Science and Politics in our Diet

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THE ANIMAL FEED QUESTION IN THE SHADOW OF CONTEMPORARY FOOD CRISES

THE EUROPEAN CHALLENGE

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Eleftherios H. Drosinos

Animal Science, Issues and Professions

NOVA

Additional color graphics may be available in the e-book version of this book.

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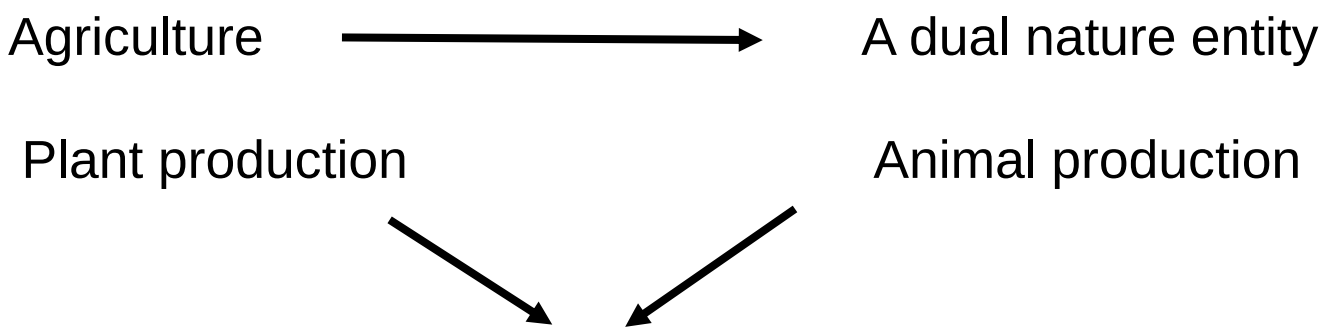
CONTENTS

People think that agriculture is tillage (ploughing of the earth). However agriculture is photosynthesis. Plants make their own body from sun's energy and C from CO_2 of the atmosphere.



Plant and Animal production both constitute one unified entity. Animals eat plants but man eats plant and animal products.

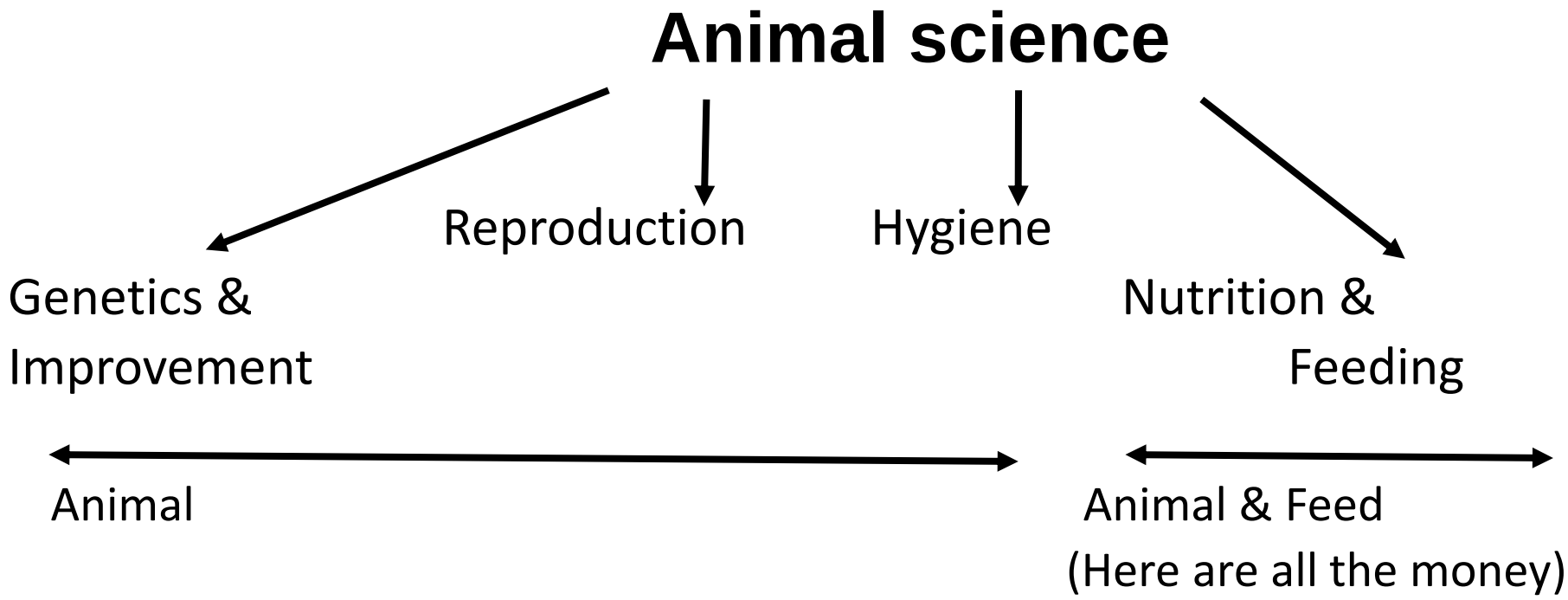
Some thoughts on the yield of animal products

Animals are considered as machines. Machines are characterized by an efficiency coefficient (P_{output} / P_{input}).

All the “art” of animal science is to achieve this coefficient to tend to 1, through the suitable management in order to minimize nutrient losses from animal’s organism (faeces, urine, heat). I intervene in genetics, nutrition, reproduction, hygiene and environment.

Food and Feed constitute communicating vessels.

Overall animal science tries to influence biological phenomena, the later expressed in financial terms.



Feeding “marries” plant and animal production

Feeding must be Balanced and Economical = Rational

In my talk I will focus on how food is polluted and tools we have to prevent it.

One sow gives birth to 10 piglets each time, 1kg each.

In 5 months all these piglets weigh 1 ton (!).

FOOD BORN DISEASES-GROUPING OF HAZARDS

Feeds do not contain only nutrients (energy, protein) but also undesirable substances

1.Biological: Microorganisms, mainly bacteria (but also yeasts, and fungi) like salmonella, campylobacter, listeria, E.Coli. Also viruses.

Case of biological war (deliberate infection by B. anthracis)

2.Chemical: pesticides, antibiotics (as anabolics), industrial materials (cleaners), naturally occurring toxins (mycotoxins), heavy metals (Cd, Pb, Hg), veterinary drugs, feed additives, dioxins, prion, fragments of foreign DNA.

3.Physical: small pieces of metals or glass.

Community Law in the sector of Agriculture

Community Law takes precedence over

National Laws of individual Member States

Types of Community legislation tools

Regulations, Directives, Decisions, Recommendations

Co-decisions between Council and European Parliament

Role of committees – Committology

Comission – Permanent Central Administration of EU

In addition, food safety is studied in a broader sense, under “Codex alimentarius” in the FAO of UN.

Food crises occurred in 90’s

BSE Scandal or Mad Cow Disease

Scandal because there were efforts for covering up the incident

responsible agents: prion, meat meal, animal species

issuing of EU legislation on controls of processed animal protein

critical issue: the analysis of meat meals (detection, identification, measurement)

the unexpected in applied biological sciences lurks

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ΠΕΡΙΟΔΙΚΟ ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΚΤΗΝΙΑΤΡΙΚΗΣ ΕΤΑΙΡΕΙΑΣ 2011, 62(1): 71-81

Review article
Ανασκόπηση

Feed Ban and BSE: the detection and identification of processed animal proteins in compound feeds

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Απαγόρευση χρήσης ζωοτροφών (Feed Ban) και BSE: ανίχνευση και ταυτοποίηση μεταποιημένης ζωικής πρωτεΐνης σε σύνθετες ζωοτροφές

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Genetically Modified Organisms (GMOs)

-applications of biotechnology: protein enrichment, fiber degradation, not charging nature with pesticides, securing nutrients and mainly water of the soil for plants.

-GM herbicide resistant plants

-Bt-plants with insecticide properties

-evaluation of GM: (a) agronomic (b) dietetic, and the latter

(1) chemical (2) laboratory (in vitro) and (3) biological (in vivo)

-even with biological trials it is unsafe to extrapolate results from one animal species to another

-critical question: the fate of “foreign” DNA of the feed in the farm animal’s organism and then its appearance in animal foods

-GMO’s is the second biggest discovery of Biotech in 20th century after DNA double helix but it has to obey rules

-one should have in mind that zero risk does not exist and James Bond’s phrase “never say never again”.

ΠΕΡΙΟΔΙΚΟ ΤΗΣ ΕΛΛΗΝΙΚΗΣ ΚΤΗΝΙΑΤΡΙΚΗΣ ΕΤΑΙΡΕΙΑΣ 2004, 55(2): 156-164
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Ανασκόπηση
Review article

Κριτική επισκόπηση των εφαρμογών της βιοτεχνολογίας στη διατροφή των ζώων

Π. Ζωϊόπουλος

The applications of biotechnology in animal feeding: A critical overview

Zoiopoulos P.

GMO’s (cont.)

-EU legislates on GMO’s at 4 levels

1. Environment, 2. Seeds, 3. Foods and 4. Feeds

In Feeds are all the money of the world since at this field belong maize, soya beans but also rape seed and cotton seed.

-**The “substantial equivalence” dilemma**

Initial EU Directive for GMO’s 90/220 for the environment. In next Regulation 258/97 for Foods EU incorporates the “substantial equivalence” principle

-In 1996 GMO’s released in trade and in 1997 dossiers for licensing

-In 1998 Zoiopoulos was sceptic publishing in New Scientist, Nature

-In 1999 eminent researcher Arpad Puztai was fired from Rowett R.I. and debate started in Nature, Science, BMJ, Lancet which marked the end of “substantial equivalence” principle

-today significant progress in the evaluation of dossiers in EFSA

Modified animal feeds must be put to the test

Sir — One way to allay public concerns and to find out more about the effect of genetically modified organisms (GMOs) would be to investigate more fully their use in animal feeds. Much money is spent on determining the safety of GMOs as human foods, but would it not be cheaper, easier and more ethical to test animal feeds first?

Large quantities of plant materials, produced by genetic engineering, are destined as raw materials for animal feed: 85 per cent of maize, for example, is used as animal feed or as agro-industrial by-products. Most soya beans are used as protein-rich meal for animals; almost two-thirds of unginned cotton, and most rape seeds and tomato pomace are used as or in feedstuffs. These crops are among the first GMOs submitted for licensing, and will end up in the human food chain. It is obviously more convenient for research to be done on animal feeds rather than on human food.

The central concept in animal nutrition is 'nutritive value' which is influenced by the presence of undesirable substances, including the potential transfer of harmful factors introduced into the DNA of plants during their conversion into GMOs. Companies base their safety criteria on the principle of 'substantial equivalence' between the engineered and the corresponding conventional plants. To measure this, they generally use chemical, *in vitro* and *in vivo* analyses. Chemical methods compare the sequence of amino acids of the introduced protein with those of known allergenics; *in vivo* methods use small laboratory animals for acute oral toxicity tests of relatively short duration. Although these methods are useful tools, one cannot safely extrapolate between species. Biology is often unpredictable: for example the antibiotic cross-resistance to ampicillin in humans. In GMO plants resistant to herbicides, a complex is created between the 'factor introduced for resistance' and the 'herbicide'. The possibility cannot be ruled out that this complex could be broken down during digestion in the gut or during fermentation, resulting in release of the herbicide.

In addition to the need for labelling and an increased role for legislation and monitoring (guidelines), there is a strong need for research in 'evaluation'. Companies have to demonstrate that GMOs are both effective and non-toxic. Risk assessments are essential to ensure the latter. Study of feeds and farm-animal nutrition for at least one reproductive cycle is also needed. If the health of the animals is not harmed as a result of these tests (which should be done in government-funded institutions), the public is more likely to be reassured. Companies would be in a better position to convince the public of the safety of GMOs.

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Keep it clean

Biotech companies should pay for independent research, argues Pantelis Elia Zoiopoulos

THE philosophers of Ancient Greece were fond of the word *spoudi*. Pronounced "spoothi", with the "i" of "pity", it has two meanings. One is "haste", the other "thorough study". Today the word is still sometimes used in formal written Greek. And when it comes to the troubled issue of genetically modified organisms (GMOs), it's the relative proportion of haste to thorough study that causes the trouble.

Many people feel that there has generally been too much haste—particularly in risk assessment. It is hard to be convinced that the safety of new products can be predicted by chemical, in-vitro and in-vivo studies on rats. Huge sums of money have been spent—worldwide, in 1996, something like $8 billion in research on GMOs. The main players have been the giant agrochemical companies, and they see it as wholly reasonable that they should get a return on their investments. Some companies have had a long wait to gain approval for their products and find a way through a labyrinth of bureaucracy in various countries.

Work on feeds and the nutrition of farm animals could provide a good way of testing the safety of a wide range of genetically modified crops and other products. It takes a mere eight weeks to fatten up broilers, and about six months for pigs to reach bacon weight. Since the reproductive cycle of farm animals is short, it would make sense to study more cycles in search of any cumulative adverse affects in the course of these animals' reproductive lives. This would, however, be subject to the availability of GMO feeds which now make up only a small part of the raw materials used for animal feed. Such work should be financed by companies but carried out independently at universities, state institutes or other authorised research organisations. The safety of the GMO feeds could then be judged by the effects on the animals' health and the quality of their products. The important thing is that the results would be obtained independently of the GMO industry.

The public, who in the end are the consumers of these products, need to be reassured that all relevant test results are independent. Perhaps biotechnology companies should allocate more of the money they spend persuading farmers of the efficacy of their GMO products to educating the public about the production of GMOs and their safety. The public would become familiar with an issue which many scientists see as a great achievement of contemporary agricultural science.

Many of us in the farming business welcome that achievement, but we reserve the right to be sceptical. We don't reject it, but we do recognise that it is controversial and that the public has a right to more information on it.

Generalisations about the safety of new products, from the producers' point of view, can seem superficial. The subject needs to be dissected, and concealed and unexpected answers brought to the surface. "The perfect look," wrote Nikos Kazantzakis, the author of *Zorba the Greek*, "is to be able to see simultaneously, at a glance, the exquisite mask and the ugly face underneath."

When it comes to GMOs, many of us take the line that Caesar's Wife should not only be honest but also be seen to be honest. The production and evaluation of GMOs is a multidisciplinary one involving many specialisations—so to seize the GMO bull by the horns we need the cooperation of lots of specialists.

Some may insist that everything technologically feasible will eventually be done. To them I say: "Let it be done. But what we are in need of here are not sanctimonious and faithful disciples but rather Doubting Thomases!" □

G. Lepp/Corbis

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Review article
Ανασκόπηση

'Foreign' dietary DNA in animals and safety evaluation of genetically modified feeds

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The Dioxin episode

- -PCCD, PCDF (products of burning), PCBs (commercial product, clauphen). Many incidents in the past like Seveso Italy
- -A case with citrus pulp (Brazil) in 1999, (the era of not transparency), problems with the analytical method. First time MPLs 500ppt ($Kgx10^{-12}$), pg
- -Cause: the wrong way of collecting wastes, in this case fried oils and fats were mixed with liquids of transformers
- -Problem in disposal of wastes in big industrial countries with small surface (Belgium, Netherlands)

Community measures for Dioxins

1.Change of the “negative” list of raw materials (fried oils)

2.Adding MPLs in the directive for undesirable substances in feeds

3.Study to establish background levels for dioxins. Everybody was stunned. The otherwise considered as best fishmeals and oils in countries round the Baltic Sea were found to be the worst. Fishmeals are top in protein content and fish oils contain high level of ω-3 essential fatty acids. But dioxins are fat soluble. So EU had to think over their banning.

12 years after new episode in the stricter country in controls namely Germany due to dioxin pollution of rocks for binders

Eradication of the problem of dioxins should focus on environmental protection (filters in industry) but this is mainly a political issue

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PEER REVIEWED

Feed Undesirable Substances As Food Contaminants

Part 2: Dioxins

Further Undesirable Substances in feeds

-Heavy metals (Pb, Hg, Cd)

-Radioactive isotopes (Cs-137) Chernobyl accident in 1986

-Mycotoxins (aflatoxin, ochratoxin, zearalenon)

-Aflatoxin : **A**spergillus **fla**vus **toxin**

-Aflatoxin B_1: confirmed carcinogen (passes to milk)

-Are measured in ppb, first found with duck chicken fed peanuts (60 years ago)

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Feed undesirable substances as food contaminants Part 1: Mycotoxins

Feed additives

-Reasonable ones like vitamins, aminoacids, enzymes, trace elements but also preservatives, anti-oxidants, colorants

-Hormones (growth hormone-somatotropin, β-agonists)

-Antibiotics as anabolics (again all the money of the world)

not used for preventing or curing diseases but increasing the efficiency of feed utilization

-Sweden which had banned antibiotics as anabolics when joining the EU in 1995 was given a 2 year permission

-However companies lost due to cross-resistance phenomenon and from 1-1-2006 EU banned their use as anabolics. USA, Canada, Australia still use them

Control tools for feed circulation

General Food Law: Regulation 178/2002, which lifts **Feed** at the same level of importance with **Food**.

This law among others introduces:

-transparency, excellence, role of the man responsible, traceability, inspections, EFSA, RASFF

Also, proceeds with a recasting of Feed Legislation (marketing, controls, auditing, hygiene) and thoroughly reconsidering additive legislation.

ROLE OF **EFSA: EUROPEAN FOOD SAFETY AUTHORITY**

Role of EFSA: the scientific evaluation of dossiers

This is scientific but not biding for member states (recommendation)

The political management remains in the hands of the Commission

with the participation of Member-States of course

Risk analysis (3 parts): assessment, management and communication.

Application of HACCP (Hazard Analysis and Critical Control Points)

Animal production (as part of agriculture) aims at yielding animal products: more, cheaper and better, **but** to combine all these 3 together is a rather difficult task, since you enter into a risky area i.e. Food Crises

The example of EU organic animal production legislation

-Initially, Regulation 2092/91 for plant production

-After that, Regulation 1804/99 for animal production without chemicals

-It covers housing, feeding, wastes, hygiene

-Problems: plethora of derogations, i.e. many things are prohibited but with derogations they are allowed from the back door

-The date of derogation expiring is not always kept (extension)

-With newer biological Regulations simply the term “derogation” changes to “exception”. Competent authority is critical

-Strong presence of the geographical dimension

-We should have always in mind the “values” of science while defining standards or defining what is meant by “green”

Examples of derogations or exceptions in EU organic animal production legislation

Animals can eat a limited amount of non organic feed if…

-Piglet castration can take place (what about welfare?)

-Providing some synthetic vitamins in the feed

-Use of sodium nitrate in sausages

-Chickens kept indoors beyond expiring date (case of influenza)

-Allows use of GM substances (vaccines)

-Use of chemical drugs instead of homeopathic once

-There are (15!) derogations in organic bee keeping law

Examples of ambiguities

- Use of words not leading to quantification such as:
- Preferably, predominantly, non systematically, or non regularly (for horn or beak mutilation), to a minimum, limited in time, where appropriate.
- **Tethering** of animals is allowed for a limited period (welfare?) or is continued for **small** farms without defining what is **small farm**.

(ii) without having recourse to them, it would be impossible to produce or preserve the food or to fulfil given dietary requirements provided for on the basis of the Community legislation.

In addition, the products and substances referred to in Article 19(2)(b) are to be found in nature and may have undergone only mechanical, physical, biological, enzymatic or microbial processes, except where such products and substances from such sources are not available in sufficient quantities or qualities on the market.

2. The Commission shall, in accordance with the procedure referred to in Article 37(2), decide on the authorisation of the products and substances and their inclusion in the restricted list referred to in paragraph 1 of this Article and lay down specific conditions and limits for their use, and, if necessary, on the withdrawal of products.

Where a Member State considers that a product or substance should be added to, or withdrawn from the list referred to in paragraph 1, or that the specifications of use mentioned in this paragraph should be amended, the Member State shall ensure that a dossier giving the reasons for the inclusion, withdrawal or amendments is sent officially to the Commission and to the Member States.

Requests for amendment or withdrawal, as well as decisions thereon, shall be published.

Products and substances used before adoption of this Regulation and falling under Article 19(2)(b) and (c) may continue to be used after the said adoption. The Commission may, in any case, withdraw such products or substances in accordance with Article 37(2).

CHAPTER 5

Flexibility

Article 22

Exceptional production rules

1. The Commission may, in accordance with the procedure referred to in Article 37(2) and the conditions set out in paragraph 2 of this Article and subject to the objectives and principles laid down in Title II, provide for the granting of exceptions from the production rules laid down in Chapters 1 to 4.

2. Exceptions as referred to in paragraph 1 shall be kept to a minimum and, where appropriate, limited in time and may only be provided for in the following cases:

(a) where they are necessary in order to ensure that organic production can be initiated or maintained on holdings confronted with climatic, geographical or structural constraints;

(b) where it is necessary in order to ensure access to feed, seed and vegetative propagating material, live animals and other farm inputs, where such inputs are not available on the market in organic form;

(c) where it is necessary in order to ensure access to ingredients of agricultural origin, where such ingredients are not available on the market in organic form;

(d) where they are necessary in order to solve specific problems related to the management of organic livestock;

(e) where they are necessary with regard to the use of specific products and substances in the processing referred to in Article 19(2)(b) in order to ensure production of well established food products in organic form;

(f) where temporary measures are necessary in order to allow organic production to continue or recommence in the case of catastrophic circumstances;

(g) where it is necessary to use food additives and other substances as set out in Article 19(2)(b) or feed additives and other substances as set out in Article 16(1)(d) and such substances are not available on the market other than produced by GMOs;

(h) where the use of food additives and other substances as set out in Article 19(2)(b) or feed additives as set out in Article 16(1)(d) is required on the basis of Community law or national law.

3. The Commission may in accordance with the procedure referred to in Article 37(2) lay down specific conditions for the application of exceptions provided for under paragraph 1.

TITLE IV

LABELLING

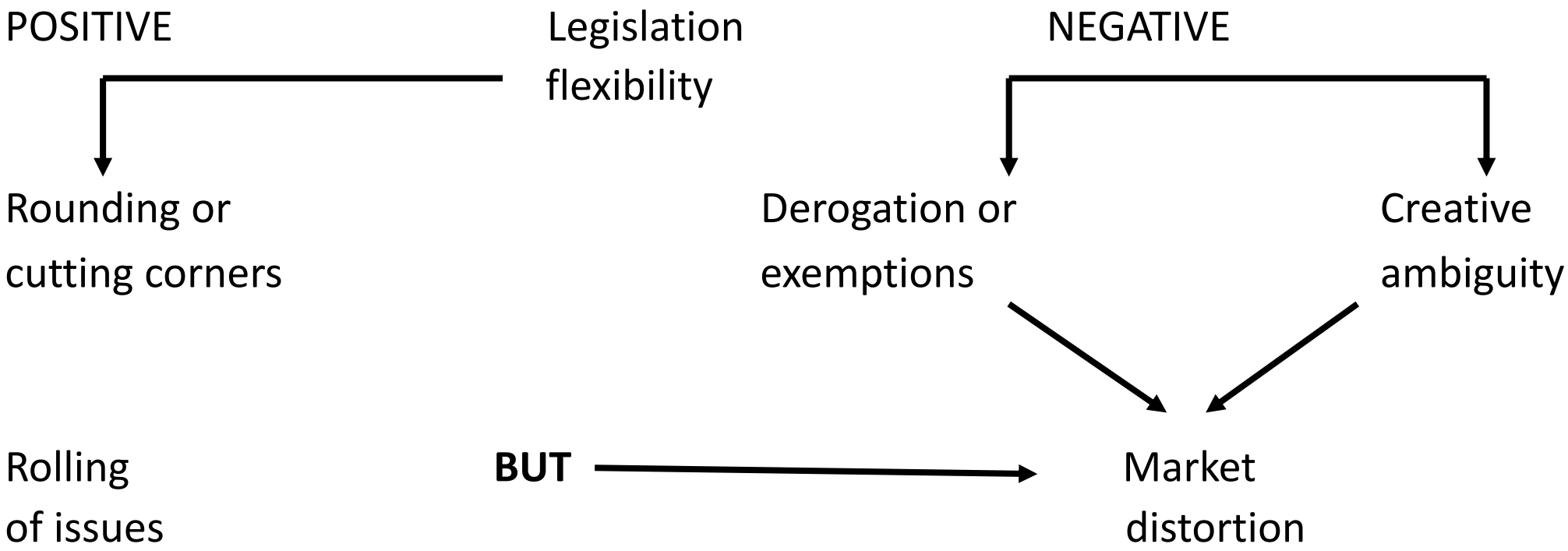
Article 23

Use of terms referring to organic production

1. For the purposes of this Regulation a product shall be regarded as bearing terms referring to the organic production method where, in the labelling, advertising material or commercial documents, such a product, its ingredients or feed materials are described in terms suggesting to the purchaser that the product, its ingredients or feed materials have been obtained in accordance with the rules laid down in this Regulation. In particular, the terms listed in the Annex, their derivatives or diminutives, such as 'bio' and 'eco', alone or combined, may be used throughout the Community and in any Community language for the labelling and advertising of products which satisfy the requirements set out under or pursuant to this Regulation.

In the labelling and advertising of live or unprocessed agricultural products terms referring to the organic production method may be used only where, in addition, all the ingredients of that product have also been produced in accordance with the requirements laid down in this Regulation.

Issuing of legislation in the Community… "kitchen"



Wording is important: from «should» (optional) to «shall» (obligatory).
Now I will show you the most mature of my works.
You can find my CV in https://users.uoi.gr/pzoiopul

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Review

Critical Overview on Organic Legislation for Animal Production: Towards Conventionalization of the System?

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Abstract: Adoption of organic animal production legislation, particularly at the Community level, is done with a spirit of compromise and an attempt to reach consensus. In this sense, legal tools are used to solve technical problems so that an appreciable number of derogations (exceptions) are introduced. These may allow the use of certain feed additives, tethered

Conclusions

-Problem is complex and difficult to solve since it is:

biological, technical, economical, social, legal and bio-ethical, political (**science vs politics**)

-What I tried to do in my talk was that in food production we should be aware of “the dark side of the moon” as well.

-The question to pose, still pending, is: What should the European citizen do to prevent all the above adverse events?

-The controls issue of general food law and the application of inspections in EU territory are very crucial and show that they work, so that I think we are moving towards the right direction.

-Within EU a struggle takes place between two powers i.e. food safety through feed hygiene and functioning of the market in financial terms. The direction of the outcome of this struggle depends on the balance of powers at a given time.

I personally see the glass as “half full”. I am rather optimistic.

Thanks for your attention.