On the Construction of Eco-agriculture in China

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I. Humans entered the 21st century with two basic survival burdens: environmental and food problems

In June 1992, the United Nations Conference on Environment and Development, popularly known as the Earth Summit, and the World Food Conference alarmed the world by focusing attention on the gravity of environmental and food problems facing humanity as it enters the 21st century. According to conservative estimates, the Chinese population will reach 1.6 billion by 2030, an increase that will require substantially more food. Based on the 1996 estimate of 410 kg grain per capita per year, this figure alone will shoot to 0.64 billion tons per year by 2030. The so-called food problem stemming from the growing population cannot be mitigated by efforts of any one discipline, such as agronomy, alone. Eco-agriculture theory can make a contribution to the integration of disciplines. The demand for an improved quality of life is encouraging a new technical revolution in Chinese rural areas—a technical revolution based upon lessons drawn from history and the present, from China and abroad, to help plan for the future by achieving a sustainable eco-agriculture.

II. Rethinking the essence of the agriculture industry

Throughout history, agriculture has been the groundwork industry through which humans produce food and fiber for survival. Agricultural civilization is the grassroots of all the other civilizations. Agricultural labor is the prerequisite and natural basis for all the other human activities. [saed: Please qualify this statement, since this applies to some societies, historically, and only since the past 1000-2000 years or so to the majority of social systems. Most of humanity for most of human history has been based on gathering/hunting] This observation was made by Turgot back in the 18th century and

echoed by Marx and Engels in the 19th century. In ancient China agriculture was said to be the King of all the other industries. Today all developed nations treat agriculture as a strategic industry.

Despite big differences between the 24 types of agriculture all over the world (Kostrowicki 1975), basically, all agriculture is manipulation of ecosystems to produce plants and animals needed or desired by humans for food and fiber (Pimentel 1984). All agriculture is simplified domestic ecosystems in which the natural reproductive processes are closely interweaved with human economic reproductive processes., Thus, agriculture is both subject to extensive dependence on environmental factors (for example, on weather, soil conditions, water sources) and creates significant external impacts (e.g., on water sources and biodiversity).

Here we define all agricultural industries as agro-ecosystems that have ecological, economic, and sociological components. Agro-ecosystems are solar powered as are natural ecosystems, but they differ in that (1) the auxiliary energy sources are processed fuels (along with animal and human labor); (2) biodiversity is greatly reduced; (3) the dominant plants and animals are under artificial selection; and (4) control is much more goal-oriented (Odum 1984). Consequently, agro-ecosystem productivity is the co-productivity of nature and society via technology, but the relationship between nature and various kinds of labor is often not linear. This can be represented with the following formula:

Agro-ecosystem productivity = nature's intrinsic productivity ⊕ human appended productivity.

[need to find out what symbol it was!]

The symbol"⊕"refers to cycle-addition [unclear what this means]. It reflects the asymmetrical relationships between the two parts and can represent all possible results, such as 1+1=2; 1+1>2; or 1+1<2. It shows very clearly that actual agricultural productivity can occur only when the essential factors of production in nature integrate with human production according to certain spatio-temporal orders into a specific agricultural complex. So the main way to develop agro-ecosystem productivity is to maximize output with the least input of socially necessary labor. This is done by intelligently revising and implementing new

and better methods, discarding old ones that no longer work, and proportionally allocating, organizing and coordinating all the factors of a specific agricultural complex.

We all believe that low-energy feedbacks that have high-energy effects are the basic features of cybernetic systems. However, as Engels (1876) pointed out in his *Dialectics of Nature*:

> Let us not, however, flatter ourselves overmuch on account of our human conquest over nature. For each such conquest takes its revenge on us. Each of them, it is true, has in the first place the consequences on which we counted, but in the second and third places it has quite different, unforeseen effects which only too often cancel out the first. . . [W]e, with flesh, blood, and brain, belong to nature, and exist in its midst…

To bring about a sustainable agricultural complex, we have to incorporate ecological, social, and economic goals into a landscape-specific design of sustainable agro-ecosystems. Development, improvement, and sustainability should all be considered according to spatio-temporal scale.

In short, eco-agriculture wants to adapt to and make the best use of all resources, and reduce losses, in both the short and long terms in order to ensure a sustainable healthy bumper harvest. To accomplish this we must have a rational evaluation of industrial agriculture throughout the world and its history.

III. Ecological problems of soil, water, air, food, pesticides/chemical inputs, and energy: Six problems exist in industrial Western agriculture

Western developed countries have managed, within a relatively short period of about a hundred years, to modernize their agriculture with the intensive use of both material (e.g., synthetic fertilizers, pesticides, machinery, new plant and livestock varieties), and immaterial technology (e.g., intellect, morals, laws). But this has come with the cost of serious ecological problems. These problems include (but are not limited to) soil erosion and contamination, water pollution, a significant contribution to the greenhouse effect,

increases in insect pests and diseases, resistance to pesticides, deterioration of the health and safety of food, and exacerbation of the energy crisis. The use of genetically modified (GM) crops may very well exacerbate matters. All these problems threaten the ability of nature to support the sustainable development of an efficient and effective agricultural industry. In an attempt to address some of these issues, the Low Input Sustainable Agriculture (LISA, now SARE [Sustainable Agriculture Research and Education]) program was created in America and imitated by other developed nations, with variable achievements. But a person cannot serve two masters—the integrity of the earth and the profitability of capitalism.

IV. Capital, production forces, and technology: three problems with Chinese traditional agriculture

Chinese traditional private agriculture **has** had several prosperous periods historically. However, the 'Peach Blossom Village Eden' image of rural China with large fertile fields, neatly standing cottages, convenient road and path networks, green trees and beautiful gardens, and quaintly dressed but content people (Yuan-Ming Tao, c. 365-427) is seldom seen. Chinese traditional agricultural depends much on weather and geography. Although it has had some successes in the past, it proves ineffective against the increased dangers posed by human-made and natural disasters. Chinese traditional farming methods are good for eco-sustainability, but not for the national economy because of their low productivity and inefficiency. Chinese traditional agriculture is plagued by inferior landesque capital, poor and unstable productive forces [this is actually clear – it means the forces of production are not as developed or stable, meaning that there is no development of mechanised production and reliance on domesticated animals and human labour is often less reliable than machinery, which is more or less the case], and a crude application of science and technology.

Chinese socialist collective agriculture began in 1950s. It created a model village, Da-Zhai, as the blueprint for China's agriculture. Da-Zhai provided the experience of dealing with the construction of landscapes, hydrological systems, forests, fields, roads, villages, and houses in a comprehensive eco-scientific way. [to answer your critique, Karen,

and I can see your point, one can use synthetic fertilizers in ways that are "ecological" – ecological just means that it pertains to ecosystems, and so the matter is really one of what is a healthy ecosystem and how that is determined and by whom, for what] Da-Zhai designed its crop planting systems, forestry, animal husbandry, fishery, and farms according to the principles of adaptation, mindful of a "right place and right time" ethic. While Chinese collective agriculture did dramatically improve the basic conditions for primary production and quickly mitigated the problem of food shortages for the 0.8 billion Chinese of the day, it did so through the increasing use of fertilizers, pesticides, machinery and hybrid varieties, and with the effect of scale economies. **[[[This type of farming pays little attention to the specific land conditions, especially compared to organic farming systems, which look to nature as a guide in managing pests, diseases, and growing healthy, abundant crops. So how is this "adaptation" and "right place and right time?]]] [well, that is a view I share with you, to some extent, but we should press Pan to explain what he means; I would otherwise dispute the claim that organic farming pays necessarily more attention to local conditions – using a tractor running on petrol, for example, and the use of manure from animal species introduced via European colonisation, or using non-native crops… these are hardly practices in tune with local conditions. It is quite the opposite, in fact, and the difference in this case is more one of degree than quality, which does not mean I would favour conventional capitalist farming, but the problem is not really one of technology (industrialised as necessarily destructive). It is one of mode of production, and thereby of extraction from ecosystems, which in capitalism is obscene]**

Contract farming with household farms began in the 1980s in China. It encouraged farmers to exploit their land productivity toward profit, and it has achieved a lot. **[[[What more did it achieve? Gains in crop yields and productivity, or something else? Also, we need more information to distinguish between family contract agriculture and Chinese collective agriculture. What did family agriculture do that was different from collective agriculture?]]]** However, family farm productivity and its ability to cope with natural disasters are certainly low and unstable. China's problems of food scarcity and malnourishment, along with environmental problems remain the country's foremost

challenges.

V. "Blind man," "mediocre man," "scientific man" [I would highly recommend that he refrain from using gender-biased language!]

Facing the West, some people feel uncertain. They yearn for the past, are discontented with the present, and unsure of the future. They lack both foresight and tactics. They do not object to blindly adopting new techniques, but object to employing new techniques blindly **[[[Please explain the difference between this and blindly adopting new techniques.]]]**. They are "blind men."

Meanwhile, there are also others who take advantage of whatever new fashionable technology is rolled out without considering its present and/or future negative effects. They only care about money, profit, and whatever benefits can accrue to themselves from the new technology. They are unconcerned with the possible negative effects on the overall future resulting from their own actions. Some of them are good at using these new technologies to attract admiration and attain fame. These people are "mediocre men."

Finally, there is the group of people I term "scientific men." They metaphorically stand on the moon and watch the earth, evaluating lessons drawn from the evolution of ecology, from the dire situations arising from both Western modern industrial agriculture and the history of the development of Chinese agriculture. They conclude that China must model herself after the laws of nature and socio-economy, follow the principles of the dialectics of nature, proceed carefully to combine methods from traditional agriculture with modern material technology in order to avoid the unexpected (and negative) consequences associated with modern Western industrial agriculture. In short, China must take the eco-agriculture road and establish a harmonious relationship between agricultural industry and nature.

VI. Theoretical framework of eco-agriculture

Sustainable eco-agriculture is the scientific, sustainable, "Peach Blossom Village

Eden" style of agriculture. Fresh air, clean water, fertile soils, abundant and nutritious foods, secure homes, beautiful clothes, a dignified and graceful social life, and harmonious relationships with nature. These define sustainable eco-agriculture and are its basic appeal. Establishing eco-agriculture in China is a comprehensive project that needs a variety of factors to come into play. The first step is to set out the appropriate qualitative economic criteria and make them known as widely as possible.

1. Constructing three integral eco-agro-complexes

❶ Harmonisation of household consumption and refuse and recycling technologies **Eco-courtyard of technology alliance [[[What exactly is this? There should be a short description.]]]**that is most suitable for family living (best use of the natural air, water, sunshine, fuel, domestic garbage, etc.)

❷ **Eco-village of Eden [[[Again, we need a description, not just a title.]]]**is most suitable for rural communities. This concept is modeled after the proposed "Peach Blossom Village Eden."

❸ **Eco-field and eco-landscape systems** utilize the highest efficiencies for both **primary, secondary and tertiary production [[[We need more info to distinguish between these.]]]** (make the best recycling use of all the available resources)

2. The three sets of qualitative economic criteria

- More and high-quality capital from material technology:
    - The average **fixed capital [[[Referring exactly to what?]]] [fixed capital, in Marxist terms, is machinery, storage places, fertilisers, etc., as opposed to variable capital, which is human labour-power]** per hectare should be as high as possible.
    - The average price of the fixed capital should be high. **[[[It's not clear what the fixed capital is referring to.]]]**
    - The component of **scientific and technical productivity [[[Again, we need to specify what he's referring to. GMOs are also scientific and technical –**

yes, but so is manuring, composting, etc. I understand your reaction, but it is jumping the gun a bit, here!.]]] in the total productivity should be as high as possible.

- Stronger and stable productive capability:
    - The socially necessary labor should be as low as possible.
    - The surplus production should be as high as possible.
    - F**armland productivity [[[Meaning exactly what?]]]**should be as high as possible.

- Dignified and graceful social life:
    - The price of labor should be high.
    - The opportunities for learning and education should be high.
    - The population growth rate should be rational.
    - The energy/**prion [[[Prions cause Mad Cow Disease. Not sure what he means here – yes, need clarification!.]]]**of diet should be diversity and quality.
    - The food must be safe and healthy.
    - The environment must be sound, safe, and healthy.
    - The pollution index must be as low as possible.
    - Transportation, medical care, communication, social insurance, and services to assist the dying and their families should be high quality, affordable, and available to all who need them.

3. Guidelines of eco-agriculture construction

The construction of eco-agriculture must be based on developing and utilizing eco-agricultural productive forces by raising the skill of the laborers, increasing the application of ecological science [there is no contradiction here; whether one likes it or not, ecological approaches are quite varied and do not necessarily lead to the same political ends!] and technology, boosting the **combination of production processes in social scale [[[?]]]**, **enriching production means and widening their functional ranges**, **[[[Again,**

referring to what specifically?]]] and making it a habit to adapting, exploiting and protecting the natural situations. **Expand and prolong continuously the "connotative" and "denotative" productivity of the systems**. **[[[?]]]**

4. The four technological categories of eco-agriculture

● **Biotechnology**: **[[[Since biotechnology is so strongly associated with recombinant DNA techniques and other corporate/industrial agendas, we should use a different word. Is he talking about classical breeding techniques? it is strongly associated with these techniques here, but not in most of the planet! I see no problem with using the term biotechnology here – we just have to alert the readers about its meaning in a Chinese context]]]** e.g., the improving of germplasms and/or species, etc.

● Eco-technology: e.g., further studying and taking advantage of the intra- and inter-specific relations in order, for example, to minimize infestations of agricultural pests. [he is referring to integrated pest management, probably]

● Engineering technology: e.g., the best use of appropriate machinery such as automatic combine harvesters, etc.

● Information technology: e.g., the most effective prediction and forecasting, planning and programming to support on-farm decisions.

In short, when all factors in each of the aforementioned sections have approached **to the world record [[[How much more is that?]]]**,agriculture will be approaching eco-agriculture.

VII. Ten topological constraint laws of eco-agricultural innovation

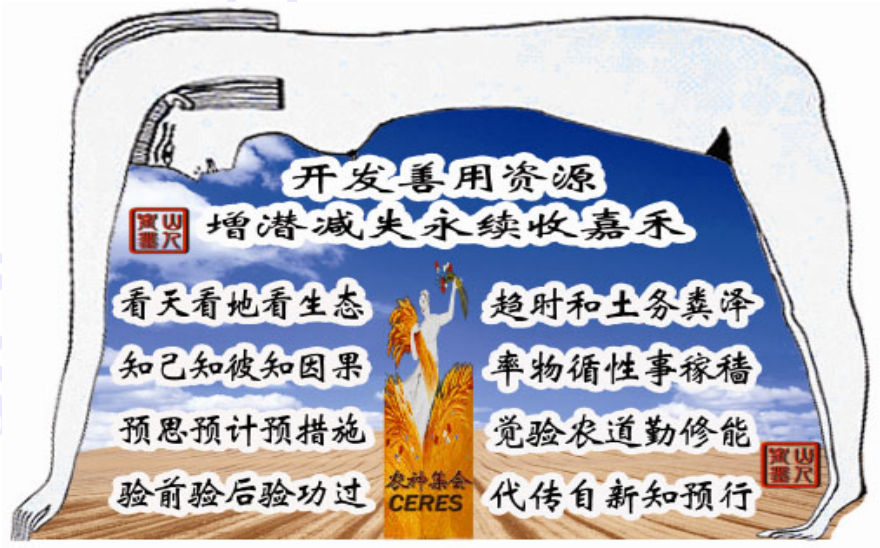
However able is the Monkey King [we will need him to explain this to us!], he can never jump outside of the Buddha's palm. However capable is the human, he can never surpass the limitation set by material and energy. Whichever new agricultural technique, from its preliminary designation to its coming into existence, then to the stage of being put into practice after having been tested, and finally to quit the system, is of little possibility to go beyond the controls of the following ten laws—Law of Conservation of matter, Law of

Conservation of Energy, Law of definite proportions and Atomism, Law of Evolution, Law of Unity of Opposites, Law of Value, Law of Least Limiting Factors, Law of Diminishing Returns, Law of Compound Interest, and Law of Ten Percent of conversion of energy.

VIII. Conclusion

Eco-agriculture is not to be regarded as the pipe dream of academic idealists. It is both theoretically and practically sound, as has been proven by its adoption in certain societies [which ones? this is not analysed or empirically supported in this text]. As such, its principles should be propagated and adopted as widely as possible. Promoting eco-agriculture certainly entails the co-operation among such factors as law, economy, ethics and morality.

To end this discussion, I emphasize the eco-agriculture logos for successful primary production as shown in the following Figure in Chinese. (Primary production is the energy fixed through the process of photosynthesis). English translation is as follows:



Primary production is to exploit and utilize all the available resources, to increase the system's potential and decrease any possible losses, finally to sustainably obtain higher and healthier outcomes with less input and less environment-degradation.

Primary production rules should be: Observe the weather, Observe the soils, and Observe the living things; Knowing one's available production techniques and means, knowing their attributes and properties, and knowing the consequences of your practices; Ponder prudently, pre-plan carefully, and get everything ready and take measures beforehand; Use both general and local knowledge and your own sense to evaluate and re-evaluate your methods before and after the season; Following the appropriateness of the season to harmonize soils by focusing on manures and water; Utilize and/or adapt to your resources to carefully manage the crop/environment complex; Integrate perceptions of the agronomic truths while developing one's skillfulness; Pass down the farming arts (knowing, predicting, and operating) from generation to generation including your own innovations and sense and local indigenous knowledge.

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Qian Tao, Chinese nature poet, c. 365-427, The prose story of the Peach Blossom Village Eden is one of his most well-known works.