УДК 338.43

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AGRICULTURE AS A STRATEGIC ASSET CLASS: ETHICS, ECOLOGY AND ECONOMICS

This paper strives for reviewing the increasing importance of agriculture as an asset class in a multi-crisis framework and reflects on the required policies and the ethics of an urgently needed„non-exponential growth culture".

The turmoil on capital and commodity markets in 2007/2008 appeared to be a reminder for the unavoidability of„change" and a wake up call to sustain the very base of mankind. It coincided with the end of the„super bubble"[1] of the US economy, caused by the over-leverage in derivative and credit markets, based on a self-deception about the limits of sustainable economic growth and an„over-confidence bias"[2] about the predictability of future events.

The increased volatility in commodities, stocks, bonds and currencies in the last two years could pave the way for deeper understanding of the very nature of man and how we interact with our ecological environment in a reflexive way. This became very obvious when financial market bubbles burst, but has much more impact concerning the set of ecological changes we created without understanding their emergence sufficiently. This refers first of all to our cognitive base, which is not sufficient to recognize more than the„mesocosmos"[3]. To explain decision making under risk„prospect

[1] Soros, George (2008): Statement of George Soros before the U.S. house of representatives committee on oversight and government reform, November 13, 2008, available at: http://oversight.house.gov/documents/20081113120114.pdf

[2] Hindsight bias generates overconfidence: If everyone thinks that one can predict the past, one is likely to be far too sure about predicting the future. After the market crashes, we tend to believe that we knew that it would crash before the event. Incorrect or inaccurate predictions tend not to be remembered, reinforcing the idea in one's mind that ones predictive ability is better than it is in fact.

[3] Vollmer, G. (2000): Können wir den sozialen Mesokosmos verlassen? in: Mittelstraß, J. (Ed.): Die Zukunft des Wissens. Berlin, pp.340-352

theory"[4] offers a consistent description of the relationship between environmental contingency (gains and losses) and individual risk propensity. Shortly, those faced with gains tend to be risk-averse, while those confronting losses become much more risk-seeking.

A major systematic source of misperception of real risk is the inability of average human beings to assess,,exponential growth"[5]. On financial markets, the compound interest effect inhibits the features of exponential growth. In real world, due to long time frames and sufficient buffer capacity in most natural resources, the gain in momentum of human-induced changes has long time not threatened the sustainability of resources and left mankind with a time delay between own action and reaction of nature. But as buffer capacities of nature vanish and global human population explodes while eradicating other species at a horrific rate, the time for self-deception has come to an end. At the same time, mankind has to react to the new circumstances, where capacities and resources are distributed more uneven and limits are reached quickly leaving much less time for correcting false strategies and policies.

Population as a function of food availability

To describe population dynamics as a result of reproduction and density-dependent mortality, a logistic equitation can be used as follows:

(1) $x_{n+1} = rx_n\ (1 - x_n)$

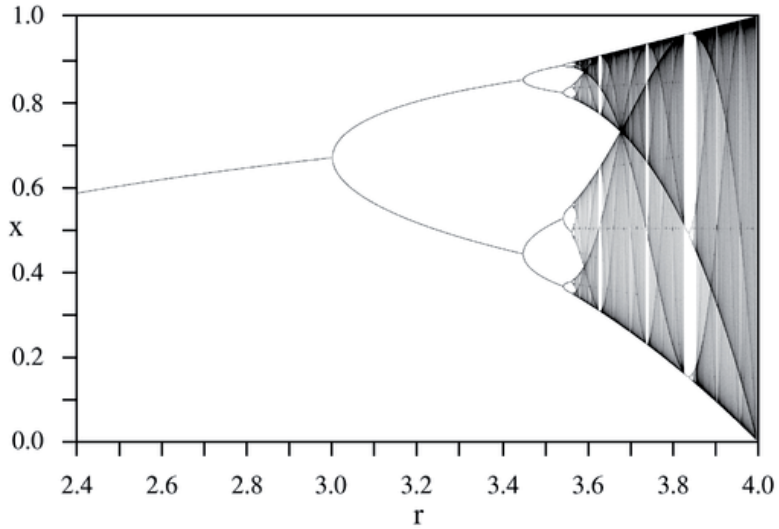
Where x_n is a number between zero and one, and represents the population at year n, and hence x_0 represents the initial population (at year 0). Term r is a positive number, and represents a combined rate for reproduction and density-dependent mortality.

This nonlinear difference equation captures two developments: Firstly, a reproduction where the population will increase at a rate proportional to the current population when the population size is small. Secondly, density-dependent mortality, where the growth rate will decrease at a rate proportional to the value obtained by taking the theoretical "carrying capacity" of the environment less the current population.

The following bifurcation diagram summarizes the behaviour of the equitation varying factor r:

[4] See with further references: http://prospect-theory.behaviouralfinance.net

[5] See Hubbert, M.K. (1976):Exponential Growth as a Transient Phenomenon in Human History, The Fragile Earth: Toward Strategies for Survival, San Francisco, available at: http://www.hubbertpeak.com/Hubbert/wwf1976/print.htm

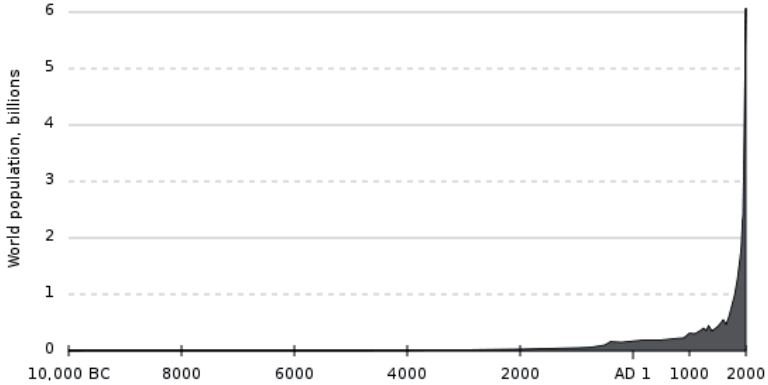


With r between 0 and 1, the population will eventually die, independent of the initial population. With r between 1 and 2, the population will quickly stabilize on the value (r – 1): r, independent of the initial population. With r between 2 and 3, the population will also eventually stabilize on the same value (r – 1): r, but first oscillates around that value for some time. The rate of convergence is linear, except for r = 3, when it is dramatically slow, less than linear. With r between 3 and (1 + √ 6) (approximately 3.45), the population may oscillate between two values forever. These two values are dependent on r[6]. Beyond r = 4, the values eventually leave the interval [0,1] and diverge for almost all initial values.

[6] With r increasing beyond 3.54, the population will probably oscillate between 8 values, then 16, 32, an so on. The lengths of the parameter intervals which yield the same number of oscillations decrease rapidly and the ratio between the lengths of two successive such bifurcation intervals approaches the Feigenbaum constant δ = 4.669. This behaviour is an example of a period-doubling cascade. At r approximately 3.57 is the onset of chaos, at the end of the period-doubling cascade. We can no longer see any oscillations. Slight variations in the initial population yield dramatically different results over time, a prime characteristic of chaos. Most values beyond 3.57 exhibit chaotic behaviour, but there are still certain isolated values of r that appear to show non-chaotic behaviour; these are sometimes called islands of stability. For instance, beginning at 1 + Ö 8 (approximately 3.83) there is a range of parameters r which show oscillation between three values, and for slightly higher values of r oscillation between 6 values, then 12 and so on.

Having the impact of r on the stability of x (n) in mind, we take a look at the real population dynamics in the last 12.000 years.

The population shows high exponential growth, by far exceeding the sustainable level, accompanied overall by a self-confirming, ignorance loaded exponential growth culture, and our principal constraints are not energy or material, but a culture[7]. This exponential growth culture failed to accomplish to bring societies on a sustainable growth path. Technological and chemical inventions as well as heavy use of natural resources led to a huge increase in food supply, but also to a switch into,,an used up world'' – without sufficient buffer capacity, seeing a human induced increase of CO2 highest in the last 650.000 years[8].



To sum up: Mankind faces a multi-dimensional crisis, namely crisis of the environment, crisis of food and water supply, partly already a crisis of fertility of agricultural land, and finally, a social crisis of self-governance and ethics (exponential growth ethics) within the society resulting from the unsolved external crisis effects on an ever greater and finally global scale. And at current, the financial crisis puts additional pressure on the cost structures of investments into the capacity to deal with them.

And in addition to the limits of human recognition capacity centred around its,,mesocosmos'', there is also the suspect

[7] See Hubbert, M.K. (1976):Exponential Growth as a Transient Phenomenon in Human History, The Fragile Earth: Toward Strategies for Survival, San Francisco, available at: http://www.hubbertpeak.com/Hubbert/wwf1976/print.htm

[8] Pachauri, R.K. (2007): The 4th IPPC Assessment Working Group Reports – Key findings, available at: http://www.ipcc.ch/pdf/presentations/pachauri-un_nyc_2007-09-07.pdf

that„conscience is self-eliminating"[9]. Coupled with the weakness of recognition and a tendency of self-deception it appears to be a heavy burden for the future and an urgent need to„change". This is most obvious for world population, which is the main driver of food demand directly, or indirectly as for the food for animals. Unaware of the risk, the short-term unsustainable use of nature left mankind being mistaken about the exponential threat of its way of life to the maintenance of the regeneration of the food supply chain. And in a certain way, the unreflected destruction of more sensitive survival concepts, which take in consideration the needs of nature, appeared to be short-term a confirmation as for the„survival of the fittest" on the expense of sustainability.

Although there is some evidence that the major concern about sustainability shifted from population growth to the saving/consumption ratio[10], food supply might be sufficient by 2030[11], but only on average and leaving hundreds of millions hungry. Animal feed and biofuels might add to the scarcity, as crop disease and export restrictions do. The underlying growth rates differ from those in the past and reflect rather a political flight behaviour to„cut the most likely real disaster scenario into pieces of hope".

In all, the logistic function gives us a concrete idea about the self-dynamics of human population growth and its chaos potential, with exponential population growth clearly outrunning resource growth. And as far as it concerns (democratic) values: Democracy cannot survive overpopulation![12]

On the strategic value of Water and fertile soil

Recent studies provide evidence for the high probability, that in temperate regions like Ukraine the hottest seasons on record will be the future average in many locations (see graphic below)[13]. In

[9] Hardin, G. (1968): The Tragedy of the Commons, in: Science 13 December 1968 Vol.162 No.3859 pp.1243-1248, available at: http://www.sciencemag.org/cgi/content/full/162/3859/1243

[10] Arrow, K., et al (2004): Are We Consuming Too Much, in: Journal of Economic Perspectives, 18(3), 147-172

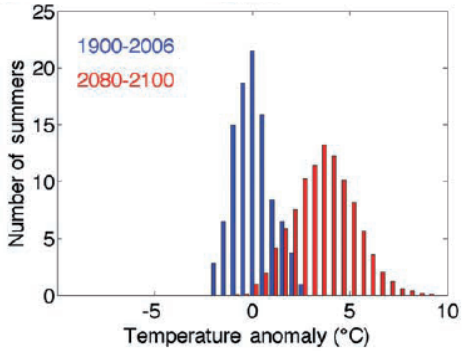
[11] FAO (2002): World Agriculture Towards 2015/2030, available at: ftp://ftp.fao.org/docrep/fao/004/y3557e/y3557e.pdf

[12] Bartlett, A.A. (2000): Democracy cannot survive overpopulation, in: Population and Environment: A Journal of Interdisciplinary Studies Volume 22, Number 1, September 2000, pp.63-71, available at: http://www.albartlett.org/articles/ee_democracy_survive_overpopulation.pdf

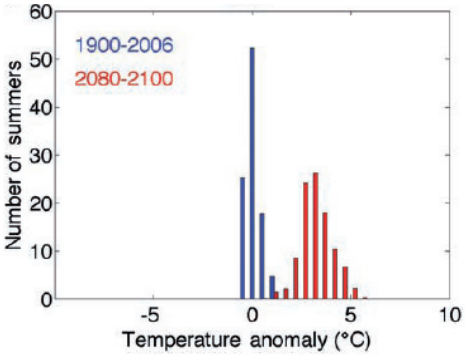
[13] Battisti, D.S.; Naylor, R.L. (2009): Historical warnings of future food insecurity with unprecedented seasonal heat, in: Science 9 January 2009 Vol. 323, pp.240-244. See also: http://iis-db.stanford.edu/pubs/22374/battisti_naylor_2009.pdf

the tropics and subtropics, by the end of the 21st century the growing season temperatures will exceed the most extreme seasonal temperature from 1900 to 2006 (see chart for Sahel Zone below)[14].

Ukraine



Sahel



The average daytime summer season high temperature in Ukraine was 1900-2006 28°C, whereas the respective temperature for 1972 was 31-33°C. Temperatures of 35°C or higher can be le-

[14] The summer season includes the months June, July and August. The temperature is plotted as the departure from the mean of 1900–2006. The right bell-shaped curve represents the mean 1900–2006, whereas the left represents the expected mean 2080–2100, based on 23 global climate models providing a 90% probability. For further details see Battisti, D.S.; Naylor, R.L. (2009), loc. Cit.

thal to crops[15]. In particular the high temperature during the key crop development stages caused a 13% decline in grain production in 1972 from the year before for the USSR as a whole. When the USSR entered world grain markets, it coupled with strongly rising demand from Asia after weak monsoon rains. Several Asian countries implemented food self-sufficiency policies to avoid exploding national grain prices and to keep political stability[16]. And as the case of Ukraine shows, it could easily spill over to world markets, as it did in 1972-1974. Contrary to the long term downward trend of grain prices until this time, the price for wheat rose from 60$ to 208$ per metric ton between the Q1 1972 and Q1 1974 in international food markets, while real prices more than tripled[17].

Elevated greenhouse gas and increasing heat will very likely lead to increased droughts in the tropics and subtropics, where currently app. 3 billion people live. Crop-based models for major grains show direct losses between 2,5% to 16% for every 1°C increase of seasonal temperature[18]. Seed yields are in particular sensitive to periods of extreme heat at certain phases of development, and might be coupled with additional losses from decreased soil moisture. In all, even in mid-latitudes global warming poses a widespread threat to food security[19].

The increasing world population will compete for access to the remaining resources in areas with relatively sufficient availability of freshwater, relatively low population density, relatively fertile soil and at best, with additional raw material for the production of energy and fertilizers. But regional distributional imbalances of freshwater and fertile soil create potential bargaining power or weakness. Threatened by the major scenario described before, a major indirect strategy might be for disfavoured countries or regions (e.g. China[20], India, Kazakhstan, Argentina, northern California, Kenya) to secure access to these resources by the purchase of land and water resources or by treaties guaranteeing the use of them. In particular, if the heat and drought stress on crops and livestock

[15] See the supplement of Battisti, D.S.; Naylor, R.L. (2009) with further references at: http://www.sciencemag.org/cgi/data/323/5911/240/DC1/1

[16] Battisti, D.S.; Naylor, R.L. (2009), loc. Cit.

[17] Battisti, D.S.; Naylor, R.L. (2009), loc. Cit.

[18] Battisti, D.S.; Naylor, R.L. (2009), loc. Cit.

[19] Battisti, D.S.; Naylor, R.L. (2009), loc. Cit.

[20] In particular central China experienced in 2008 the worst draught in 50 years with rainfall 80% below normal. See: Engelhardt, T. (2009): Burning Question: What does economic,recovery' mean on an extreme weather plant?, available at: http://www.truthout.org/021709U

becomes global and therefore exists less potential for balancing regional disparities via commodity markets. Financially, because of the expected higher volatility, protection costs against higher food prices would increase as well.

Ukraine's agriculture – managed like a strategic asset of national happiness?

Given all these facts and foreseeable risks, agriculture appears to be without doubt a litmus test of how leadership can use their political power in a wise way to capitalize on the rich agricultural resources. And since decentralized and efficient production requires as well decentralized decision making, Ukraine faces several important challenges to cope up with the tasks to deal with before getting into a sustainable growth path in agriculture as well as water and energy use. Due to the increasing dual character of agriculture as a source of energy supply as well as food supply, strategic planning is needed for Ukraine to develop a sound political concept to consistently reach several targets at once:

a) The skyrocking oil price in 2008, coupled with the pressure on funding sources rooted in the financial crisis shall be seen as a final call for Ukraine to finally start to end the organized irresponsibility of poor governance! State capacity is in no way sufficient to handle the coming food, water, and energy challenges in a trustworthy and sustainable manner, neither for its citizens nor for international long term investors. Policy planning is as urgently needed as much higher accountability and professionalism of the political class. According to IMF estimates, poor institutional capacity reduces growth by app. 25%, leaving major risks for Ukraine welfare increasing and the policy option space for change decreasing.

b) Due to the high importance of agriculture for Ukraine's regional development, migration and urbanisation strategies and options, its fiscal decentralization as well as its provision of public goods, it could be used as a trigger for sustainable rural development strategies. There should be in particular broad discussion about if and to what extent land privatization to large scale investors, in particular foreign state owned wealth funds, contributes to the associated goals of regional balanced and sustainable growth. Procedures to include the political will of the respective citizen's community into the administrative admission process would increase direct democratic awareness of the polity.

c) Ukraine should as well focus on how to gain high long term crop yields with less fertilizers to avoid overuse of its strategic asset. Since agriculture is to become a multi-use strategic contributor to GDP, special political attention should be paid to a higher biodi-

versity than in the„green revolution". Many crops have become genetically so uniform that a crop failure would be very widespread, followed by a high economic risk for all affected economic sectors.

d) Petroleum based fertilizers create a strong dependency of agricultural production on crude oil, seeing wheat, coarse grains and vegetable oil highly sensitive to petro-leum-based assumptions[21]. Furthermore, crude oil has a huge price impact on trans-portation and food processing as well. So energy and food prices are directly linked.

e) With increasing activity of institutional investors on the derivative markets for agricultural commodities, open interest and trading volume increased as trading strategies showed greater variance, and the aggregate effect of the entry of new non-commercial investors with a less hedge-oriented motive might well be higher price volatility[22]. Ukraine should therefore develop a coordinated risk management system for agricultural commodities and promote respective education among farmers and farm cooperations.

f) Energy mix: External energy dependency to fossil resources creates strategic weakness and therefore should be a driver for a fundamental shift to another energy supply mix of Ukraine. For playing a greater role, there should be created a sound governmental incentive programme coupled with intensified applied research how to use available resources (biomass, biofuel, wind, solar energy, water). In addition, Ukraine should make measurable concrete steps towards a structural compatibility with and an increasing inclusion into the unified energy system of the EU.

g) To avoid ending up with unsolvable contradiction to harmonize the urgent needs of ecology, economics and ethics for stable communities, Ukraine urgently needs„2nd order change"[23] There

[21] FAO (2008): Agricultural Outlook 2008-2017, see: http://www.agri-outlook.org/dataoecd/54/15/40715381.pdf

[22] Total open interest in maize, has increased from 0.66 million contracts in February 2005 to 1.45 million in February 2008. In that time, non-commercial traders' share in opening interest in long positions increased from 17% to 43%. For wheat, contacts increased from 0.22 million to 0.45 million over the same period and the non-commercial traders' share of opening long interest rose from 28% to 42%. Soybeans showed the same pattern while sugar contract volumes increased over this period but non-commercial traders' share in open long sugar positions remained at about a third. Monthly trading volumes have increased during that period by 85% for maize, 125% for wheat and 56% for soybeans, and by threefold for sugar. See FAO (2008): Agricultural Outlook 2008-2017, at: http://www.agri-outlook.org/ dataoecd/54/15/40715381.pdf

[23] First order change is change within a system, while the system's rules

are already first moves to include these and more criteria into a comprehensive view, that guides responsible and accountable politicians, business and spiritual leaders. Regardless of all the differences, the concept of,,Gross National Happiness"[24] of the Kingdom of Buthan looks in particular promising and provides a sound view on the unavoidable needs for ecological, ethical and economic resonance.

Ukraine has been blessed with rich natural resources. They require a high sense of responsibility for their sustainable use in the context of increasing ecological, economic and ethical conflicts as well as political wisdom and decisive action to secure Ukraine's welfare in an ever more challenging global environment.

remain invariant. Second order change requires discontinuity, a shift in the logical level and a transformation in the very nature of the system itself. The urgent need for second order change can be considered a crisis condition. A system freezes in its habitual mode while the context has changed. The crisis is then a failure to produce second order change, failing to change the decision rule itself. Important failures are e.g. failure of response, failure in preventing run away, failure of identification or exponential amplification.

[24] The GNH indicators have been designed to include nine core dimensions that are regarded as components of happiness and well-being in Bhutan: 1.Psychological Well-being 2.Time Use 3.Community Vitality 4.Culture 5.Health 6.Education 7.Environmental Diversity 8.Living Standard 9.Governance. In this perspective 'happiness' comprises to have sufficient achievements in each of the nine dimensions. See: http://www.grossnationalhappiness.com