Biologization as an opportunity for a sustainable development of agriculture

EkosystEM – Nature's Heritage Association

Roman Izdebski, Sławomir Gacka, Stanisław Kolbusz

XIX IFMA Congress, July 21-26, Warsaw, Poland

Table of contents

Warnings from the scientific community (1)

- Millennium Ecosystem Assessment, 2005: safety concerns for biodiversity have been exceeded tenfold, 60% of the services provided by ecosystems have been destroyed or are being used unsustainably [1]
- IAASTD, 2009: the current agricultural model is not able to meet the food needs of a growing human population;[2] there is a need for fundamental changes in policies and practices that will stop this trend of continued loss of biodiversity, including loss of soil biodiversity
- Humanity can not survive without natural systems sustaining life. Since 2007, the annual demand of global economy for natual goods has exceeded Earth's capacity by half [3]
- The increase in use of pesticides does not prevent the loss of crops; in 1955-2000 in the United States, despite more than a tenfold increase in the use of pesticides, crop losses due to insects increased from 7% to 13% ! [4]

[X] Source number at the last slide

Warnings from the scientific community (2)

- Decrease in nutritional value of foods [5-6]
- Biodiversity losses cost the EU **50 billion Euros per year** or 545 billion Euros in 2000-2010, which equals to 1% of GDP of EU [7]
- Natural agritechnologies consume less energy and water [8-10], hence the need for radical change in agricultural policies favoring less energy consuming food production methods
- Preferring non-chemical methods for integrated plant protection [11]
- Traditional methods of calculating economic growth do not include natural resources degradation costs [1, 4, 12]

World of politics – offers and declares:
conventions, strategies, declarations, laws

- Millennium Ecosystem Assessment signed by the governments [1]
- European Union promotes sustainable development:

  Treaty of Lisbon, Article 3 [13], Europe 2020 Strategy [14], new objectives of CAP [15]
- European Commission's initiative:
- "Thematic strategy for soil protection" [16] and European Parliament report thereon [17] have not been approved by the governments of five countries - France, Germany, United Kingdom, Austria and the Netherlands
- Directive 2009/128/EC on the Community Action for the Sustainable Use of Pesticides [18] preferes non-chemical methods in integrated plant protection and allows Members States discretion in choosing their methods
- Despite the implementation of policies on EU level, devastation, erosion, and soil degradation are increasing whilst treatments to restore fertility and soil productivity do not bring expected results [19]

Biologization of agriculture: offer for consumers, i.e. all of us

Association provides biologization as a solution for sustainable agricultural development, as it is better to treat the causes than tackling the effects!

Biologization of Agriculture: [20]

"Using biological yield-enhancing factors in crop cultivation such as compost, manure, bio-preparations, rational crop rotation, phyto-amelioration, high-yielding, pest-resistant varieties, biological nitrogen retention of legumes, in order to produce healthier foods and protect the environment"

The fundamental role of soil in development of civilization (1)

- The basis of the essential functions of life on Earth; Around 1500, Leonardo da Vinci stated, *"We know more about the movement of celestial bodies than about the soil underfoot."* [21]
- About 25% of all earthly species live in the soil. In 1 gram of soil there is as much as 1 billion bacterias and about 10 thousand of various bacterial genomes; bacterial population can double in 20 minutes! The scientific community has indentified **only about 1%** of the microorganisms living in soil [22] – role of penicillin.
- More fertile soil requires less fertilizers and pesticides thus the CO2 emmissions are lower [23].
- Fertile soil – natural plant protection against diseases and pests

The fundamental role of soil in development of civilization (2)

According to UNEP [24] every year we lose up to 50,000 km² of acreage due to soil degradation, mainly soil erosion. Every year, our planet loses as much as 24 billion tons of humus.

- The fertile soil lost within the last 20 years could cover all the arable land in the United States.

- The loss of productivity only because of desertification costs the world more than $40 billion per year! [24]; 39 € billion soil degradation in the EU-25 [7]

- In order to compensate for the loss of one hectare of fertile land in Europe cultivation on an area of ten times the size should be started in another region in the world [25]

Probiotechnology for sustaining the soil and cultivation of healthy plants

ProBiotechnologia™ (Greek *pro bios* – life): the method of manufacturing and applying natural microbial products, which are based on compositions of probiotic microorganisms and their metabolites and other natural products and components such as minerals, plant extracts ferments, natual and organic fertilizers, whose purpose is to have a beneficial effect in the ecosystems for human health and the health of the environment [26]

ProBio Emy™ produced in natural fermentation process from SCD Mother Cultures, i.e. selected and properly composed of bacterial and yeast cultures compositions, enriched with minerals and medicinal plants extracts with structured water and natural growing media, whose purpose is to have a beneficial effect on the health of plants, animals, humans and the environment.

According to FAO/WHO definition, probiotics are "living microorganisms which, when applied in sufficient quantity, have a positive impact on the health of the host".

Biologization effects in Agricultural Experiment Station in Chylice (1)

Total cultivated area: 440 ha, including potatoes for chips: 200-220 ha, seed corn: 220-240 ha

Potato yields increased from 7 tons/ ha in 2001 to 35 tons/ ha in 2009 on soils predominantly belonging to the fifth and sixth class of soil valuation, i.e. very low quality

Soil's organic matter content increased by 0.3 - 0.8% (catch crops, fermented potato waste, ProBio Emy)

Although the main crops grown on the farm are corn and potatoes, both burdening plants for the soil, its **levels of phosphorus and potassium availability increased (Table 1)**

Biologization effects in Agricultural Experiment Station in Chylice (2)

Table 1. Increase of nutrient availability after using probiotechnology in the cultivations of the Agricultural Experiment Station in Chylice in 2011 compared to 2006

Source: Roman Izdebski calculation using data provided by Jan Marczakiewicz, M.Eng. manager of the Agricultural Experiment Station in Chylice

Year	Content of nutrient availability in mg/100 g soil (average vaules)			
	ph in KCl	Phosphorus - P_2O_5	Potassium - K_2O	Magnesium - Mg
2011 (99 analysis)	6,10	15,9	13,2	5,3
2006 (95 analysis)	6,17	11,7	7,5	5,4
2011/2006 in %	98,8	**136,5**	**177,0**	98,7

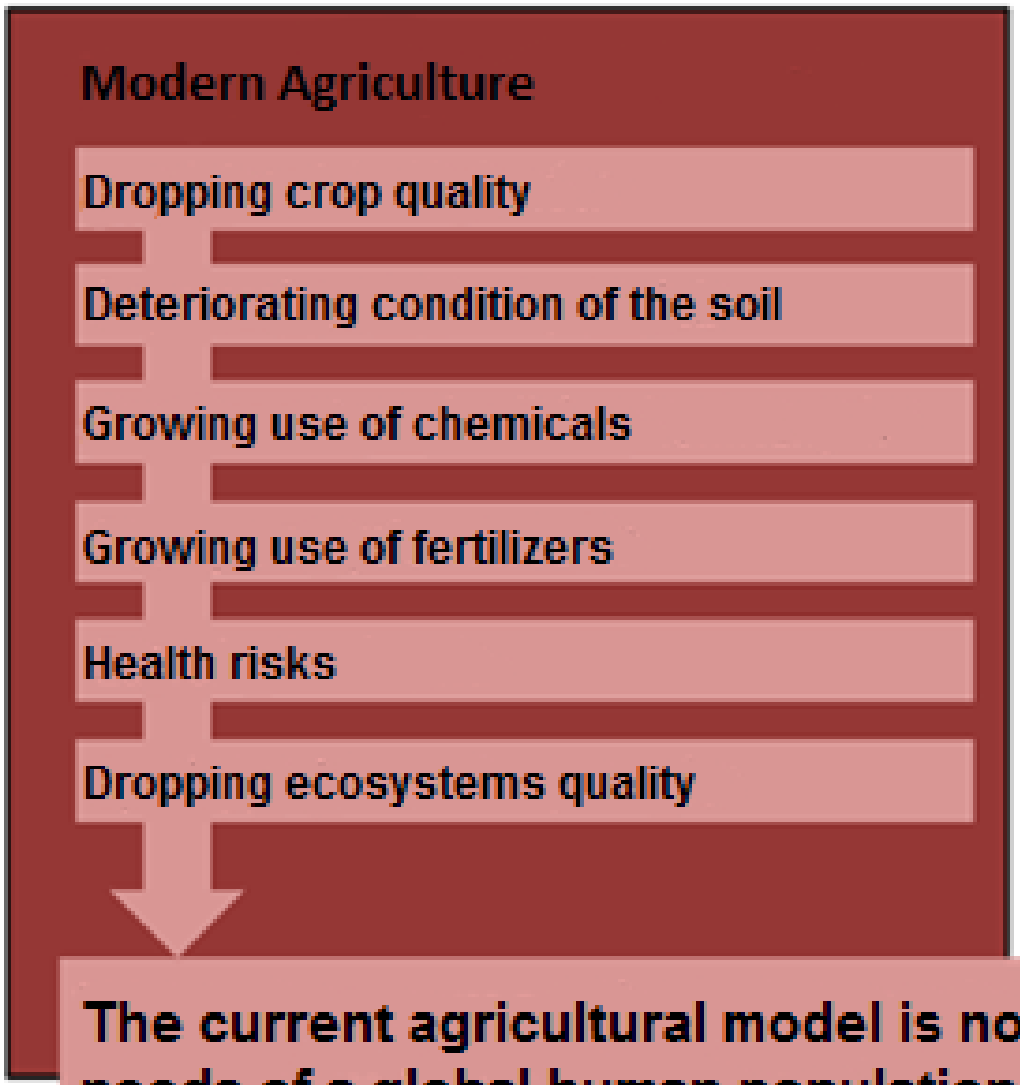
Biologization improves the quality of crops and competitiveness of farms

Cabbage cultivation - 42 ha organic farm
Grażyna i Mirosław Serafinowicz; 23% (59%) cost's reduction

Conventional cultivation based on chemical methods				Biologization with ProBio Emy			
Name	Quantity	Unit price	Value	Name	Quantity	Unit price	Value
Potassium sulphate	4 quintal	280,00 PLN	1 120,00 PLN	Potassium sulphate	1 quintal	280,00 PLN	280,00 PLN
Superphosphate 40%	2,5 quintal	180,00 PLN	450,00 PLN	Minced phosphorite	3 quintal	110,00 PLN	330,00 PLN
Nitrogenous	5 quintal	160,00 PLN	800,00 PLN	Compost *	30 tons	50,00 PLN	1 500,00 PLN
Fungicides	6 treatments	200,00 PLN	1 200,00 PLN	ProBio Emy	100 litres	7,00 PLN	700,00 PLN
Zoocides	6 treatments	50,00 PLN	300,00 PLN	Ema5	10 litres	40,00 PLN	400,00 PLN
Microelements			300,00 PLN				
Total: 4 170,00 PLN				Total: 3 210,00 PLN *Total with own compost used : 1 710,00 PLN			

Yield 50 - 60 tons/ha Yield at least 60tons/ha

Biologisation and modern agriculture



The growing need for intruducing better ways of farming, such as **biologization of agriculture**

The report commissioned by the United Nations and the World Bank from the International Assessment of Agricultural Knowledge, Science and Technology for Development, on the preparation of which participated more than 400 scientists from around the world

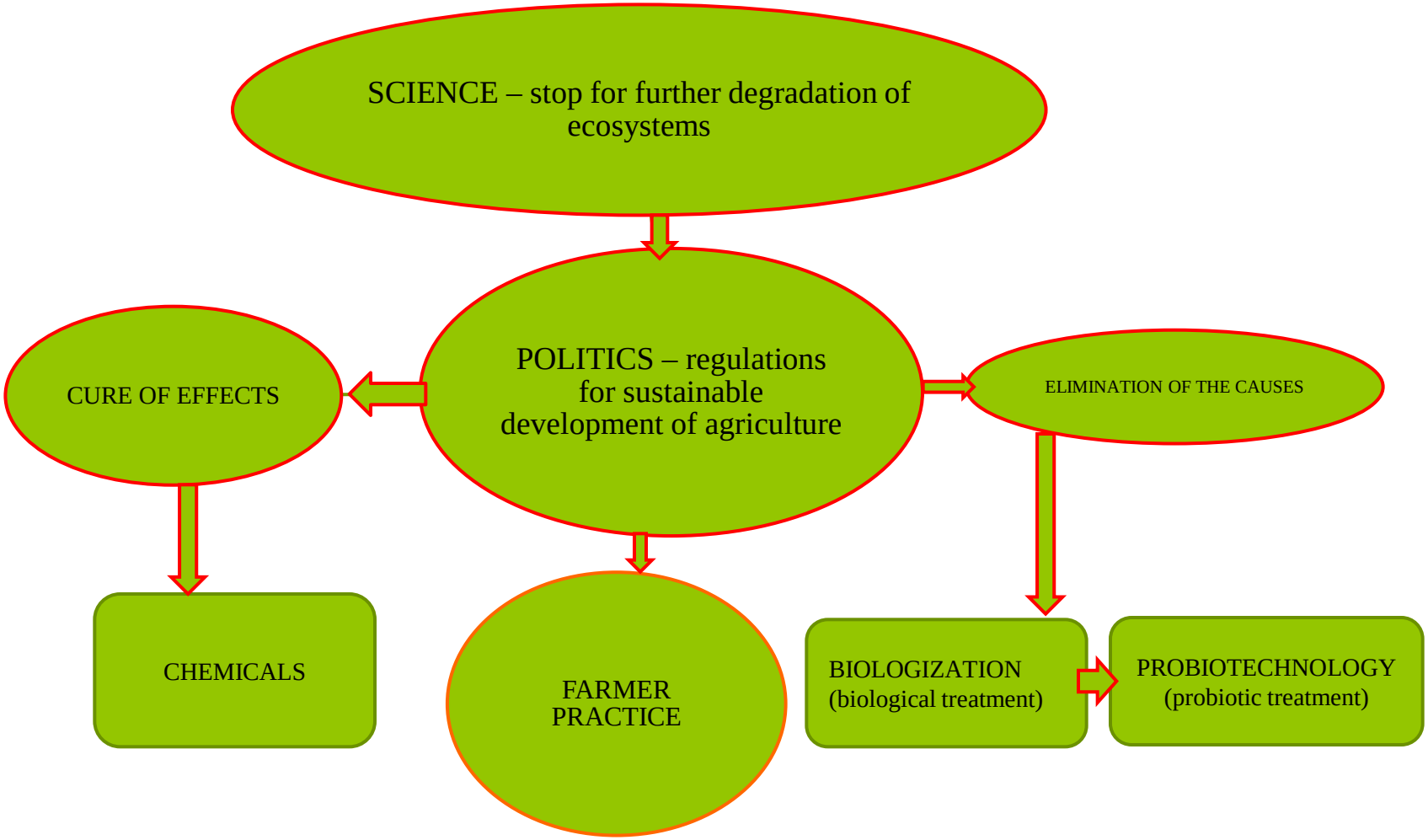
IAASTD, 2009. Agriculture at a crossroads. IAASTD Synthesis report.

The current agricultural model is not able to meet the food needs of a global human population

Sources

1. Millennium Ecosystem Assessment. UN, 2005.
2. Agriculture at a crossroads. IAASTD Synthesis report.
3. Brown Lester R., 2012. Full, planet. Empty Plates: The New Geopolitics of Food Scarcity.
4. Pimentel, D. 2005. Environmental and economic costs of the application of pesticides primarily in the United States. Environment, Development and Sustainability, 7: 229-252.
5. Burns Sarah „ Nutritional value of fruits, veggies is dwindling", 7.09.2010.
6. Gajewska D. and Myszkowska-Ryciak J. Lectures for the Warsaw University of the Life Sciences within the theme "Diet prophylaxis of diet-conditional diseases".
7. "Land degradation and desertification". European Parliament study IP/A/ENVI/ST/2008-23, March 2009.
8. Brown Lester R, 2011. World on the Edge: How to Prevent Environmental and Economic Collapse (New York: W.W. Norton & Company, 2011).
9. Erb Karl-Heinz et all, 2009. Eating the planet: Feeding and fuelling the world sustainably, fairly and humanely a scoping study.
10. Effects of industrial agricultural on global warming and the potential of small-scale agro-ecological techniques to reverse those effects". A report to Via Campensina by The New World And Ecology Group. November 20, 2009.
11. Gomiero, Tiziano , Pimentel, David and Paoletti, Maurizio G., 2011. "Environmental Impact of Different Agricultural Management Practices: Conventional vs. Organic Agriculture". Critical Reviews in Plant Sciences, 30: 1, 95— 124
12. Nikolinka G. Koleva, Uwe A. Shneider. The impact of climate change on the external cost of pesticide applications in US agriculture". International Journal of Agricultural Sustainability, Vol. 7, issue 3, 2009.
13. Consolidated versions of the Treaty on European Union and the Treaty on the Functioning of the European Union. OJ C.83, Official Journal of the European Union Volume 53, 30 March 2010.
14. Communication from the Commission. EUROPE 2020. A strategy for smart, sustainable and inclusive growth. Brussels, 3.3.2010. COM(2010) 2020 final.
15. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. The CAP towards 2020: meeting the food, natural resources and territorial challenges of the future, COM(2010)672 final, 18.11.2010.
16. The Soil Thematic Strategy, (COM(2006)231 of 22.09.2006.
17. The report of the European Parliament on the proposal for a directive of the European Parliament and of the Council establishing a framework for the protection of soil and amending Directive 2004/35/EC (COM(2006)0232– C6-0307/2006 of 24.10.2007.
18. Directive establishing a framework for Community action to achieve the sustainable use of pesticides (2009/128/EC).
19. European Parliament resolution of November 13, 2007 on thematic strategy on soil protection (2006/2293(INI)).
20. Lesław Zimny. 2003. Environmental and agricultural encyclopedia. Wydawnictwo Akademii Rolniczej, Wroclaw.
21. Skubała Piotr. Are biodiversity and environmental services in the soil at risk?
22. Soil biodiversity: functions, threats and tools for policy makers. European Commission - DG ENV, February 2010.
23. Gomiero T., Paoletti M.G. & Pimentel D., 2008. About energy and environment issues in organic and conventional agriculture..
24. UNEP, 2007. Global Environment Outlook GEO-4 environment for development.
25. Gardi C. et all., 2011. Soil Sealing: "Land Take and Food Security: Impact assessment of land take in the production of the agricultural sector in Europe", JRC, 2011 r.
26. Definition adopted by EkosystEM – Nature's Heritage Association in "Uzdrowić Ziemię" album. Warsaw 2012

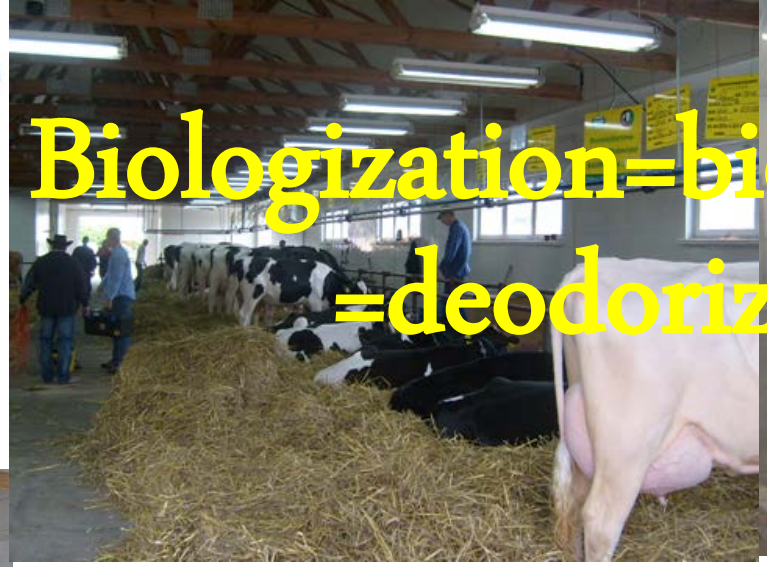
General scheme for biologization



Deodorization Sielinko

- Cowshed sized 12m x 34m
- Height 3m
- Height at the roof ridge 6m
- Treatment of bedding (15) with 10% solution of Bio Klean Soft

Biologization=bioassecuration =deodorization



Deodorization of MTP (Poznań International Fair)

- Area of the building - 2478,5 m2
- Cubature of the building - 63 000 m3
- Time spent by the animals (cattle) in the building - 5 days (1 day prior to the show and 4 show days)
- Additionally, the building has a mezzanine floor of about 2500 m2, height of the building: 2,90m (underneath the mezzanine floor) up to 17,60m at the peak of the roof arc

Deodorization of MTP (Poznań International Fair)

- Total area of the building - 8772 m2, including the "new" part of the building, where fur animals will be on display, of 2864 m2
- Total cubature - 126 500 m2, height of the previous and the new part of the building is similar (new part is 1m higher)