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# China – Green Forever?

"I would rather suffer hardship in my youth than live in poverty when I grow old." The words of this Chinese proverb rings true today, as China faces the problems that have surfaced as side effects of the Green Revolution. Left to debate whether the promises of science have relieved the calamity of world hunger or contributed to it, science must now find a way to appropriately balance technology and nature. Lester R. Brown, in his book Who Will Feed China, warns, "In an integrated world economy, China's rising food prices will become the world's rising food prices. China's land scarcity will become everyone's land scarcity. And water scarcity in China will affect the entire world." In effect, China's hunger may likely become world hunger.

The Green Revolution, started in the 1940's, has since then tremendously impacted the social and ecological aspects of agriculture. Genetically engineered plants, which were more responsive to nutrients, matured more quickly, and grew at any time of the year, remarkably increased the amount of cereal produced. In fact, by 1990 seventy percent of the land used to plant rice used these High Yielding Varieties, or HYV's. The yields of rice and wheat nearly doubled, and the cost for these crops greatly decreased. In a mere six years China managed to raise grain production from 200 kilograms per person to 300! With increased income for farmers, heightened demand for farm inputs, and a more stimulated economy, the valuable effects of the Green Revolution are easily seen. Doubtlessly, many have benefited from the enormous amounts of food generated from hybrid seeds every year. China itself has seen huge progress in the amount of malnutrition and poverty present in the country. With all these tremendous leaps in agriculture, it is easy to see why perhaps thirty years ago the Green Revolution would have seemed much like a miracle, perhaps one "too good to be true."

Throughout its reign the Green Revolution has widely been both praised and criticized. There are a number of issues surrounding the debate over how extensively HYV's should be used. For example, although these crops do much better than other varieties in the presence of adequate irrigation, pesticides, and fertilizers, they may lag behind and be economically inefficient without these factors. Since these plants are hybrids, their seeds must also be purchased and replanted every year, possibly making crop production more expensive. Scientists are now also realizing the long-term effects of the Revolution, finding problems such as environmental degradation and increased income inequality. Some critics even venture to say that its effects have led to more severe absolute poverty. Which is it then, a fertile savior that will end world hunger or an awe-inspiring devil leaving nothing for the children of tomorrow? A modicum of truth is evident in both sides of one invention, as suddenly it seems China's problems have only begun.

The Chinese can remember, with a heart-wrenching clarity, the feeling of hunger in the pits of their stomachs. In the famine that ravished the country from 1959 to 1961, between 14 million and 26 million people suffered unnecessary deaths. At that time, China was taking great strides in industrializing in the Great Leap Forward. Mao Zedong established numerous engineering projects but neglected to compensate for the farmers who deserted their job of food

production for work in the cities. Together with the effects of a devastating series of floods and droughts, the movement of the industry and the social system resulted in unforgettable sorrow for three desperate years. Plainly, both the shortcomings of the government and the wrath of Mother Nature control the productivity of the land and the sustainability of its people. It is no wonder that the people of China embraced the technologies of the Green Revolution and held its vision so dear in their hearts.

What is in the past, however, is history, and now China must look forward once again. The pain of those who came before serve as a poignant reminder, but the foreboding of what is to come fills the real fear in my heart. The world looks not at yesterday with lamentation, but toward tomorrow with apprehension. It is not too late to fight the downhill slide, and it is never too early to take precaution.

Issues on the harmful effects of the Green Revolution have begun to emerge. These include, but are not limited to, the effects on environmental degradation, the lack of available, arable land, and a lack of proper distribution of wealth.

The amount of environmental degradation caused by Green Revolution practices can be observed by damage done to three points: water, air, and soil. Pollution in all of these areas is a severe and pervasive problem. First of all, the contamination of drinking water in China from fluoride, arsenic, and agro-chemical wastes poses a serious health issue. For example, over 26 million people in China suffer from dental fluorosis and over one million from skeletal fluorosis. 82 million simply live in areas where water is scarce. Water shortages, especially abrasive in the north, cause immense problems. Factories which produce mercury often discharge large amounts of waste into China's rivers, directly affecting the sources that irrigate cropland.

Another problem concerning water is the Green technology's need for irrigation systems. Although the number of irrigation systems in China has grown substantially since 1950, some argue that there has been very little growth since 1978. Land that is irrigated is often used intensively, as soil that once produced a single crop now produces two or three every year. This rigorous use of land is harmful to the soil as nutrients are quickly depleted. Other harmful effects of extensive irrigation are also seen in the problems of water logging and salinity. When river water is diverted onto the land, some of it will flow downward. Unless there is sufficient drainage, the root zones of deep-rooted crops will be saturated with water and damaged. Salinity occurs when water rises to the surface and evaporates through the top layer of soil, leaving behind a film of salt. If the rise in the water table is not reversed through the installation of underground drainage systems, the salt will eventually turn fertile soil into a wasteland. The other side of the extreme can be debilitating as well, as the steady fall of the water table in the north poses an equally serious threat of quickly depleting aquifers.

Another area of concern is the cleanliness of China's air. The Green Revolution heightened the use of pesticides, and many of these chemicals (such as DDT) are hard to break down in the environment. These are especially dangerous because they accumulate through the

food chain and spread throughout ecosystems. The dependence on coal also adds to pollution caused by greenhouse gasses, which contribute to the creation of acid rain.

Lastly, the destruction done to China's soil enormously impacts the agricultural future of the country. Soil damage is largely attributed to the extensive use of pesticides, herbicides, and chemical fertilizers. For example, the accumulation of heavy metals such as mercury and nickel, mainly from industrial factories, leaves soil hard and infertile. A devastating 10 percent of the China's total farmland area has been contaminated, most of it in prosperous areas such as the Pearl River Delta. This is largely attributed to the release of harmful industrial waste, another ill side effect of industrial growth. Even more alarming is that residues from chemical fertilizers and pesticides are now appearing in farm products, endangering both people and livestock. According to SEPA, China's State Environmental Protection Agency, about 12 million tons of crops are polluted with heavy metal residues every year. These contaminated crops also pose an enormous threat to public health by contributing to disease. One instance of this contagion is the intensive use of Bluestone solution. Bluestone, a copper sulfate compound found in insecticides, affects the production of fruit and can cause serious chronic poisoning symptoms. Pollution from Nitrate is also an issue because in the human body it can deoxidize into nitrite, a carcinogen. This is particularly troublesome because the amount of Nitrate found in vegetables grown in southern China is 70 percent over the national safety limit.

A second point is that China's environmental worries are linked with the scarcity of arable, available land. Arable land in China has fallen from an area of 0.57 hectares in the 1950s to 0.29 hectares today. This is an especially difficult problem, as twenty-two percent of the world's population depends on food grown on China's farmland. Although it is the world's fourth largest country, only 1.27 percent of China's land is used for permanent crops and only 14.86 percent is arable. The problem here is obvious – an enormous country producing a huge amount of food on quickly choking plots of land will eventually wear out the soil. As fertile ground becomes unproductive, a great decrease in the food supply will soon follow.

Farmland is often abandoned for four main reasons: the construction of buildings and roads, low fertility, decline in multiple cropping, and more profitable interests in fruit (rather than grain) production. The effects of industrial development are especially noticeable, as the trend of shrinking cropland bases is seen consistently through the industrialization of Japan, South Korea, and Taiwan. Unless the trend is reversed, China will find it extremely difficult to escape a similar fate. Naturally, a population shift to the industrial sector will result in a decrease in farmers and agricultural workers. Thus, factories will continue to grow at the expense of cropland.

A third and final argument against the effectiveness of the Green Revolution lies in the schism between the rich and the poor. In such destitute areas as the western provinces of China, poverty and illiteracy are especially high. Many people do not have access to safe water supplies, good schools, or proper health care. One possible reason for this is an improper distribution of the food supply. The disparity between the income of urban residents and peasants holds a ratio of 2.6:1, the widest gap seen since 1985. One fourth of the rural population has less than a

minimum level of calorie intake, and in especially remote areas the infant mortality rate exceeds 100/1000.

Especially hard hit by these situations are the women of China, who benefit proportionally less than men from economic growth. Primary school completion for girls is significantly lower, and females constitute up to 70 percent of the illiteracy in poor areas. Furthermore, inadequate health services in struggling areas leave women with higher chances of reproductive problems. Up to 60 percent of rural births are unattended, and the maternal mortality rate averages 202 per 100,000 – a level that is twice the national average. These numbers clearly show the tragedy of inappropriate distribution of wealth.

Because of the money needed to start making a farm "Green," many say that the Revolution has only deepened the divide between large-scale farmers and those working small, personal plots. Large farm owners are more likely to adopt such technologies because they have easier access to irrigation water, fertilizers, seeds, and credit. Conversely, if small farmers attempted this new form of agriculture, they would soon find themselves in debt. Mechanization has also eliminated many jobs that would have employed rural workers, making it harder on those less wealthy.

So, how can all of these problems be eradicated? The answer is not a simple one. Gordon Conway, President of the Rockefeller Foundation, has proposed a transformation of agriculture he calls the "Doubly Green" Revolution. This new movement emphasizes both conservation and productivity, and he urges farmers to develop alternatives to chemical fertilizers and pesticides. Better soil and water quality management is also a goal, along with increasing job opportunities for the underprivileged, especially women.

Hunger problems can also be alleviated by a proper redistribution of money and resources toward the poor. Establishing an agricultural technology in favor of the wealthy does nothing to address social equality in reaping the benefits, and thus does nothing to help reduce poverty where help is most needed. Education is also important, as farmers should understand how the chemicals they apply to the land affect not only their generation but also those to come.

Although Conway's goals are essential for the well-being of future generations, many obstacles are yet to be overcome. New technologies must be developed to keep crops pest-free yet safe, to effectively rebuild the depleted soil, and to purify the extensive amounts of pollution existing. Policies must change, jobs must be made, and more money must go to the producers rather than the rich landowners.

The government must play a role in making sure that wealth is equally distributed, and that small farmers are acquiring more for their hard labor. Nations must work together to develop less harmful fertilizers and pesticides, to rid the environment of the chemicals already present, and to maximize the crop yields economically. If the world concentrates on working together to ensure a doubly green revolution, perhaps tomorrow can yield another sweet harvest.

The Green Revolution has brought us far, as China's improvements have clearly demonstrated. Unfortunately, there is often a negative aspect to all that is wonderful, and one can only wonder if the good outweighs the bad. Although the revolution has helped many in a crusade to end world hunger, problems, old or new, have yet to be solved. Yes, technology has proved fruitful, and yes, the results have been miraculous. Nonetheless, it seems the fruits of the present will soon become the pain of the future. Looking towards tomorrow, we can only strive to better the world for the next generation, and keep the world truly Green.

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