balances according to international and domestic incentives, in particular because of increasing energy demand. Agro-industrial sectors are adapting themselves and they are innovating in the production of biofuels mainly focusing on residues use. With public policies that supported devices and research networks, and from the good results of the transformation processes of sugarcane corn and soybean, products which are increasingly competitive, Brazil and Argentina are leading the international markets for bioethanol and biodiesel.

Creativity, large interpersonal relationships and good levels of training distinguish the actors involved in the development of biofuel networks. This is not exclusive of the biofuel alone but is mixed in the whole transforming chain where biofuels are produced. In that sense, in the Argentinean Pampas, or in the Brazil's São Paulo state, integrate this new activity within well-established agro industrial sites reflecting the dynamism of the engineers, workers, and entrepreneurs, who are locally entrenched and capable of bouncing into a new economic cycle. They adopt new techno-productive alternatives in the co-construction process of technology exchange and regulation.

This is particularly true for the Ag Argentinean sector that has a very broad and intensive action on the public side represented by INTA and on the private side by

AAPRESID and CREA farmer's organizations.

The industrial plants responsible for the principal market share of biodiesel and bioethanol are characterized by its high scale and efficiency. Most are located beside the processing complex and ports, which gives enormous advantages from the energy and emissions results. IN the case of soybean oil, raw material comes from a radius no larger than 300 km, which also helps to increase efficiency.

In the last years, new bio refineries were developed in order to get higher value products of the biodiesel process as glycerin and sub products. This enlarges the benefits of the chain and increases the countries income. The estimation of 2014 biodiesel complex exports ranges around 2000 million dollars.

3. Logistics:

If we look at present big scale biofuel production there is a common pattern between mayor producer and used feedstock's that could be summarized in the following points:

- Derive from a well-established transforming chains (food, fiber, feed etc.)
- Produced from a coproducts of soymeal, sugarcane or corn production
- Rely on logistics and size economy savings already established.
- Production of multiple impacts in established markets generating new products, price movements, replacements, food feed patterns etc.
- Much affected by policy and administrative changes inside and outside country boundaries
- The industry were feedstock transformation occurs has great plasticity to produce or not the biofuels according to prices profit etc.

Soybean is a good example of the relative low weight of the biofuel component in the whole value chain. The common sense given the size of biodiesel market is the latter, but the growth of alternative energies based on food commodities has been mentioned as one of the determinants for both food production and price growth. A first point against this hypothesis is the size of the market as mentioned. In Argentina's case, the world leading soy biodiesel exporters since 2009, the weight of that fuel in the value of soy-based exports is marginal.

If the biofuel industry expands from a primarily sugar or starch based original materials to a cellulosic-based system, new infrastructure will need to be developed across the countries. For example the corn-based ethanol system can rely on a well-established logistics process for harvesting, transporting, and storing maize, but many of the feedstocks for the cellulosic process do not have such a robust logistics support framework. The new specific energy crops are also more susceptible to changes since there are no or little alternative markets for the product. On the other hand, while the specific details of every biomass supply chain are different, most of them include a common set of components that are shared in multipurpose crops,

Regarding food production and food security multipurpose crops have the advantage that if any climatic, disease or weed problem occur and there is a

shortage of food biofuel transformation can be stopped immediately deriving all the material into the food market with no harm for the farmers.

Biomass as a source of energy has to distinguished characteristics: low energy density (amount of energy per kilogram) and high dispersion over the territory. Both severely affects the logistics requirements and cost.

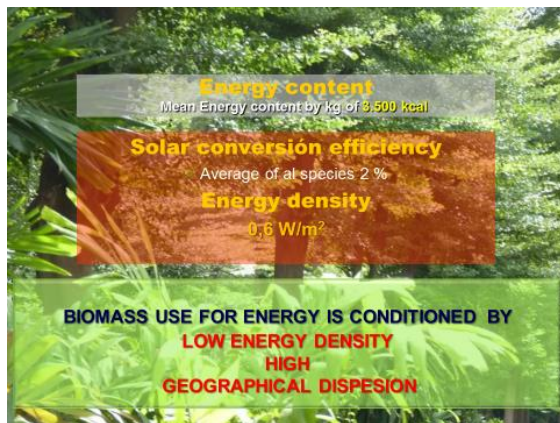


Figure 9 Biomass principal characteristics

In all cases biomass transportation can be a significant component of the overall product cost, and careful planning and coordination is required to optimize the movement of a low-density, low-cost, widely dispersed feedstock to one or more processing facilities within a given region.

Present commercial multipurpose crops have the advantage that co-products and by-products are responsible for covering significant portion of production cost and the biomass and biofuels can use this advantage toward lowering costs and energy consumption. Depending on the travel distances and the local infrastructure, it may be possible to achieve cost savings with multiple transportation modes (e.g., truck, rail), but this will depend on the specifics of the feedstock origins, processing destinations, and other local conditions, such as infrastructure availability.

All this aspects are increasingly starting to be considered specially when planning the use of specific crops or new residues were a whole logistic transportation infrastructure must be put in place and operate in an efficient manner at all time.

4. Use of residues

The use of residues is being widely promoted as a new source of biomass for biofuel production at large scale using present technologies and second or third generation ones.

There are certain concerns regarding this use without having a systemic view of agricultural systems. Rapid expansion in residual biomass use for all purposes including biofuels and bioenergy is increasing demands over ecosystem resources. This stress compromises the ability of agro ecosystems to sustain productivity in the e long term. Specific parameters and effects must be studied (fig 5)

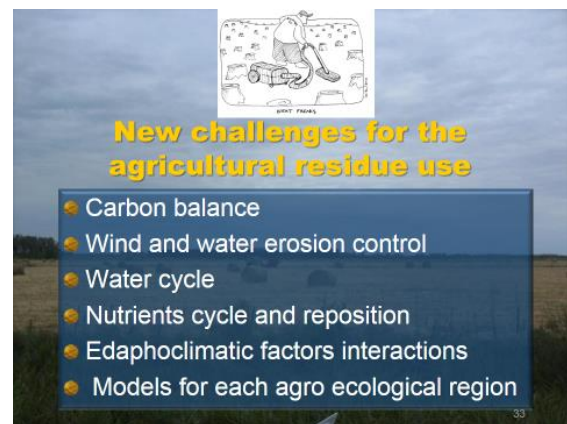


Figure 10 Challenges on residue removal

. Biogeochemical processes and ecosystem sustainability are not well known and research efforts are low in comparison with the knowledge needs. The effects of biomass removal on soil organic matter (SOM) and nutrient storage have been studied, but more information is needed on:

- How different biomass management systems interact with soil types and climate to alter greenhouse gas (GHG) emissions;
- Implications of increasing biomass removal on other biogeochemistry-related ecosystem services;
- How nutrient and C cycles of different crops respond to fluctuations in water availability
- Indicators of soil productivity that could be applied operationally in land management at a site-specific level.

Ecosystem processes-based models are valuable tools for synthesizing biogeochemical cycles and can be used to address environmental and management challenges, and to predict the long-term effects of land use and management practices on soil properties and productivity. This type of approach has been used only in certain countries and there is a great need to confront and adjust them to different soils, crops and climates in order to improve the forecast results.

Looking at food production residues could also be transformed into food resources since cellulose transformation generate food type products that are then converted into bioethanol following known technologies. Looking at normal farming practices many of those residues have been for years used for feeding animals generating high protein products as different sources of meat. The final choice of biomass end use depends on relative prices.

5. Environmental impact

Since one of the principal drivers, that promoted new legislation regarding the use of biofuels derived from positive implications of their use over greenhouse savings and environmental advantages this has been an aspect under permanent controversy and study. As a well-established method to comprehensively determine potential environmental impacts of a product system throughout its life cycle Life cycle assessment (LCA) has been broadly used. Starting with production and extraction of raw materials, including manufacturing, transport and use, until disposal of residues at end of life

(Allen D.T. and Shonnard D.R. 2002) this methodology has been broadly used to study biofuels. LCA is useful to gain an understanding of a product system, to identify the most relevant potential environmental impacts, guide improvement, and for stakeholder communication but this general scope is susceptible to the professional desition when performing it over a certain feedstock or biofuel. Interest in achieving environmental sustainability for biofuels and bioenergy and inclusion of this aspects in new legislation has provided additional momentum to study biofuel pathways using LCA. Partly in response to policy and regulatory provisions, emissions of anthropogenic (man-made) greenhouse gases (GHG) have been a common feature of biofuel LCA. Examples of this kind of requirements are the United States the Renewable Fuels Standard 2 (RFS2) wich defines a methodology to assess GHG emissions of biofuel pathways, including indirect land-use change emissions of CO₂ The LCA requirements and results are affecting production systems throughout the Pan American region for countries exporting biofuels to the U.S. or to the European Union, through the Renewable Energy Directive (EU-RED). This has already been demonstrated in the Argentinian case, where exports of soybean oil biodiesel have significantly reduced in the last couple of years due to restrictions on GHG emissions as calculated under EU-RED guidelines (Hilbert J. A. and Galligani S. 2014).

Biofuel LCA can be a very complicated analysis and, depending on study scope, may include over 100 unit processes. Aspects of LCA methodology such as choice of system boundary, source of inventory data for unit process inputs, and decisions on co-product allocation can all have a profound effect on study results (Allen D.T. and Shonnard D.R. 2002). Choice of system boundary will have a large effect on study results depending on whether only impacts directly linked to the biofuel pathway are considered (attributional LCA modeling) or whether indirect effects are considered (consequential LCA modeling) (Allen D. T. et al. 2009). Several studies concluded that the choice of method to allocate inventory data among biofuel pathway products and co-products has an overwhelming effect on LCA results (Bailis and Baka 2010; Larson 2006; Wang et al. 2011b).

6. Food security

Food security has been a hard topic on biofuels discussion in the recent years. One of the premises behind this discussion is the positive relation between food production and food security. There is no consideration here on the surplus of food already produced in the world. According to FAO, more than 1300 million tons of food are thrown each year. If we add over nutrition and obesity, we can conclude that today's production is sufficient to feed the whole world population. Food insecurity and starvation is a very complex issue not solved by an increase in crops yields. Sseveral studies challenge the perception of biofuel policies having a big impact on agricultural market balances and long-term price developments. (Baffes and Haniotis 2010) point at the fact that worldwide biofuels account only for about 1.5% of the area under gains/oilseeds. Furthermore, in analysing market

developments, both authors note that 'maize prices hardly moved during the first period of increase in US ethanol production and oilseed prices dropped when the EU increased impressively its use of biofuels. On the other hand, prices spiked while ethanol use was slowing down in the US and biodiesel use was stabilising in the EU. On the last months severe drops in commodity prices of soybean and corn have occurred although no significate in biofuel production was present. Although nowadays we have a shared market for this commodities any good harvest in the US or in Brazil Argentina and Paraguay have strong effects on Chicago prices due to a surplus in feedstocks.

The important decrease of soybean oil biodiesel from Argentina (2013/2014) did not affect international grain prices or crop surface within the country. A limited effect was produced on FOB soybean oil prices in the country due to a surplus of this product that found difficulties in developing new customers eager to buy it...

During the 2007-08 food price hike, prices of the biofuel substitutes – in particular fossil oil – were rising at the same time. These points to the fact that price rises in energy markets have a strong influence on food prices via rising input costs of farming. There is more to say about the strengthened links between energy and food markets. Baffes and Haniotis (2010) reason that there is a level at which energy prices provide a floor to agricultural prices. The World Bank (2009) reported that crude oil prices above USD50/barrel effectively dictate maize prices, based on the strong correlation between maize and crude oil prices above that price and the lack of such a correlation below that price. Baffes and Haniotis examine the energy/non-energy link, investigating among others six food commodities, and find that energy prices explain a considerable part of the commodity price variability... Next, the authors find that food commodity prices respond to energy prices by moving in a very synchronous manner, indicating that analysing food markets requires an understanding of energy markets as well. The authors also conclude that agricultural commodity market fundamentals appear, in the short term, to be playing somewhat a lesser role than in the past, tending to be overshadowed by the much stronger pull of energy prices.

The discussion has addressed the impact of biofuels on food prices, which determines the price and is therefore a central factor in the accessibility of food to poor consumers. There is also a possible relation to be explored beyond food prices in relation to overall inflation. In countries that depend heavily on imported fossil fuels, oil price rises will give upward pressure on inflation rates – as indicated by rising consumer prices index CPI. The development of a substantial domestic biofuels supply will, under such conditions, help to ease price inflation pressures. In theory, this may help to stabilize consumer purchasing power and the stability of access to food of poor consumers.

Effects on multipurpose crops price increase may have positive impacts in technology use and yield increase. In some crops as the food component is much greater than the fuel a positive effect of bioenergy production on food production could appear. The processor may well exert a strong influence on the crop choice and the scale of operation used for production. Relative production of product may vary according to different external forces as domestic and international policies (Fig 8) Private investors could favour large-scale production because

they entail lower production costs.

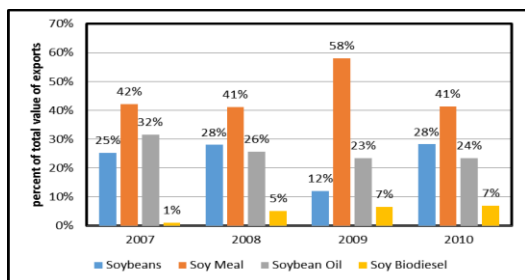


Figure 11 Different products production Source: Author's elaboration using information from INDEC/CIARA

While promoting biofuel production may have strong distributional effects, biofuel developments may contribute to an overall improved macroeconomic performance and living standards. This is because biofuels production may generate growth linkages (i.e., multiplier or spill over effects) to the rest of the economy. A good example can be found in Argentina where export tax over biofuels are distributed between the whole society. Finally, there are macroeconomic linkages through which biofuels may stimulate economy-wide growth. For example, biofuels exports can relieve foreign exchange constraints, which often limit developing countries' ability to import the investment goods needed for expand production in other sectors.

The pathways for food security impact of biofuels and biofuel policies cover price effects, income effects and macroeconomic effects. Key underlying mechanisms relate to the allocation of available land of different qualities over its possible alternative uses, and to the impact of biofuels on the energy or fuel balance in the production country. In order to evaluate the full impacts and trade-offs of biofuels production on food security, a framework is needed that captures the direct and indirect or economy-wide linkages and constraints at the macro- and microeconomic level (FAO 2010). The economic method specifically designed to capture these impact pathways is known as "computable general equilibrium" (CGE) modelling.

A particular strength of CGE modelling is the capacity it provides for a consistent analysis across related economic systems that share or compete for resources such as land and investment capital. Although this tools are well oriented there is a lack of information regarding field data on real impacts of biofuels in other markets and most models rely on old data relations that need to be confirmed. For biofuels and food security analysis, the interaction between the food and energy systems is pivotal. Global CGE analysis will allow analysis of energy and food price developments worldwide, which is important when comparing market interventions that will have implications for the global biofuel or agricultural markets. In contrast, a CGE analysis at the country level may allow a more in-depth examination of the cross-sector repercussions of demand and supply changes in biofuels, with often more attention on the distributional impact.

One of the common mistakes seen on the food – biofuel approach is that whole crop impacts are studied rather than specific products being used for biofuel production. Two examples of this is to consider corn instead of corn starch or soybean crop instead of soybean oil.

We should stress out the need of deep studies focusing on

the relation between different products end use of the main feedstock is used in the world today examples
 Sugarcane sugar bioethanol bagasse
 use for energy
 Corn DDGS DGS bioethanol
 corn cobs for energy
 Soybean soybean meal fiber pellets
 oil biodiesel

Models that predict future effects rely on previous history experience and they confront difficulties in imaging new changes as food patterns and behavior and policy movements.

There are certain considerations and precatory concerns regarding the new energy crops since they may have a much greater impact on food production capacity derived from LUC. The use of this crops is less flexible and in the case of a production loss in some of the main commodity providers there would be difficulties in implementing changes in those feedstock's conversions since most of them are not food products.

7. Alternative use of biomass:

The end use of biomass is not simple. The transformation of agricultural biomass into a bioenergy source phases many challenges in the medium and long term.

The final behavior of the different markets, population growth and food patterns will give us the answer of which role and size Ag feedstock's use will be.

Public perception has an enormous force on different countries and there are in some parts of the world several paradigms that need to be revised and corrected if they found to be mistaken.

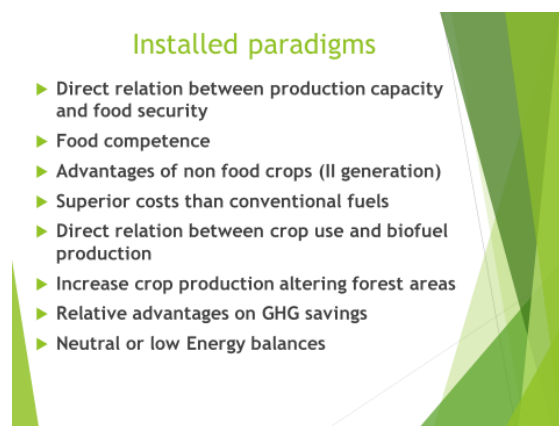


Figure 12 Biofuel paradigms in certain societies

8. Certification of biomass production:

Over the last years some of the raised concerns on biofuels production tried to be solved implementing certification processes in order to have a measurement and control over environmental and production effects

To date, there are several international programs for biomass certification, based on the products final destination and target market. These programs can be based on requirements (such as the European Directive of renewable energies 2009-28) public or private (such as the Code of Sustainable Agriculture from Unilever, the Program of agriculture certified AAPRESID, responsible Soy Programme or Programmes of Good Agricultural Practices or Agricultural Labour Practices of Phillip

Morris).



Figure 13 Complete certification system focus on farm production rather than a specific crop or product

For biomass producers the main drivers for sustainability certification include:

- Prices
- Access to markets
- Increase in the participation of markets
- Technical advice
- Personal commitment

When companies have to demonstrate the quality, which possess, they need an organism with credibility to ensure that their products or processes have the expected quality. This is precisely the aim of the certifications that have spread so widely in the business world.

In general terms, certify is to issue a document attesting that a product, person or company conform to a set of certain technical standards. (FJM González, 2004).

However, emphasis should be not only on the need for certification by their status as commercial opportunity but that there are also emphasizing the need to respond to a scenario that requires composing environmental sustainability with the commercial. (Darts, 2008)

To Hilbert (2008), the certification has direct benefits for the agricultural entrepreneur, both in technical management and business. On the one hand, the certification involves the use of records and ranked information, which together with the survey of the quality indicators, they add value to the agronomic management, making it more reliable, accurate and professional. On the other hand, as it is based on principles and general standards with local adaptation, the certificate allows generating the differentiation of the process.

In this context, standards bodies and management protocols emerge. Also Good Agricultural Practices (GAP's) begin to implement, which consist in applying the knowledge available to the sustainable use of basic natural resources for the production of agricultural products.

On the other hand, international quality requirements, in many cases can be translated as tariff barriers to trade, especially to the extent that is advanced in the specialization, differentiation and added value, thus GAP's are the "first link" in the path of the quality (FAO, 2004).

Schemes in place aim essentially to the certification of a product linked to a crop or specific feedstock and presents as serious flaw not considering farming systems that have particular characteristics linked to the rotation

of crops and interaction with specific soil and climate factors for each region.

Many results are also based on static and specific determinations and do not take into consideration the annual variations. The results achieved after three years of biofuels and co-products plants monitoring indicate the importance of a historic study that alterations in sensitive values as yields on field can significantly alter the results. (Hilbert 2014)

9. CONCLUSIONS

- Looking at the different relations between food.feed.fuel markets and the multiple implications of multipurpose and specific crops there is an urgent need to increase research over real markets.
- Recent history covering policy implementation and change, growing production of biofuels and food give plenty of field data to improve the understanding of complex relations between markets.
- Models results should be confronted with real market behavior in order improve the understanding of possible impacts of different types of crops and biofuels technologies.
- Punishments and promotions should be based on reliable data rather than future predictions since big mistakes could be made.
- New studies should be made over first and second generation biofuels with the same kind of methodology in order to study the multifactor effects of them.

10. REFERENCES

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