

A Multifunctional Agriculture for China Sustainability Aspects Considering the Spatial Dimension

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1 INTRODUCTION

China is currently undergoing rapid changes in many respects, mostly noticeable in big towns and cities in terms of economic growth and consequentially with effects on social, environmental, infrastructural and political systems there. The rural areas, where still 70 % of the Chinese population is living have not been affected by these tendencies until now. 50 % of the population are still farmers and live on or somewhat above subsistence level. Hence, China's agriculture is extremely small structured with an estimated average size of farmland/farm of about 0.5 hectare and the per capita arable land comprises about 0.11 ha, which equals only one-third of the world's average (see LIAO 2005). *China...is now feeding 22 % of the world's population on about 1.3 billion hectare, which only accounts for 7 % of the world's cultivated land.* (GUO 2002).

The Green Revolution, which has reached China in the late 1970s, supported endeavours of intensification of agriculture and insures a high land-productivity level until today. *China has significantly improved its agricultural technology since 1978. The country has introduced high-yield crops, increased its use of agro-chemicals (fertilizers, pesticides) and agricultural machinery, and expanded irrigation.* (HEILIG 1999) However, in many cases the lack of education and adequate instructions about the use of these new technologies led also to misuse and consequentially to damage of the natural environment.

All these innovations left their marks also in the appearance of the agricultural landscape. Today the very small structured agriculture is not visually perceivable. In many cases the single fields cannot be distinguished from the neighbouring fields, because a whole village/region plants the same crops year after year. In regions with intensive agriculture there is whether any field margin vegetation nor any islands of "wild vegetation" or other landscape shaping elements. Soil is just considered to be economically productive and leaves cleared swathes of land. The aesthetic dimension of a diverse "nature" is not yet considered as a value within the Chinese society. This dimension is "kept" in more or less artificial gardens and in some nature reserves.

Within the China-EU-Project "SUCCESS - Sustainable Users Concepts for China Engaging Scientific Scenarios" (ICA4-CT-2002-10007) a qualitative sustainability approach was chosen for the agricultural analysis in four Chinese villages.

Following this approach the rural areas shall be recognized as important parts of the whole system within the Chinese society and fair rural-urban partnerships with mutual benefits should be the long-term perspective and will contribute to economic stability in rural regions. Rural life as important balancing complement to urban life should get a higher significance and value within the Chinese society apart from just being production base.

2 FOUR PRINCIPLES OF SUSTAINABLE AGRICULTURE – THE THEORETICAL APPROACH

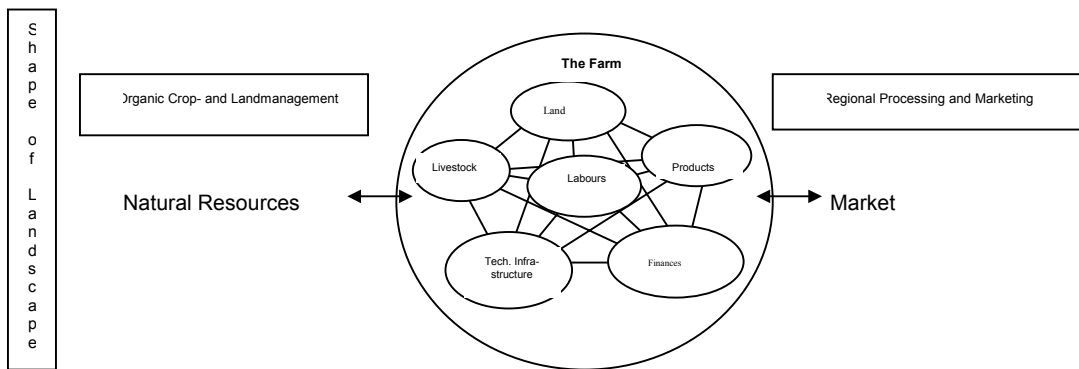
The theoretical basis of the agricultural research within the SUCCESS-Project was influenced by a strong sustainability approach (cp. Levine 2004) which primarily claims balanced ecological concepts and leads to socially acceptable adaptations of economic structures. ...strong sustainability recognizes the unaccounted ecological services and life-support functions performed by many forms of natural capital and the considerable risk associated with their irreversible loss. Strong sustainability therefore requires that natural capital stocks be held constant independently of human-made capital. (Wackernagel, Rees 1996) Such unaccounted ecological services include e.g. the appearance of landscapes which cannot be measured in economic concerns at first sight but contributes to economic prosperity if it can be used as tourism potential. Monotonous agricultural steppes will not attract any visitors.

The Four Principles of Sustainable Agriculture (Prändl-Zika 2005) were developed following this approach and served as an ideal and framework respectively for the analysis of Chinese agricultural production and marketing systems. Hitherto sustainability concepts within agronomy concern predominantly the production side of agriculture and differ widely from efficiency oriented approaches as e.g. integrated agriculture to systemic approaches as e.g. organic farming. (cp. Mason 2003) Sustainable marketing and processing strategies as well as structural and organisational dimensions are often not considered in these concepts.

The fact that agriculture is one of the worst polluters indicates that there is an urgent call for action in developing new locally adapted concepts for sustainable agriculture. They should be accompanied by a paradigm shift from a short-term quantitative towards a long-term qualitative approach wherever possible. Following a strong sustainability approach organic agriculture is the core of the concept.

However, organic agriculture should not be regarded isolated but always in relation to local and regional, social and economic circumstances. Within the system of sustainable agriculture the farmer transforms into an entrepreneur organising his farm by crop and land management, by product processing and marketing.

Figure 1: The farmer as sustainable manager between natural resources and the market



The farm is the smallest productive and economic entity in agriculture. Influenced by the agricultural policy and market conditions the decisions what to produce and how to produce are made on the farm.

Sustainable agriculture describes one possible relationship between the use of natural resources and the needs of the market and tries to balance ecological capacities and economic interests.

The *Four Principles of Sustainable Agriculture* form an ideal concept – in the first instance following the intention of protecting natural resources as soil and water – with emphasis on:

1. organic plant production and animal husbandry,
2. regional processing
3. regional marketing and
4. additional income through para-agricultural activities.

(cp. Prändl-Zika 2005)

3 THE PRESENT AGRICULTURAL SITUATION IN CHINA AND SUSTAINABLE FUTURE POTENTIALS

3.1 Current major tasks of China's agriculture

China's agriculture is currently facing big challenges. To feed the biggest nation of the world means an extraordinary tightrope walk between the production of enough food by exploitation of natural resources by technical and chemical means, the production of safe food not burdened with chemicals and other pollutants and the maintenance and protection of a healthy environment and diverse landscapes.

3.1.1 Food security

One important aim of China's agricultural policy is to reach/maintain a high self-sufficiency ratio of primary food commodities as wheat and rice, which presently is considered to be secure (cp. Heilig 1999). However, according to different tendencies and impacts of economic growth in China future strategies for food production and consumption should be developed.

These tendencies are:

- The still growing population of China estimated until the year 2030 will demand for increasing amounts of staple food. (cp. <http://www.library.uu.nl/wesp/populstat/Asia/chinac.htm>)
- The ever increasing need for land for construction and technical infrastructure will reduce the arable land more and more.
- Erosion and desertification are major dangers in China and therefore another reason of arable land reduction
- The change of nutrition habits in urban areas will demand for new agricultural products which are more land and energy consuming in production.

As a consequence, priority decisions on land use will be necessary and also the question should be posed, which crops and products could deliver the necessary food energy for the nation.

3.1.2 Food safety

Healthy food and clean drinking water are declared aims of the Chinese government. But it is an official fact that food safety cannot be guaranteed in many cases. Lacking of regulations, of controlling measures, of authorised disposal and of adequate education and knowledge in agricultural production and processing of food are the main reasons for misuse of chemicals in these branches.

In addition, both the individual interest of achieving high yields in order to gain more money and to raise the living standard, and the public concern of achieving food security lead to the request of ever increasing land productivity by chemical means. There exists the fallacy mostly among farmers that the more chemicals are applied the proportionally higher yields can be expected. Side effects like chemically burdened crops and drinking water as well as degraded soil are the consequence and compromise food safety.

Hence, in countries like China where food security is at its limits both tasks will enter into competition with each other. The Chinese answer to these conflicting areas was the introduction of "Green Food Production" which seems to be the pendant to the western concept of integrated farming and tries to combine different sometimes contrarious purposes. *It considers aspects of food production, economic viability, producer and consumer safety, social responsibility and conservation of the environment in a well-balanced manner.* (EISA 2001)

This concept intends to hold a high level of productivity but with a more efficient use of agrochemicals. *Using crop protection products as much as necessary, but as little as possible, always applying legally and in a targeted manner.* (EISA 2001)

From a strong sustainability approach the weakness of this concept lies in the fact that universally valid definite directives for are very difficult to compile as different natural conditions demand for different answers. This is also the reason why the controlling of this production system and therewith an adequate quality assurance is almost impossible.

3.1.3 Rural poverty alleviation

The third big task of Chinese agricultural policy is to achieve a better-off life for farmers and the rural population and to narrow the income-gap between urban and rural population.

In this context urbanisation is the magic word in China, which follows the reverse that urban structures and lifestyles wherever transferred lead to good living conditions. In many Chinese cases this becomes obvious in an improved infrastructure. But, as it is not always fitting to rural conditions and often neglecting local demands and styles this strategy is not necessarily leading to long-term improvements. Another measure in this context, which is already adopted in the “Small Town Strategy”, is to resettle peasants in urban structures in the periphery of cities or even to found new small cities for this purpose and then hope that peasants will integrate into their new lives. (ACCA 21, 2005)

It seems that rural live in China is mostly just implicated with poverty until now and therefore this situation should be strongly altered or even eliminated. It seems also that its big potentials as e.g. the special socio-cultural life in villages, the cultivation of old local customs and traditions which shape the identity and diversity of a country and influence in its peculiarity the appearance of local landscapes are not yet recognized as complement to urban structures. From a sustainability point of view typical rural structures must be maintained and strengthened. Rural development needs special adapted concepts considering local potentials and abilities with the aim of creating new jobs there.

3.2 **Characteristics of Chinese agriculture in brief**

During the SUCCESS research 4 Chinese villages – Xiao Qi, Jiang Jiazhai, Bei Suzha and Du Jia – have been visited for agricultural investigation. They represent – besides literature and internet research – the basis for this agricultural analysis. The following listing is based on findings in these villages and gives a short overview over the current state of Chinese agriculture.

The Chinese agriculture is characterized by:

- very small structures in concerns of field sizes and heads of animals, most farmers cannot make use of economies of scale
- mostly conventional production systems which achieve high land productivity; besides the tendency to “green food production”
- low degree of mechanisation which is the reason for low labour productivity
- water shortage as the main limitation in agriculture in many regions
- soil degradation, desertification and erosion problems in some parts of China - mostly in the western regions
- poor structured cultural landscapes; the non-economic value of the preservation of a beautiful landscape is not yet recognised as a public benefit and considered in different measures
- a low income level and consequently low living standards for farmers
- high dependency of farmers on outside forces as e.g. political programmes, big traders, big companies and cooperatives and therefore a weak position on the market
- no direct subsidies for farmers but there is a system of micro credits
- inflexible land-transfer rights, which make it difficult to leave the first sector for the second or third
- the existence of agricultural high-tech zones all over China as a network of further education and for the introduction of new agricultural techniques and for marketing

4 **A MULTIFUNCTIONAL AGRICULTURE FOR CHINA**

4.1 **Preconditions**

In future Chinese agriculture should not be seen just as the production basis of food and raw materials in sufficient quantities, but as a sector providing several services for the whole society, like safe food, a healthy environment through a sustainable management of natural resources, an attractive agricultural landscape and a vital rural life cultivating traditions and customs and in sum leading to good living conditions for farmers.

4.1.1 Adaptive education systems

Basic and further education of farmers is the first postulation to secure a safe exposure to agro-chemicals and therewith to guarantee no harms for humans and the natural environment. The network of agricultural high-tech zones in many rural regions in China can support the requirement of farmers' education and training. These agricultural high-tech zones, which are supported by the government and have close links to agricultural universities, should develop efficient instruments and methods for a better knowledge transfer to the village level.

Moreover departments for organic cultivation and processing could be installed there to promote research and implementation in this field and to develop maybe a Chinese type of environmentally sound agriculture lying in its approach between green food production and organic cultivation. For implementation an adaptive education system could be recommended, which is based on conducted trial-and-error processes operated by farmers in their fields. Continuous knowledge transfer and exchange of experiences between farmers, agricultural trainers and scientists should accompany these processes to come to locally adapted solutions which may lead to sustainable concepts.

4.1.2 Subsidies and state aided credits

The major aim of an agricultural subsidy system should be to provide farmers with a reasonable standard of living and consumers with quality food at fair prices. (EU 1992)

In China an agricultural subsidy system would contribute to poverty alleviation of farmers and their allocation should be bound to laws and regulations of environmental standards. Subsidies influence farmers decisions in production to a large extend and can induce farmers to operate an environmental sound agriculture. In addition such a policy will establish the value of healthy, balanced ecosystems as a need for the whole present and future society and therefore justify the financial support for farmers who operate agriculture in this sense.

State aided credits in agriculture should be awarded for investments in small scale holdings with innovative long-term concepts which are embedded in superior concepts on village or regional level.

4.1.3 Laws and regulations

Agricultural laws and regulations have to include the compilation of environmental standards and strategies to fulfil them and set up thresholds for dangerous chemical toxins. (cp. EU Council Directive 91/676/EEC 1991) A legal framework for organic or similar agricultural production systems has to be elaborated and controlling authorities have to be established to guarantee their abidance.

4.1.4 Knowledge about markets

To introduce new crops and value added products, it is elementary to have a good knowledge about markets and possible tendencies in demand. Farmers should identify different markets and existing marketing channels and open new sale possibilities, e.g. contracts with hotels, restaurants, social institutions as schools, hospitals, staff canteens etc. and reduce too strong dependencies from outside forces. If tourism is an option for certain villages agricultural production and marketing should consider this fact in their orientation.

For China where the rural mobility and therefore the access to knowledge about markets are very limited a system of key-persons, who provide the village with those informations, could be set up. These key-persons should be authorised by the village and the local government and would represent a link between the local agriculture, governmental strategies and market conditions with the target to set up new economic networks of fair urban rural partnerships.

4.2 **Perspectives**

4.2.1 A good living standard for farmers

Major efforts for a better-off life for farmers and the rural population have to be undertaken. Through larger farm sizes (see 1 and 4.2) and within a basic subsidy system, (see 5.1.2) which guarantees farmers to fulfil their subsistent needs, more flexibility in land-and crop management would become possible and farmers would have more options to generate income. Additional services could be offered by them as tourism services and also social services, which are accordable with the agricultural work.

Within the concept of a multifunctional agriculture the farmer transforms from being just simple producer to a manager, who steers all processes on the holding, who cultivates marketing contacts and who is a member of local cooperatives and networks. The farmer with his family comprehends his holding as a small scale enterprise adapting the activities to the personal, infrastructural and financial abilities and natural resources. The self-conception of farmers would change for the better and working in agriculture would get a better image and become more attractive again.

4.2.2 Food safety and environmental safety

Food safety and environmental safety should become the major ambitions in Chinese agriculture delivering healthy food and leaving an intact environment. Quality of agricultural crops and products should take priority over quantity.

A Chinese type of an environmentally sound agriculture could help to reach these targets. It could emanate from the Chinese green food production concept and include more methods of organic farming as conserving soil cultivation, green manuring, wider crop rotation and intercropping systems. The careful exposure to water with sparing water consumption techniques and preferably low eluviation of nutrients and pollutants into the ground- and surface-water should be also major research issues.

4.2.3 Rich structured agricultural landscape

The aesthetic dimension of landscape should be conceptualised as the rural equivalent of urban public space and therefore be understood as an important public resource and future capital. Chinese farmers operating sustainable agriculture that preserves natural structures will become the keepers and “designers” of an attractive landscape. This activity should be recognised as a service by farmers and reflected in financial acceptance by the society

4.2.4 Agriculture and gentle tourism

Agriculture and gentle tourism can be a fruitful combination in rural regions being attractive as to their beautiful landscape and traditions. Such a concept similar to “holidays on a farm” in Europe could be based on the idea of “urban family meets rural family”.

Small scale tourism would allow direct contact and exchange between rural and urban people and fit to a small structured agriculture. By temporarily watching, experiencing and participating in rural lives, farmers' image and esteem of their work would increase.

In China rural regions with their beautiful landscapes, clean air and tranquillity will become more important destinations of recreation for urban people burdened with stress, polluted air, noise etc. in their daily lives. Chinese domestic tourism with its specifications as culture tourism, weekend excursions and holiday tourism will get higher significance and different concepts for tourism in different places will be developed.

A multifunctional agriculture in China should recognize the manifold interfaces with economy and social realms and thereof identify new potentials of farming activities and find synergies with agriculture. New concepts for agriculture should prepare the path to innovative strategies creating new networks of resource management, production, processing and additional services. Such conception of agriculture could contribute to the stabilization of social and ecological structures in rural areas. It needs approval and reward in the public and reflexion in political measures. These should become manifest in fair prices for agricultural high quality products and in financial support for farmers in terms of subsidies, subventions and state aided credits for services provided by them for the whole Chinese society.

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