

CONSUMER ATTITUDES WITH RESPECT TO CROP PROTECTION

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ABSTRACT

Within Europe consumers are taking an ever-increasing interest in the origin of their food, production methods, food safety, nutrition and food quality. The BSE crisis, incidents of food contamination and concerns about genetically modified food ingredients have fuelled many of the current concerns by European consumers. BEUC, the European Consumers Organisation, has studied closely the emerging consumer trends food production issues, witnessing the shift in consumer needs towards quality, safety and nutrition. This has heralded the so called 'plough to plate' approach to understanding and tracing food production and supply. In recent years, an increasing number of European consumers have taken an interest in organically produced food produce. Also, many consumers are looking for zero-free agrochemical residues in their food in order to escape their belief that residues are unsafe. These new trends and demands place important pressure on the European governments who are keen to ensure they satisfy consumer expectations

BACKGROUND INFORMATION ON BEUC

BEUC, the European Consumers Organisation, represents the interests of the key national consumers organisations in Europe towards the various EU institutions. BEUC have 34 members in 24 countries, including all EU member states, and a number of accession countries.

Active in the EU policy arena since 1962, the mission of BEUC is to defend the interests of European consumers (citizens as purchasers/users of goods/services) in the EU policy process. Drawing on the collective knowledge and experience of the BEUC team and our members, expertise is contributed on issues that have direct economic or legal consequences for the consumer and on issues that impact health and safety and the environment we share.

BEUC seeks to maximise the consumer benefits of the Single European Market; at the same time seeking to minimise potential damage to the consumer, focusing increasingly on matters of quality and on social and ethical issues. Special attention is paid to the needs of our most vulnerable citizens, including children, the elderly and the disadvantaged. To maintain and strengthen basic consumer rights across Europe is the goal.

BEUC believe that consumers in Europe are entitled to eight core consumer rights and works to integrate these rights into all areas of EU policy.

- The Consumer Right to Safety
- The Consumer Right to Information
- The Consumer Right to Choice
- The Consumer Right to Representation
- The Consumer Right to Redress
- The Consumer Right to Education
- The Consumer Right to Satisfaction of Basic Needs
- The Consumer Right to A Clean Environment

Food policy has an impact on all these rights, and is therefore one of the main campaign areas for BEUC.

Consumers are more than ever interested in the origin, characteristics, quality and nutritional properties of the food they purchase. They know that food production, processing and breeding methods have become much more intensive, and that the use of pesticides, fertilisers and chemicals has increased. Recent developments such as BSE, dioxins, and other food scares have led many consumers to question the safety of their food. Reassurance is no longer sufficient. The conditions must be created in which consumers have good reason to feel confident about the food they eat.

In May 2002 the Food and Veterinary Office of the European Commission published the report of the year 2000 pesticide residue monitoring program. The report highlighted the results of the analysis of pesticide residues in 45 000 samples of fruits, vegetables and cereals and revealed that 96% of the food samples did not exceed Maximum Residue Limits (MRLs). Although the results might not seem to be alarming, there is still a series of remaining questions, which express the need for:

- harmonised monitoring and surveillance systems in Europe;
- comparable consumption data;
- harmonisation of substances allowed for use in Europe;
- the establishment of particularly designed control groups if residues are ubiquitous;
- setting of MRLs.

On top of it, it is important for consumers to have reassurance that special attention is being paid to:

- vulnerable groups of populations;
- bound residues of pesticides and pharmaceuticals;
- the combined effect of multiple pesticide residues, including possible synergistic effects of multiple residues;
- multiple sources of exposure to pesticides.

Given the challenges that are involved in the use of pesticides in general and the risk perception by consumers in particular, it is all-important that pesticides must be used at levels as 'low as reasonably achievable'. Consequently, the use of chemicals for crop protection should be part of an integrated crop protection system within the strategy on a sustainable use of pesticides. BUEC sees the achievability of this aim is through the following recommendations:

- Specific targets should be designed at national levels to progressively achieve more stringent qualitative and quantitative reductions in the use of pesticides on specific crops and overall.
- Principles for Good Agricultural Practices (GAP) should be developed which specifically aim at reducing the dependency of agriculture on plant protection chemicals. This may be facilitated by establishing an EU-supported 'GAP research facility'.
- Least-harmful plant protection practices should be developed and promoted wherever feasible and practicable.
- Best environmental practices should be applied.
- The use of pesticides should ultimately give reason to appropriate control measures of the residue levels.

To achieve this aim all players in the chain should have the appropriate knowledge about the responsible use of pesticides, and ongoing training should take place. This should help to create the conditions in which consumers have good reason to feel confident about the food they eat.

CROP PRODUCTION SYSTEMS AND PRACTICES IN CHINA

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Crop production systems and practices in China

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ABSTRACT

China's trading and social influence on the rest of the world is already immense and growing. With 15% of the world's population reliant on farming in China for their livelihood, the condition of China's agriculture as an integral part of China's society will have an effect on the whole world. This paper sets out to examine the current state of the agricultural industry in China focusing mainly on general issues that effect many regions. It examines the overall environmental challenges that have an overriding impact on the industry as well as briefly examining specific crop production issues. Some initiatives are discussed that would help the farmers in China overcome the many challenges that face them. The Chinese farmer has shown great resourcefulness over the last three decades, and provided certain crucial issues are addressed, there is no reason why China's agriculture cannot continue to adapt rapidly to the demands of the world marketplace and continue to be a vibrant feature of China's economy.

INTRODUCTION

With nearly 15% of the world's population reliant on farming in China for their livelihood, the present farming practices, and how they adapt to the current challenges will have an effect on all of us. This paper is a personal observation on the current state of agriculture in China and the challenges it faces in the coming years.

The author's comments and observations reflect the situation in Shandong province, in North China, which produces 25% of the agricultural exports from China. Shandong relies on these exports for 25% of its GNP. In addition to farming in Shandong, the author has also been involved with agricultural projects in Hebei, Jiangsu, Zhejiang, Fujian, Gansu, and Yunnan provinces, and the same issues experienced in Shandong are largely relevant to these other areas.

WILL CHINA FEED THE WORLD?

Almost all manufactured goods you buy in the shops seem to come from China these days. Will the same happen in food production? It is very unlikely. To understand this, it is important to put China's agriculture into a world context.

Table 1 compares the current agricultural situation in China with another similar sized country, The United States of America. As can be seen from the table the countries are similar in size, but China has a population almost five times larger than the USA but only fifty- percent of the farmland. Furthermore, this land area has been diminishing. There has been a decrease in land per capita from 0.26ha of land per capita in 1950 to 0.10 ha

per capita in 2000. This is one of the smallest areas of available land, per member of population in the world.

Table 1. A comparison of the level of cultivation with population in China and USA

Comparisons	Scale/units	USA	China
Population	People	275 million	1.25 billion
Land area	Square miles	3.5 million	3.7 million
Farmland	%of total land area	20%	10%
Number of farms	Farms	2 million	220 million
Average farm size	Hectares	>160	<0.5

From Skorburg J., China Briefing Book, September 2001

Globally, China has 25% of the world's population, and only 7% of the world's cultivatable land. And there are restrictions to the potential as well as the quantity of the cultivatable land, for a wide range of reasons

So it is unlikely that China will become a dominant force in the world agricultural market place. It is true that there have been recent gluts caused on the world market partially by Chinese overproduction, in commodities such as Garlic, Apple Juice, and Onions. But this has been more to do with a lack of awareness of the demands of the market place causing farmers to overproduce and having to sell at uneconomic levels, rather than the precursor to China's future dominance. However it should be noted that because of its sheer size, China is already a leading bulk producer of rice, potatoes, barley, peanuts, pork, corn and soybeans, and produces around 35% of the worlds vegetables.

THE AGRICULTURE MARKET IN CHINA

Agriculture has been at the forefront of economic reform in China in the last 25 years. Internal structural reforms both at a national and local level, in the late 70s and early 80s lead to de-collectivization. Millions of family farms were formed, selling their produce on a relatively free market, though with some advice and guidance on the market situation from local officials and experts.

These reforms of the countryside led directly to a rapid increase in agricultural production and efficiency in the 1980s. This had two significant implications for China. One was a significant increase in revenues generated in the rural communities, and therefore the economy as a whole, and secondly, a release of a vast pool of labour to drive the re-development of industry in villages, towns, and the rapidly expanding cities.

Production has not continued to increase at the same pace, but joining the World Trade Organisation (WTO) is expected to stimulate change in the rural economy. It appears that the Chinese Government is hopeful that joining the WTO will stimulate new opportunities, as well as putting economic pressure on the small scale farms that are predominantly growing commodities, such as rice, corn, wheat and barley. Many townships have been encouraged to establish agricultural technology zones to stimulate the farmers to change to other crops, or increase in scale.

But there are currently major obstacles to this development of a market economy. Largely due to the fragmented nature of the market structure today. Apart from the commodities such as barley and rice, the marketing of the farmer's goods is primarily a local affair, often through local produce markets and agents purchasing relatively small volumes from farmers growing on a very small scale. Any products exported have historically been through state owned export agencies, who themselves hold the relationship with the customer dearly and are loathe to allow the farmers and customers to communicate too freely with each other. The result is that farmers have limited access to premium markets for their produce, or the knowledge required to conform to the market's requirements

In practice, while there often appears to be large volumes of products in local markets, the supply and demand is usually almost in balance at this level, with insufficient excess product to allow a processor who could add value to obtain substantial volumes from one source. For example if a farmer only grows one acre of broccoli or cauliflower, then the most product he could expect to harvest in one day would be less than one tonne. In practice it will be substantially less. So it is impossible for a farmer to leverage higher prices by growing substantial volumes of better quality produce.

Thus there is no possibility of improved payments for the less obvious quality aspects, such as low pesticide residues, better taste, better storage qualities, as the products are lost among the products of all the other farmers. So farmers have no incentive to invest in new technology, such as better quality varieties, modern pesticides, effective machinery and storage facilities.

If the farmer does decide to invest in new technology he then faces the problem of inadvertently purchasing counterfeit goods. In the year 2000, a survey suggested that 30% of the products labeled as imported pesticides were in fact fake copies. The pesticide companies are constantly battling with this problem of fake pesticides, and with a concerted effort by the authorities there are signs that the situation is improving. However, plant protection rights and controls on the packing of seeds in China are still weak at best, and often the seeds that the farmer buys do not perform as he has hoped.

The farmers also appear to have a distrust of marketing operations, and contracts. The rural community is a cash based society and price on the day overrides loyalty to contracts. In order to accumulate enough land to operate an effective contract, village and town governments have to be involved and there is sometimes mistrust between the farmers and the government officials and village leaders. Rivalry between villages can also be fierce and can lead to conflict.

Until very recently relatively little attention has been paid to food safety issues. Plentiful food with a wide range of variety and choice, have not always been available, and the Chinese consumers have not been particularly conscious of the issues that concern the

western consumer, who has enjoyed the luxury of plentiful food of all types for two generations. In my experience, buyers from Japan, which is the major market for exports from North China, have always concentrated on the appearance, taste of products, and price rather than the other less obvious quality issues for their imports from China.

However the situation has changed noticeably in the three years I have been in China. Japan has suffered a number of recent food scares in its own production systems. These range from BSE in its beef herds, to bacteria laden yogurt produced in unhygienic conditions. As a result of the ensuing breakdown in consumer confidence, much more attention is now being paid to food safety issues, especially pesticide residues. Many fresh and frozen vegetable imports from China to Japan have recently been suspended due to pesticide residue concerns, especially in Spinach. Great efforts are now being made to install traceability systems and introduce better controls of pesticides of products being exported to Japan. Only three years ago there was no interest at all in this issue.

In China, the consumers in the cities are rapidly becoming more aware of food issues, along with all other environmental pollution issues. There is no doubt that central government is now taking the issue very seriously indeed, with major investment in equipment to upgrade analytical laboratories, and to improve the environment.

AGRONOMIC ISSUES

Water. Quantity, quality and overall utilisation

China is a vast country with every climate and geographical feature represented. But generally the country can be split from north to south, somewhere on a line around Shanghai, on the Yangse river. To the south there are generally adequate water resources, with rainfall experienced regularly throughout the year. Indeed often the problems are caused by excess rainfall leading to severe flooding.

In the north, rainfall is sporadic, falling mainly between the months of June and September. As a result, water resources in this area are scarce with the water table around Beijing lowering by an average of 1.5 metres every year. The south of China has 33% of the cultivatable land and 80% of all the available water, while the north has 67% of the cultivatable land and only 20% of the available water. This northern area includes Shandong and Hebei provinces in the North China Plain where a large proportion of China's cereals are grown. The Yellow River that flows through Shandong does not flow as far as the sea in many summers, and there is claimed to be an annual water deficit of 40 billion tonnes per annum in this area.

The Chinese government has announced the building of a major water transport system, from South to North, but it will not be operational till 2010. In the meantime agriculture has to compete with the cities and industry for an increasingly expensive resource, and even following the completion of this water transport project, water conservation will continue to be a major issue.

A general observation is that the usage of irrigation water is inefficient. Most farmers still rely on simple flood irrigation systems, or a single large bore hosepipe to water their crops. The water may come from rivers, lakes, boreholes or holes in the ground. There is

often wastage between the extraction and the application due to leaking or porous ditches and pipes. Irrigation scheduling to maximise the efficiency of use is not in evidence. Considerable increases in efficiency of use could be made with the establishment and maintenance of reliable primary transport systems for the water, the greater use of sprinkle irrigation or indeed drip irrigation, and better timing of applications. Water quality is also a major issue with 80% of the rivers and lakes polluted in some way.

If this water issue is not solved then this will restrict the opportunities for farmers to grow more intensive crops. This change in cropping is necessary as vegetable salad or fruit crops are more suited to small-scale farming. But they are financially more risky and require more water, than commodities such as wheat or barley, that cannot compete with imports or with farms growing on a larger scale.

Water use efficiency and water conservation will have the biggest impact of all on the changes needed in cropping and farming practices to retain profitability in the rural communities. Without good reliable water supplies the changes in practices necessary to save these communities from ruin will be impossible.

Cultivation practices

As the scale of the farming is small, then so is the equipment used for cultivating the soil. Farmers may use a wide range of methods for cultivation: A man and his wife pulling a simple plough together; the use of oxen, horses or even camels; simple manually steered 2 wheel motorised cultivators, small tractors of around 10-20hp, then medium horsepower tractors. Most of the machines are locally built, though there are imports of machines from some of the major worldwide manufacturers, including tractors up to 250hp. Contracting is quite common, ranging from one farmer in the village owning a tractor, to machinery groups organised at a village, town or district level.

The Chinese farmer is excellent at turning his land round between crops. In Shandong all the wheat and barley may be harvested in one week. The following week virtually all the land is re-established with maize, soya, or peanuts. However, most of the cultivations are at a superficial level, tilling just the top few centimeters of the soil. While this is quite satisfactory while small machines are used, the greater use of larger machinery is causing problems of ground compaction. Evidence from soil pits dug around our own farm revealed that a soil pan is endemic, 10-15 cm below the soil surface, and with many of the soils in the alluvial North Plain being a silty soil, deep cultivations are necessary to remedy the situation. There appears to be little awareness of this issue, and how to remedy it, in part due to the lack of horsepower available to do the cultivations, or strong enough cultivation equipment to cope with the necessary work.

Importing modern 'sophisticated' tractors is not really the answer. In common with other countries attempting to establish new agricultural technology, the rural communities are unable to cope with the sophisticated electronics, commonly used today. The large imported 250hp tractor that the New Millennium Group has on its own farm, has spent too much time out of action, due to the local mechanics having no access to the equipment necessary to understand the electronics. The Chinese rural engineers are excellent in finding ways to keep machinery going, but this is impossible when electronics are concerned.

Fertilisers

With so many people in such a small area, human waste is a very important fertiliser in many communities, and it is a common sight between crops to see cartloads of composted waste being tipped on the fields and spread. However some farmers, (including the New Millennium Group) now avoid this, and there are processed organic manures available. Also phosphate potash and nitrogen fertilisers are readily available, either from state manufacturers or imported. The Chinese have a different philosophy to other nations regarding the benefits of macro and micro nutrition. The farmers are not familiar with the concept of "rotational applications" where application of the macronutrients such as P and K is restricted to the most suitable part of the rotation. The Chinese farmer would rather apply a little and often.

When Pacific Andes took control of the farm near Qingdao, the soil was found to be quite acid, and there were problems obtaining lime, as the concept of liming to reduce acidity was an unfamiliar one with no demand in the locality.

Seeds

The Chinese farmer becomes more excited about new varieties than almost anything else. However the barriers to him obtaining new effective varieties are high. Until recently there have been no effective plant protection rights in China, so anyone introducing new seeds has been unable to gain any long term benefit from the technology introduced. The situation is so bad with open pollinated genotypes such as cereals, or vegetative reproduction types such as strawberries, that few effective new varieties have been introduced from abroad. Many organisations holding plant-breeding rights positively embargo sales to China. The only products arriving are products that are "off patent" and are no longer protected in their country of origin.

The situation is a little different with hybrids, as they cannot be multiplied effectively, and so imported modern hybrids are available in China. However, as the farmers cannot afford to pay too much, the market is very price sensitive. As the farmers expectations of the benefit of new varieties is limited, and will pay little extra money, then the quality of the seed sold in China tends to be at the low end of the quality scale in terms of germination and vigour. This of course creates a vicious circle, because the farmer becomes disillusioned with the performance of the new seeds and is less inclined to purchase again. This increases the sensitivity to higher prices. This is an understandable situation, but the strengthening of the plant breeding right acts will ultimately help the Chinese farmer to obtain better quality seed leading to satisfactory return on his new seed investment

Pests diseases and chemicals

It is impossible to categorise all the pest issues facing the Chinese farmer together. This is due to the wide range of climates and resultant farming practices in China. Yunnan province in the south has an altitude of 2500 metres and an amenable climate throughout the year. Heilongjian Province in the north has Siberian winters and hot summers. In the west farmers struggle to farm on the fringes of the Gobi desert, and in the mountains; while on the east coast a maritime climate allows farmers to intensively grow their crops. In the central regions you will find farmers eking out a living in the most severe conditions on terraced mountains.

However one feature is common to all areas in China and has an overbearing influence on pests and diseases. All the cultivatable land is worked extremely hard, because of the small scale of the farms, and the shortage of land. Areas of mountains are cultivated as terraces that many countries' farmers would have abandoned years ago as uneconomic. And multi-cropping is common, with up to three crops a year being grown in areas where this is possible. Where the climate does not allow this, such as North China, extensive areas of polythene are used to extend the season, and "greenhouses" (temporary structures with one earth wall, bamboo cane arches, and polythene covers) are used extensively to produce fruit and vegetables in the winter. These may be erected annually, or remain in the same place, but with no ground sterilisation, or proper disposal of the discarded plants at the end of the season, these houses are an ideal environment for pests and diseases to accumulate and survive.

Whether caused by multi-cropping, the greenhouses, or climate, pest pressure tends to be high, with continual "green bridges" and warm places for pests and diseases to harbour in winter. The warm spring temperatures and an incohesive approach to pest control by the fragmented farms exacerbate this problem. There is little knowledge in the farming community about developing integrated pest management strategies, or how to prevent pest resistance. A common view among farmers is that if a certain dose of a pesticide won't work then apply more of it.

It appears that this lack of awareness of how to develop sophisticated pest management strategies extends back into the classroom. When Pacific Andes employed ten graduates, in the year 2000, from two of the leading agricultural universities in China they had no practical knowledge of integrated crop management, though they have been quick to learn and understand the principles.

There is now greater awareness that modern specific pesticides are more desirable than some of the older broad-spectrum products. The government recently announced a plan to phase out organo-phosphates.

Because there is a lack of understanding about integrated pest management and anti-resistance strategies, chemicals soon come under great pressure after they are introduced. For instance Fipronil is used for Diamondback Moth control in Shandong Province. However, given the rapid proliferation of this pest in the spring, and the fact that Fipronil is relied on heavily as one of the few effective pesticides, it may not be effective for many seasons. We have already recently witnessed this with Imidicloprid. This product has rapidly lost its effectiveness in a field situation.

Application technology is also in need of improvement. The vast majority of chemical applications are made using knapsack sprayers, resulting in uneven application rates. Protective clothing is rare.

Harvest and post harvest practices

This is an area where generally the performance of agriculture in China is below the standards acceptable elsewhere. Harvest losses in cereal crops can be much higher than would be acceptable to a farmer with access to modern equipment. Due to crude harvesting and drying processes, quality and yield of the cereal crop is compromised, and

the post harvest handling and storage of fruit and vegetables is wasteful with ineffective refrigerated storage.

Cereals are harvested in a range of ways, from hand cutting, stooking and carting from the field for later threshing by hand; to some contract combines. With field sizes often ranging from 0.03ha to 0.1ha there is little opportunity to bring efficiencies into the system.

The cereals are usually dried and sometimes threshed on open hard areas of ground in the sun. The roads are an ideal place, resulting in very interesting driving conditions in mid June.

The situation with fruit and vegetables is complex. The Chinese people tend to buy today what they will eat today, often from small local markets, and so it has not been generally necessary to develop efficient systems that encourage long shelf life. There are chill rooms in many markets, but they are inefficient with very low volumes of air. (Commonly relying on convection from roof mounted cooling pipes.) and varying temperatures. The concept of removing field heat quickly as a means of extending shelf life is not clearly understood. Where you do see any type of forced air system, the volumes of cold air produced and the temperature control is usually inadequate. In part perhaps due to the difficulties faced in developing a high capacity electricity system to the far-flung rural areas of China. In North China, products such as Chinese cabbage and carrots are still commonly stored in pits dug in the ground, as soil temperatures will drop well below freezing. This can be very effective if done properly, though waste levels would be unacceptable to people familiar with more sophisticated systems. However, product losses must be weighed against the low cost of the system.

While the main road infrastructure is good in China, the country roads can often be potholed dirt tracks. This can also lead to post harvest damage in the transport of produce. Cool chain facilities are limited, and so even if the farmer attempts to cool down his produce quickly, temperatures may rise again later in the chain, leading to product instability due to condensation etc. The great distances that have to be covered are also a barrier to success. Produce harvested in the west faces an 8-10 day train-ride to the ports in the east. The logistics of using airfreight for produce have not yet been fully developed.

This lack of effective infrastructure in conjunction with the lack of varieties suited to extended shelf life causes many problems for companies attempting to export fresh produce, or supply international fast food chains with salad product

BIOTECHNOLOGY

China is more active in biotechnological development than any other country apart from the USA. In 2001 China was fourth in the world rankings for the area of transgenic crops grown with 1.5 million ha. Seemingly every agricultural institute visited will have a department developing tissue cultures of genetically modified strains of a range of genotypes. However it does not appear that much of this work gets beyond the first stage.

But China has made progress in a number of the core crops that have severe pest and disease problems, such as rice, maize and cotton. This progress is seen in a positive light as the country was facing severe pest resistance problems with corn borer in corn, and

bollworm in cotton, and the introduction of resistance imparted from a gene isolated from *Bacillus Thuringiensis* is claimed to have largely overcome the pest problem. Bollworm resistant cotton was planted on 20% of the cropped area of cotton in 2000 and in 2001 this coupled with favourable climatic conditions provided a bumper crop. It is now estimated that bollworm resistant cotton has been planted on 50% of the available acres in 2002.

Chinese scientists are also working on a wide range of other crops, and sixteen crops were in trials or being commercialised already in 1999, most of the trials focussing on insect resistance and virus resistance, though work on drought and salinity tolerance is also progressing.

Consumers in China seem unconcerned with the issue of biotechnology, although interestingly the government recently imposed restrictions on the import of US Soya, insisting that all imports of GMO should have a safety certificate, and must be labeled as genetically modified before they are sold. Foreign investment is not allowed in Biotech enterprises in China.

ORGANIC FARMING

The evolving marketing label known in Europe as organic farming is relatively new in its current form in China. There are few organic farms although a number of farming areas are currently going through conversion. The best organic farms witnessed have been on land reclaimed from the Yellow, or Yangse rivers, where inherent fertility is being used to produce good crops of carrots, broccoli etc. There was a great deal of interest during the period that Iceland Stores in the UK were planning to go organic with their vegetable lines, and I am sure there will be more now with the current fears about pesticides in Japan.

The Chinese themselves seem a little confused by the concept of organic farming. It is illogical that some chemicals are permitted while others are not, and so they seem happier with the concept of "green farming" which they perceive as not using pesticides unless you really have to, but not sacrificing the crop for the sake of a marketing idiom. It must be questioned if organic farming should be encouraged in China with such few land resources, high pest pressure, and 1.3 billion mouths to feed.

DEVELOPING THE AGRICULTURAL SYSTEM

It is vital to understand that agriculture stands at the core of Chinese culture, society and history. The Chinese are rightly enormously proud of what they have achieved throughout history. Any initiatives proposed to change the industry must take this into account. The family and the land that it farms, are two of the most important priorities to a farmer in China, and both will be jealously protected. Many people are still deeply aware of their roots, even if they or their parents have moved to one of the cities. Changes must be made sympathetically with this background in mind if they are to be achieved successfully. This is really not easy for a foreigner in China to understand, but without being aware of the often intangible differences in cultures and attitudes, long term success will not occur.

The agricultural industry in China has gone through immense change over the past twenty five years. While there are clearly many problems, this is understandable given the challenges posed by this development. China's agriculture has had to develop an infrastructure in twenty five years that many countries have had the luxury of centuries to develop. It has gone from a peasant community barely self-sustainable, to one that is able to feed its people, export surpluses, and release labour for the burgeoning manufacturing industries, in the space of less than three decades.

Even so, the pressure for further change is immense. With the exposure to the WTO, and the reduction of protection for farmers, rural incomes are threatened. However, the Chinese farmer is very resourceful and capable, and with aid in crucial areas should be able to make the necessary transition.

The most important thing is to allow the farmer access to markets that will enable the better ones to receive more income for producing higher quality. This means getting information down to the grass roots farmer about market requirements, and the benefits pertaining if he can produce crops that are demanded to an acceptable standard. This requires a co-ordinated approach from all sectors of the supply industry and the produce market. Central government needs to reinforce patent law, on seeds and technology to ensure that the vendors of the technology can receive a return.

The suppliers of new technology, be it seed, equipment, pesticides or any other, need to work closely with the market, to develop packages of support to ensure that the farmer can deliver what the market wants. At its simplest form that consists of the produce customer supplying the necessary seed to the farmer so that he grows what is required, offering delayed payment terms. A more complex solution is to offer farmers a complete agronomic package linked to a production contract. Government credit guarantees to offer some security to these companies while farmers become more familiar and comfortable with contracts, and amalgamating their land would spur this process on, as farmers are still very wary about contracts, or pooling resources.

More should be done by the multinational chemical industry to encourage farmers to use pesticides responsibly, protecting themselves, their families, their customers and the environment. Initiatives are often discussed and a number of demonstration centres have been established, but little impact is evident at grass-roots level. Much effort must be put into educating the farmer to protect the efficacy of the chemical products he uses by mixing chemical groups, and improving post harvest hygiene and rotations.

Central government should put resource into improving irrigation infrastructure in order that new crops can be reliably grown, and partnerships can develop. There is no point in developing new growing techniques if water is unavailable. The problem is not only that water is in short supply, but that much of it is wasted, often not even getting to the crops it is supposed to water in an efficient fashion. Moveable solid set sprinkler irrigation systems and drip tape irrigation systems are capital intensive, and labour intensive. The farmers have plenty of labour but little capital, and government aid is required initially to reduce the cost of these systems to the farmers. Support is needed too, for the education required so those farmers can maximise the efficiency of these new systems with proper irrigation scheduling.

Support is also needed to develop better cooling and storage facilities for agricultural products. The capital cost of the equipment required is too high for the small rural communities that are at the start of the food chain. But if proper facilities could be provided, the overall impact on the industry would be significant. It would allow the produce organisations to make full use of the improving air, road and rail infrastructure to better serve their customers, and return better value to the farmers.

Thus a few basic steps to make farming more efficient will go a long way to improve the income of farming communities in China. But there also needs to be a sympathetic attitude in the wider world to the problems that they face. Changes are being made in the full glare of publicity. The farmers are supposed to comply with systems that are totally alien to them, systems that a European farmer would have found it impossible to meet twenty years ago. And the implementation of the trade regulations governing products coming into the EU, Japan or the US, compared to those produced within these communities are very different, making the challenge even harder. But that's another story.