

The Contradictions of the Green Revolution*

Will the Green Revolution turn red? That is the big question about the recent and highly publicized upsurge in Third-World food production. Food output is rising, but so is the number of unemployed in countryside and city. Is this growing class of dispossessed going to rise up in socialist revolution? Such is the specter invoked in an increasing number of mass-media news stories.

Scholarly studies echo the same fear, and concern is growing among officials at the Ford and Rockefeller Foundations, the World Bank, and the U.S. Agency for International Development (AID). All of these organizations are anxiously trying to buy the answers to these questions. As more and more research money flows out, reams of reports from eager university and field-staff researchers are piling up.

Yet for all the vast literature, radical researchers and strategists have paid little heed to the Green Revolution or to its revolutionary potential.¹ This is a strange oversight in a generation of radicals more impressed by peasant revolution than by Marx's vision of revolution by an industrial proletariat. How important is this new development to U.S. foreign policy, that such mighty institutions should be stirred into action? What is the real impact of the Green Revolution on the internal contradictions of modern capitalism? Will social tensions be abated or exacerbated? It is my hope that this essay, which discusses these and related questions, will open a discussion among radicals and move others to probe more deeply into the whole phenomenon.

1. The Green Revolution and Imperialism

The Growth of a Strategy

Most Americans discovered the Green Revolution only when plant-breeder Norman Borlaug was awarded the Nobel Peace Prize last year for his work on new high-yielding varieties (HYV) of grain.² The Green Revolution is usually thought of narrowly as the current, accelerated growth in Third-World grain production which results from combining the new seeds --mostly wheat and rice-- with heavy applications of fertilizer and carefully controlled irrigation.³ Few have stopped to ponder why Borlaug's prize was for peace and not biology. Yet such meditation is called for because the story of the Green Revolution is far more than one of plant breeding and genetics. It is woven into the fabric of American foreign policy and is an integral part of the postwar effort to contain social revolution and make the world safe for profits. When understood in this broader perspective, the Green Revolution appears as the latest chapter in the long history of increasing penetration of Third-World agriculture by the economic institutions of Western capitalism. Thus the term Green Revolution encompasses not only the increased output associated with a new technology but also the political, economic, and social changes which have produced and accompanied it.

The story of the Green Revolution began in 1943 when the Rockefeller Foundation sent a team of agricultural experts, which Borlaug joined a year later, to Mexico to set up a research program on local grains.⁴ The Foundation's interest in Mexico at the time was stimulated by at least two factors. First was the recent expropriation of the Rockefellers' Standard Oil interests by Mexican President Lazaro Cardenas in 1939. Second was the wartime bid of the Nazis to expand their influence in the hemisphere. The friendly gesture of a development project would not only help soften rising nationalism but might also help hang onto wartime friends.

The research program was not long in paying off with practical results. By 1951 rust-resistant wheat strains were being widely distributed, and a new wheat/fertilizer package was developed that gave high yields in the newly opened irrigation lands of Mexico's northwestern deserts.⁵ This initiated a rapid growth in overall wheat yields, which rose from some 770 pounds per acre in 1952 to some 2,280 in 1964.⁶ In the newly irrigated areas alone, using all the necessary inputs, yields climbed to over 2,900 by 1964.⁷ This increase in yields, coupled with expansion of acreage, caused dramatic jumps in total wheat production throughout the 1960s.⁸ Mexico, which had been a sizable net importer of wheat at the time of the Rockefeller team's arrival, was able to achieve "self-sufficiency" by the early 1960s and began to export a portion of her crop.⁹

Over the years the Mexican research project grew from a small team to a large organization: the International Center for the Improvement of Corn and Wheat (CIMMYT), which became the nucleus not only of international programs of research but also of the training of Third-World technicians from many different countries.

As the Mexican wheat research began to produce returns and as Mexico became, for many reasons, a less antagonistic neighbor, the Rockefeller Foundation began to focus its concern with agricultural development on the Far East. There, crisis after crisis was threatening capitalist interests. The victory of the Chinese Communists in 1949 had brought to an end decades of effort, largely private, to “save” China. Like many others, the Rockefellers saw their pet projects, such as the Peking Union Medical College, disappear behind the Bamboo Curtain.¹⁰ In the early 1950s while U.S. troops were fighting in Korea, much of Southeast Asia was alive with rural guerrilla war. In Malaysia the British were fighting Communist insurgents. In the Philippines some observers thought the Hukbalahap were close to victory. In Indochina the French were rapidly losing ground.

These developments were a serious worry to the foreign policy makers of the U.S. elite.¹¹ The immediate problem was Communist revolution. This they could and did fight with military force --war in Korea, military aid to the Filipino government and to the French. But some, including the Rockefeller Foundation, were worried about a basic cause of revolutionary upheaval: the conflict or contradiction between a rapidly growing, poverty-stricken population and the inability of colonial and neocolonial capitalism to provide enough food. They saw that the outgrowth of this contradiction, hunger, was a major Communist ally in Asia and that one way to fight it would be with food.

This association between food production and anti-Communism was quite conscious. Though it may seem a bit unsophisticated today, when anti-Communism is called humanitarian intervention in the academic community, during the 1950s the relation was discussed quite openly. “The major problem in the struggle to keep South and Southeast Asia free of Communist domination,” wrote Fulbright scholar John King in *Foreign Affairs* in 1953, “is the standard of living of their peoples The struggle of the ‘East’ versus the ‘West’ in Asia is, in part, a race for production, and rice is the symbol and substance of it.”¹²

Nor was this view new. Food was already an old weapon in the anti-Communist arsenal of American capitalism. After the First World War Herbert Hoover had wielded food relief against “Bolshevist insurrection” in Eastern Europe --sometimes offering, sometimes withholding food aid to support anti-Communist forces.¹³ Toward the close of the Second World War the United States funneled food and other economic aid to Chang Kai-shek in China through the United Nations Relief and Rehabilitation Administration. At the end of the war, major food aid was sent to France and Italy to help stave off famine and growing Communist-led unrest. After the initial emergency shipments, food was kept flowing to a shaky Europe through the Marshall Plan. These aid-financed exports subsidized U.S. farm prices, and production soared.

In the early 1950s when aid fell off, commercial demand failed to grow apace. The result was rapidly accumulating surpluses and sagging food prices. A struggle over farm legislation ensued between those farmers who wanted support prices and those free traders of the elite, inside and outside the State Department, who feared the impact on world markets, and hence on Third-World stability, of high U.S. prices and subsidized dumping. The immediate outcome for several years was that the farmers got their support prices and the surplus problem grew. But in 1954 the elite got Public Law 480 which put a new food weapon into their not unwilling hands.¹⁴ Hubert H. Humphrey, one of those most responsible for P.L. 480, saw its potential this way: “I have heard . . . that people may become dependent on us for food. I know that was not supposed to be good news. To me that was good news, because before people can do anything they have got to eat. And if you are looking for a way to get people to lean on you and to be dependent on you, in terms of their cooperation with you, it seems to me that food dependence would be terrific”¹⁵

P.L. 480 was used to support short-term U.S. policy objectives, both domestic and foreign, but it also bought time for more long-term solutions to be found to the problems of hunger and social unrest in the Third World.

Indeed, while Congress was still arguing about surpluses and food relief, John D. Rockefeller III and the Rockefeller Foundation were already hard at work setting up new research and training programs to help find those solutions. In 1953, J.D.R. III set up the Agricultural Development Council to provide a special focus and analysis capability for the training of foreign (mainly Asian) agricultural economists and managers.¹⁶ The goal was to complement the

CIMMYT technicians with higher-level technocrats, who would be trained largely at U.S. universities or by ADC financed professors from the United States. The hope was that these students would take over agricultural policy-formulation in their home countries, and, with the help of their teachers, mold the rural economy into forms compatible with technological change and social stability.

That same year J.D.R. III made a survey trip to the Far East, with Dr. William Myers, Dean of the Cornell University School of Agriculture. Soon after his return the first ADC advisors were dispatched to Asia to set up new programs in the universities and to ferret out promising young students for stateside training. The ADC is small in terms of the absolute number of personnel and students it supports, but, together with Foundation fellowships and AID participant training, it has helped coordinate much thinking on agricultural development strategy and on foreign student training for Southeast Asia.¹⁷

During this same period the Ford Foundation also became more directly involved with molding Asian agriculture - -mainly in India. The Foundation moved with money and people into the Indian Community Development Program and began to support agricultural research and education. The Rockefeller Foundation also began work in India by sending agricultural experts to work on corn and sorghum.¹⁸

The decade that followed the founding of the ADC and the introduction of a new private American presence in Asian agriculture and Asian universities saw many changes in the open struggle for Asia. The guerrillas were temporarily beaten in Malaysia and the Philippines. Half of Korea was lost, and in Indochina American troops replaced the vanquished French. In Indonesia, leftist Sukarno expropriated Dutch private business and was closing that country to most foreign investment. Though the focus had shifted somewhat, there was no let-up in the anti-capitalist movements for national liberation.

It was against the background of this changing challenge to capitalist primacy that the Rockefeller and Ford Foundations decided to expand their agricultural research operations in Asia. In 1960 the Ford Foundation, with the approval of the Indian government, initiated the Intensive Agricultural Districts Program (IADP).¹⁹ This project, which focused on the most modern, the most creditworthy, and the richest farmers in the most prosperous regions laid the pattern for most subsequent efforts in that country, including the Green Revolution. In 1961 the Rockefeller Foundation created a new research program to study millet in India, and in 1962 the two foundations joined forces to found the International Rice Research Institute (IRRI) in the Philippines to develop new strains of Asia's major food crop. This new breeding project, the largest and best financed of all, gave results even quicker than the Mexican effort. Within barely three or four years "miracle" rices of all sorts were boosting yields in the Philippines. Like the Mexican wheats, the new rice varieties were dwarfs and they had similar stringent requirements for fertilizer and irrigation.²⁰

As at CIMMYT, young technicians were trained in the fields of IRRI. These plant breeders --students and teachers-- of IRRI, of CIMMYT, and of the country projects, together with the agricultural economists schooled under Foundation, AID, and ADC auspices, formed more than a group of highly trained individuals. They made up an international team of experts ready and willing to spread the seeds and policies of the Green Revolution throughout the Third World.

Much of the country work, such as the Intensive Agricultural Districts Program, was crippled both by lack of any new technological breakthrough and by the lack of government financial support for agricultural development. The new seeds from CIMMYT and IRRI would soon provide the needed technology, and a major shift in U.S. government-aid policy would soon force a change in the attitude of local government.

The shift came in 1966 when Lyndon Johnson announced that future shipments of "Food for Peace" under P.L. 480 would be subject to stringent new conditions. Deliveries would depend on the willingness of receiving countries to shift emphasis from industrialization to agricultural development, to expand or institute population control programs, and to open their doors to interested U.S. investors.

The crunch came with the application of this new policy to India during the droughts and famines of 1965-1967. Successive droughts brought about major food shortages, and U.S. capital was knocking at the door with plans for new fertilizer plants and demands for control over prices and distribution. Faced with upheaval at home and

Johnson's intransigence, the Indian government opened its doors, through which flowed U.S. capital and most of the Green Revolution.²¹

How much success has the international team had since 1966 in spreading the new technology? The results have been mixed.²² In Mexico today almost 100 percent of wheat acreage is under high-yielding varieties. Elsewhere they have succeeded in expanding the Third-World area devoted to new wheat grains from some 23,000 acres in the 1965/66 crop year to about 24,664,000 acres in 1969/70 (see table 1) . Acreage planted to new varieties of rice expanded from 18,000 acres to 19,250,000 in the same period (see table 2, p. 87) . The biggest acreages have been in India, West Pakistan, and Turkey for wheat; and in India and the Philippines for rice. West Pakistan and the Philippines have seen the greatest relative change. About 46 percent of West Pakistan wheat and some 43 percent of Philippine rice lands have been planted to the new varieties. In India and Pakistan, the growth rates of wheat production have increased dramatically, rising from 4.8 and 9.7 percent respectively in 1963/65 to 10.2 and 18.6 percent during the period 1967/70. In the Philippines, the growth rate of rice production has risen from 2.9 percent to 8.4 percent during the same periods.

Table 1
Extent of Spread of New Wheat Varieties

Country	HYV1 Year	(acres)	Total2HYV (acres) as %	%
Afghanistan 3	1968/69	360,800	5,199,000	6.9
India	1969/70	15,100,000	41,066,000	36.8
Nepal		186,500	494,000	37.8
W. Pakistan	"	7,000,000	15,361,000	45.6
Iran		222,400	11,609,000	1.9
Jordan	1968/69	230	405,000	0.1
Lebanon	1969/70	4,200	148,000	2.8
Turkey		1,540,000	20,995,000	7.3
Algeria		12,400	5,311,000	0.2
Morocco	"	98,800	4,792,000	2.1
Tunisia		131,000	2,717,000	4.8
Guatemala		7,400	99,000	7.5
Twelve-Country Total		24,664,000	108,397,000	22.8
Capitalist Third World Total'		24,664,000	145,644,000	16.9

1. HYV acreage from Dalrymple, *Imports and Plantings*, pp. 9-10.

2. Total acreage was taken from FAO, *Production Yearbook, 1970*. These data were used instead of Dalrymple's because they allow direct calculation of Capitalist Third World Total.

3. Afghanistan data in Dalrymple are dated inconsistently, so above figures may not be correct (pp. 9 and 35).

4. Definition of Capitalist Third World: South America, plus Guatemala and Honduras, plus Asia, plus Africa. Definition thus covers most of what is called the Third World, minus the Communist states and Mexico.

The output of rice and wheat has been successfully raised in these three countries, but it is also true that the overall impact, both in geographic area and in total food output, has been much less impressive. For the capitalist Third World as a whole, only about 17 percent of its wheat and 8 percent of its rice acreage have been affected. In most rice- or wheat-growing countries the affected acreage is well under 10 percent of the total. Furthermore, in many areas rice and wheat are only minor parts of the diet of the poor. This means that even where there has been success, the poor may be the last to benefit from the new production. For example, in Mexico the peasant's diet is based on corn, in southern Asia on beans. These factors suggest, though more research is needed, that in many ways and in many areas the Green Revolution may be little more than a palace revolt.

Table 2
Extent of Spread of New Rice Varieties

Country	<i>HYVI</i>	<i>Year</i>	<i>Total2</i> (acres)	<i>HYY</i> (acres)	<i>as %</i>
Ceylon		1969/70	65,100	1,620,000	4.0
India		“	10,800,000	93,119,000	11.6
Nepal			123,000	2,964,000	4.1
Pakistan			1,890,700	29,640,000	6.4
Burma			355,900	11,856,000	3.0
Indonesia			1,850,400	20,345,000	9.1
Laos			4,940	223,000	0.2
Malaysia (West)			316,000	1,272,000	24.8
Philippines			3,345,000	7,842,000	42.7
S. Vietnam ⁷			498,000	6,224,000	8.0
Ten-Country					
Total			19,250,000	177,105,000	10.9
Capitalist Third					
World Total 4			19,250,000	523,148,000	8.3

1. HYV acreage from Dalrymple, *Imports and Plantings*.

2. Total acreage taken from FAO, *Production Yearbook, 1970*. These data were used instead of Dalrymple's because they allow direct calculation of Capitalist Third-World total.

3. What these figures represent is anybody's guess!

4. Definition of Capitalist Third World taken from FAO classification: North and Central America, minus Cuba and the United States, plus South America, plus Asia, minus Taiwan, Japan, North Vietnam, plus Africa. Definition thus covers most of what is called the Third World, minus the Communist states.

5. Probably understated due to development of unreported new varieties, e.g., in Thailand.

Markets and Profits

But if increased food production has been the principal thrust of the new strategy it has not been the only one. Closely tied to the effort to increase output has been the transformation of agrarian social and economic relations by integrating once isolated areas or farmers into the capitalist market system. This “modernization” of the countryside, which has been an important part of so-called nation-building throughout the postwar period, has been facilitated by the dependency of the new technology on manufactured inputs. The peasant who adopts the new seeds must buy the necessary complementary inputs on the market.²³ In order to buy these inputs he must sell part of his crop for cash. Thus the international team widens the proportion of peasant producers tied into the national (and sometimes international) market as it succeeds in pushing the new technology into the hands of subsistence farmers. Obviously in the case of commercial producers, adoption only reinforces existing ties to the market.

These development experts, however, apparently feel that widening the market by pushing new inputs is not always enough. Along with their recent admiration for the “progressive” peasant who jumps at any opportunity to grow more, they have been making an effort to teach personal gain and consumerism. In his widely read handbook, *Getting Agriculture Moving*, ADC president Arthur T. Mosher insists on the theme of teaching peasants to want more for themselves, to abandon collective habits, and to get on with the “business” of farming. Mosher goes so far as to advocate extension educational programs for women and youth clubs to create more demand for store-bought goods. The “affection of husbands and fathers for their families” will make them responsive to these desires and drive them to work harder.²⁴

A new study by another elite group, Resources for the Future (RFF), done for the World Bank on agricultural development in the Mekong Basin, also recommends substantial efforts to change the rural social structure and personal attitudes of peasants in such a way that new capitalist institutions can function more efficiently. The RFF, like others before it, suggests massive doses of international capital and more Western social scientists to help bring about the necessary changes.²⁵ These tactics of the ADC and RFF are more than efforts to bring development to rural areas. They are attempts to replace traditional social systems by capitalism, complete with all its business-based social relations.

International agribusiness is also interested in the sale of inputs peasants. Bilateral and multilateral financing for complementary irrigation systems, fertilizer and tractor imports, and joint production ventures have long provided large profits to these firms.²⁶ Local government grain-support prices, overvalued currencies, and special tariff structures have cheapened the costs of imported inputs and have helped increase sales. These firms now see in the Green Revolution, based as it is on many inputs, a new source of profits. Adoption of the new technology means growing needs for fertilizer, irrigation equipment, pesticides, herbicides, and other inputs. International agribusiness is more than ready to invest in the effort to stave off hunger and save lives-at a profit of course.

Many Green Revolutionists have had an eye on international corporate profits all along. Lester Brown has hailed the multinational corporation as “an amazingly efficient way of institutionalizing the transfer of technical knowledge in agriculture.” He sees international agribusiness as a major source of new investment in both inputs and international marketing. He approvingly cites Johnson’s opening of India to foreign capital and raves about ESSO’s wide-flung agro-service centers in the Philippines. He even glows over the expansion of the old octopus, United Fruit Company, into Colombia and its “strategic contribution” in “providing access to external markets through its global marketing system.’²⁷

Nicholas Philip, executive director of a multinational agribusiness consortium, reports a “renaissance” in international agribusiness. The “highly profitable” plantations of the past will be replaced with newer but no less profitable forms of exploitation. Philip sees new opportunities not only for input sales and for consulting and construction firms in the development of supportive infrastructure, but also in output marketing of rising production.²⁸

In Jalisco, Mexico, an experiment financed by AID is underway to involve foreign private capital investment in a new kind of corporation, which would provide inputs to “independent” peasants and then market their combined output (in this case corn). Such a corporation is designed to earn an annual income of 50 percent on equity after the third year. Its involvement in “fighting hunger” is expected to provide a good public relations cover to the foreign capital involved.²⁹

Will the Green Revolution turn out to be a profits bonanza for international business? If the aid lobby, which includes those elite institutions responsible for the Green Revolution, succeeds in increasing economic aid appropriations for agricultural development, as recommended in several recent studies, then input sales and profits will probably rise, though they will continue to be financed more through foreign aid than through direct commercial contracts. But for all the best-laid plans of apologetic economists and corporate planners, exploitation is not always an easy business and market creation can be costly. ESSO has recently sold its oft-cited fertilizer distribution network in the Philippines because of low profits.³⁰ And despite all the arm-twisting in India, the actual amount of foreign investment in fertilizer has been rather limited. So far, the overall increase in input sales to countries adopting the new technology seems to be far less than expected, and the marketing of food grain output almost nil. It seems unlikely, at least for the next few years, that international agribusiness will be able to move into Third-World grain marketing in a big way. The most profitable of the new international investments in agriculture are not in food grains. They are in traditional export crops like meat, oil palm, and fruit and vegetables. These products not only have higher demand elasticities but their processing can be geared to locally abundant low-cost labor.³¹

We have now seen that the Green Revolution has been paid for and staffed by some of the major elite institutions of the American ruling class. The goals of this agricultural strategy based on a new technology are to increase social stability, spread capitalist markets into rural areas, and create new sales and investment opportunities for multinational agribusiness. So far the Green Revolution has been successful in raising food output in only a few countries. The immediate payoffs in terms of increased corporate investment and sales have also not been as great as hoped. On the other hand the new technology has been partially successful, and there have been sizable increases in food production in a few of the largest and most important of the Third-World countries.

How much this increased output will insure stability in those countries, however, remains very much in doubt. For, as I shall try to show, in the very process of trying to resolve one contradiction of neocolonialism, the Green Revolutionists appear to be creating or accentuating a whole series of other contradictions. These latter are threatening not only national social stability and the future of imperial economic relations between the developed

countries and the Third World, but may also be jeopardizing the fundamental ecological balance of many agricultural areas.

2. The Effects of the Green Revolution on the Contradictions of Capitalist Development

The simultaneous existence of poverty and wealth, side by side, is a fundamental characteristic of capitalism. That unevenness, which results from investing where the private rate of return is greatest—what John Gurley has called “building on the best” is a well known phenomenon, and the Green Revolution is now intensifying this pattern in the Third World.³²

Contradictions between Regions

By breeding new grain varieties that require carefully irrigated land for maximum results, the Rockefeller scientists insured that only limited areas of Third-World agriculture would benefit. This was partly due to their concentrating on the best potential lands. It was also because within capitalist systems there is little hope of reversing the dictates of “efficiency” by transferring wealth from rich regions to poor ones. Irrigated land represents only a small proportion of the total cultivated land in most countries, and well-controlled irrigation as even rarer. The resulting regional bias of the new technology has been obvious from the beginning. In Mexico the new wheats were planted overwhelmingly in the new irrigated districts of the Northwest, and it has been this area alone which is responsible for the rapid growth in wheat output. The rest of the country, where most of the people live, has remained virtually untouched by the new varieties.³³ India has only some 20 percent of her cultivated land under irrigation, and only about half of that has assured water supplies. The adoption has thus been concentrated in the North and Northwestern states like the Punjab where irrigation facilities are concentrated.³⁴

In Turkey, wheat adoption has been limited to the coastal lowlands where irrigation and high rainfall have given good results. But these wheatlands account for only about 15 percent of Turkey’s total acreage. The traditional wheat area of the country is the vast dry Anatolian plateau which, like the poverty-stricken East, has not benefited at all from the new package.³⁵ In Thailand, where local research has produced new rice varieties similar to IRRI strains, their use has been largely confined to the central lowlands and has not reached into the large northern and northeastern areas.

The most striking case of uneven regional development being exacerbated by the Green Revolution is that of Pakistan. In West Pakistan, where nearly all the cropland is under controlled irrigation, the spread of the new wheats was very successful. There has been hardly any success in flood-irrigated Eastern Pakistan (now Bangladesh). The result has been to transform the West into a food-surplus area while leaving the East heavily dependent on food imports and its people a greater relative poverty than before.

In all of these countries the Green Revolution is benefiting those regions which are already the most developed and neglecting the poorest and least developed areas. Moreover the prospects for future extension into these latter areas are not very promising. There has been some work but very little success with the development of new varieties adaptable to dry or flood areas.³⁶ So far no major breakthrough has appeared that is capable of resolving the contradiction of uneven regional development. There are sizable cultivated areas in many of these countries that could be brought into irrigation if enough resources were invested in costly major waterworks, but the time lag for such projects is long, even if funds can be found. Furthermore, rising productivity in the already developed areas is beginning to flood the market and make such extensions “inefficient.” Flood control and irrigation works are possible for East Pakistan but its recent bloody birth as an independent Bangla Desh may put off any such major works for quite a while. Prospects for northeastern Thailand are poor. Even with the eventual development of the Mekong basin the terrain and soils are such as to make successful adoption of the new technology highly unlikely.³⁷ The spreading use of tubewells will increase both the efficiency and scope of irrigation, as it has already done in the Pakistani and Indian Punjabs. But it is doubtful that even this more versatile approach will ever reach the majority of cultivators. It seems more likely that the bulk of current drylands and flooded areas will be unable to develop the irrigation and drainage facilities necessary for a long time to come.

Contradictions Between Classes

Just as the Green Revolution appears to be accentuating the regional contradictions in capitalist development, so also is there evidence that it is intensifying inequalities within the regions it has affected directly. It is frequently claimed that larger farms and wealthier farmers have profited most from the new technology.³⁸ It is true that foundation and government officials often turned first to established, commercial farmers for initial field trials.³⁹ Since then, following wider adoption, the case is not so clear. The diffusion models used to study the existence of such a bias have appealed to both socio-psychological and economic phenomena. The results of numerous studies on both rice and wheat have been far from unanimous, but if there is a trend it is that “them what has gets.”⁴⁰ This usually does mean larger, commercial farmers ⁴¹ but it has also meant small peasants close to extension and market centers,⁴² and sometimes tenants where landowners have supplied financing.⁴³ At least two of the studies show that in some areas where the initial adoption rate was higher for larger farmers, there was a rapid catching up by others.⁴⁴ The problem with most of these studies is that they concentrate on the diffusion of the new seeds alone, whereas the real question is that of the package. There is some indication that, while more wealthy farmers may not use a higher percentage of seeds, they do use more of the complementary inputs.⁴⁵

How representative these studies are is hard to judge, but they do indicate that, while the new combination of inputs is largely neutral with respect to technical economies of scale, there are other costs like financing and education which are not. That capital is more cheaply borrowed by the rich and that they get more education is hardly new. In the case of the Green Revolution it may well account for much of the evidence of bias toward the wealthy.⁴⁶

For those wealthier farmers who can adopt the new grains and afford all the complementary inputs, the change can be a very profitable one. A study by AID shows impressive differentials in average cash profits between traditional and new methods. For example, it shows 157 and 258 percent increases in returns over cash costs per acre in the Philippines and India respectively. Over all, the study concludes that per acre returns over cash costs have been about doubled by the use of the new technology (rice in this case).⁴⁷ This is obviously quite a generalization to make, since profits are directly related to grain-support prices and input prices, and both of these have varied considerably over time and between countries. Nevertheless it seems safe to make the tentative assumption that sizable profit rates have been earned by many of the adopters, and for the larger commercial farmers this probably means enormous absolute profits. Viewed together with the higher adoption rate for the entire package by large farmers, the implied greater profit differential suggests that the Green Revolution is resulting in a serious increase in income inequality between different classes of farmers in those areas where it is being adopted.

Wolf Ladejinsky claims that in the Indian Punjab such high profits have resulted in an increased demand for land, which has driven its price up as much as 500 percent. There is a growing effort, he says, by landlords to acquire more land and to convert their tenants into hired laborers, in order to reduce their costs.⁴⁸ A recent study of the Punjab shows that very big farmers (over 100 acres) have been increasing their holdings for some time: about 40 percent between 1955/56 and 1967/68.⁴⁹ There are very few data to either support or deny the asserted growth in tenant evictions, though the existence of such phenomena is neither new nor limited to the Green Revolution.⁵⁰ The claim has been repeated by many observers, and under some situations it does seem to be an optimal strategy for a landlord trying to maximize his own profits. To the degree that it is occurring, such a change could have significant implications for the class structure of the countryside. A shift from a quasi-feudal structure of tenancy and sharecropping to a concentration of land in large operational units dependent on wage labor suggests a trend toward some variation of the classical capitalist two-class dichotomy.

With the growth of a rural proletariat, which is already very large in India, there is also swelling the “reserve army” of the unemployed. For, encouraged by increasing profits and new land acquisitions, capitalist farmers are accumulating more and more of their capital in the form of mechanical equipment. Investment in such capital is also being encouraged by the structure of relative input prices. Overvalued currencies and government subsidies have sharply reduced the relative cost of equipment to farmers often considerably below world prices. “Labor shortages” in some Green Revolution areas are also accentuating this trend by raising cash wage rates.⁵¹ Mechanical pumps, tractors, threshers, reapers, and combines all contribute to raising yields and output; but there is considerable evidence that their net effect in employment is labor-displacing. These labor-displacing effects are tending to offset the much heralded positive impact on labor utilization caused by the new seed-fertilizer package. In the absence of mechanical equipment, the new technology not only requires more labor for planting and cultivation, but by increasing output and in some cases permitting double cropping, there is a considerable increase in harvest-labor requirements.⁵² The effect of mechanization varies, but the impact of reapers, threshers, and combines during harvest periods will be far more dramatic than that of irrigation pumps and tractors used for land preparation and

cultivation.⁵³ This is not only because the absolute number of men displaced will be higher during harvest, but also because harvest has been the one period of relatively sure employment for the seasonally unemployed rural laborers.

The overall outlook indicated by the various available studies points in the direction of considerable increase in rural unemployment in those areas where mechanization proceeds rapidly. This effect, especially if combined with the eviction of an appreciable number of tenants, will generate a growth in both the size and insecurity of the rural landless labor force. Some of the displaced workers may fall back on other rural areas, joining family members or finding their own subsistence holdings. Such a movement would intensify subsistence farming in less advanced areas and increase the poverty there. It also seems likely that such intrarural migration will simply tend to expand the prevalence of an unemployed wage-labor force rather than dissipate it in a return to subsistence farming.

If this is so, then growing numbers of the unemployed will leave the countryside and join the migration to the cities, swelling the urban slums. This movement, coupled with the inability of neocolonial capitalism to create urban jobs through industrial growth, is affecting the class structure of the cities.⁵⁴ The rising tide of urban unemployment threatens to transform an already large urban "reserve army" into a vast and permanently unemployable lumpenproletariat which will swamp even the new rush by multinational corporations to capitalize on cheap foreign labor.

This is part of the specter that has produced urgent rounds of discussion of land reform and mechanization policy among the elite planners of the Green Revolution. Sharply differing points of view are currently generating a heated debate on proper policy. On one side are those who think that nothing can really be done to slow down the trends in land tenure and mechanization, even if it were desirable. Mechanization is already a fact, they argue, and it is helping increase production, which is the primary aim of the Green Revolution. Land reform is impractical because the landed elite still hold too much power and can block any effective legislation. Whatever problems of unemployment may exist should be dealt with in separate programs like rural public works.⁵⁵ On the other side are the reformists, either too optimistic or too scared to give up hope. Mechanization still has a long way to go, they say, and most labor-displacing equipment is imported and could be blocked by prohibitive tariff duties or local taxes which would equalize private and social costs. (Worries about the mechanization problem are leading some of the economists working on the problem to begin to damn the funding agencies which go on financing equipment imports, and the "production is our business" attitude of international agribusiness when they are reproached for selling labor-displacing equipment.) Land reform must also be achieved because, even with the development of rural workshops (to make tubewell pumps and equipment geared to bullock power) and public works, there simply will not be enough jobs.⁵⁶

Bruce Johnston, one of the most concerned advocates of this second position argues that the choice is narrow. Either land reform and tariffs are imposed, which he believes would enable agricultural development along the lines of Japan and Taiwan, or the current trend will continue toward a "Mexican" model of a countryside sharply divided between prosperous mechanized commercial farms and poor subsistence farms.⁵⁷ The ultimate decisions about policies to be followed are, of course, out of the hands of the worried academics. Their role is to estimate the trade-offs to the ruling class. But one indicator of the seriousness with which the ruling class is listening to the debate is the large amount of new money now being poured into pertinent research by the foundations, AID, the OECD, the UN, and the World Bank.

At present there has been little reverse movement either with respect to capital costs or to land reform.⁵⁸ Pakistan recently abandoned its 50 percent subsidy of fertilizer-not a labor-displacing input. The Philippines have passed another land-reform law which appears no more effective than those which went before it. The United States and the puppet regime in Saigon have recently introduced a land reform as part of their war effort. What effect it will have and how far it will be carried is still unknown.

There has been no substantial recent land reform at all *in* the other major countries affected by the Green Revolution. Indeed, in some countries the discussion of land reform without action may have hastened the process of tenant eviction.⁵⁹

Contradictions in Price and Trade Relations

The Green Revolution countries are now experiencing, perhaps more fully than ever before, one of the fundamental contradictions of capitalist agriculture: in order to achieve higher output of rice and wheat, their prices must be kept high to make the necessary investment profitable to farmers. This has been, and is being, done. But by maintaining high support prices the government also keeps consumer prices up and encourages surplus accumulation. High consumer prices are a cost of living increase that hits all of those who must buy food for cash. But it does not hit all classes equally. In India, for example, lower-income groups often pay more than the rich for the cereal foods that make up so much of their diet.⁶⁰ Thus, price supports hurt the wage-earning rural and urban poor the most. The rising money wage rates mentioned earlier for rural laborers correctly indicate a shift in relative capital/labor costs, but they do not necessarily mean workers are better off or are sharing in the benefits of the Green Revolution. Burdhan has shown that in much of the heartland of the Indian Green Revolution, real wage rates have actually been declining.⁶¹

Any fall in support prices, however, will result in decreased incentives to capitalist producers and a likelihood of reduced output. Such a fall will hit the poorer peasants with narrower profit margins more than the big commercial adopters of the whole new package. Sufficient decline might well push many of these small producers back into subsistence farming or off the land. Rising production must be either sold domestically or exported to avoid downward pressure on prices and surpluses. The chances of substantially raising the incomes of the millions of rural and urban poor, through employment or welfare programs in order to increase domestic demand sufficiently to absorb the rising production, is out or the question. Unemployment is getting worse, not better, and the size of the welfare program needed would bankrupt the United States, not to mention the countries of the Third World.

Because of this, it is increasingly being said that continued success of the new agricultural strategy will depend on the readiness of the developed countries to import the increased grain production of the Third World.⁶² As Third-World imports are being replaced with surpluses, only the rich countries appear to have the potential effective demand to absorb the excess. But there is little reason to believe that these countries are about to open their doors to food grains from abroad when they themselves are major exporters. It is the entry of Japan's highly subsidized rice exports (two-and-a-half times the world price) and substantial increases in U.S. rice exports (also subsidized) which are major factors in the growing glut on the international rice market. "Rice prices have declined to the lowest levels of the past decade and a half, and export earnings from rice of the developing countries have been drastically reduced."⁶³ The share of the underdeveloped countries in world rice exports has *dropped* from 66 percent in 1959/63 to only 45 percent in 1969, while that of the imperialist countries has *risen* from 19 percent to 40 percent in the same period.⁶⁴ And an unnoticed Green Revolution has been taking place in the imperialist countries that has been upsetting the wheat market. Yields have been rising for both traditional importers and traditional exporters.⁶⁵ England has drastically reduced her imports. Production has been rising in Canada, the United States, and Australia, all traditional exporters. Rather than the Third-World countries turning to the developed world for markets, the opposite is taking place. Canada, for instance, faced with declining markets in Europe has increased her shipments to the Third World.⁶⁶

Substantial amounts of exports from the developed countries are concessional, and Thailand has charged that they are cutting into her traditional markets. Those behind the new agricultural strategy may ask their colleagues in the grain-production business to give up their favorable trade position, but they are unlikely to get such a gift. This extreme difficulty in increasing exports which faces the governments of the newly adopting countries is bound to increase the tensions and contradictions between them and the elite in the United States. The latter have helped initiate the increases in production and are now faced with the need for a sacrifice they are unwilling to undergo.

If the Third-World governments are forced to strangle the Green Revolution by lowering prices radically to avoid surpluses and budget deficits, we have an idea of what could happen. Marginal producers for the market may be pushed back into subsistence, and further spread of the new technology would be limited. The widespread hopes stimulated by the new programs would be demolished either slowly or all at once. It is hard to imagine that such a development would be met without resistance by the increasingly aware and politically active elements in the countryside.

Ecological Contradictions

The most difficult to foresee but the most potentially devastating of all the contradictions of the Green Revolution are those involving the ecosystem.⁶⁷ The Green Revolution is basically an extension of capitalist agriculture to the

tropics. That agriculture brings with it all of the serious ecological contradictions that we have been discovering in the United States. These contradictions are more than just technical problems, because the technology itself is a product of the capitalist economic system. Pesticides, for example, which are widely required in heavy doses for the new varieties, are primarily developed in the laboratories of private business. Their efforts to minimize research costs and to reach as large a market as possible are dictated by capitalist competition. The resultant products are both under tested and designed to kill a broad spectrum of pests.⁶⁸ The lack of kill-specificity is bad enough in the United States; when transferred to the much more complex tropics the results can be catastrophic. It is one thing to kill a few bald eagles. It is quite another to poison fish ponds and their protein supply while spraying rice fields.⁶⁹ The run-offs from the heavy inorganic fertilizer applications called for by the new technology will also add to the process of protein destruction, since they result in massive eutrophication of lakes, streams, and rivers.

The rapid distribution of a few new plant varieties has created the danger of oversimplified ecosystems. The recent Southern Corn leaf blight in the United States is an example of what may be in store for Green Revolution areas during the upcoming race between the breeders and the pests. There were over 50 percent losses in many areas of the Gulf states and a one-billion-dollar loss to the country as a whole when the leaf blight struck. The vulnerability of the crop was apparently due to the efforts of commercial hybrid breeders to reduce labor costs involved in detasseling of corn plants. They used a particular kind of sterility gene which eliminated the need for detasseling but also conferred susceptibility to the leaf blight.⁷⁰ Serious problems of this kind already impeded wheat production in Turkey in 1968 and 1969. The Philippine rice boom was set so far back in 1971 by a virus disease that rice will have to be imported.⁷¹ The United States can afford a limited number of such "mistakes"; the Third World cannot. When such crises arise it is already too late for that season. The team of breeders may patch things up for next season, but patchwork won't solve the basic problem of having food production tied to a profit-maximizing system where the input manufacturers profit but don't have to bear the costs of error. These contradictions are serious ones and cannot be dismissed, as the Rockefellers' Nobel-Prize-winning plant breeder Norman Borlaug has recently done, as a "vicious, hysterical campaign against the use of agricultural chemicals."⁷²

If the peoples of the Third World are to avoid widespread ecological crises, they must be freed from a system that insists on selling them its most deadly technology. Whether the Third World accomplishes this before the ecological contradictions of the Green Revolution negate all of its successes remains to be seen.

To summarize: (1) The Green Revolution is the creation of the U.S. elite, which has succeeded in building an international team of experts to spread the new technology that its dollars have developed. (2) The avowed goals of this agricultural strategy are to increase social stability, spread capitalist market institutions into rural areas, and create new market and investment opportunities for multinational agribusiness. (3) The Green Revolution has been limited to a few countries but has resulted in substantial aggregate production gains in those countries where it has been successful. (4) The adoption of the new technology and the resultant increases in production are accentuating the contradictions between adopting and nonadopting regions within the successful countries. (5) Within adopting regions there is evidence that it is the larger, wealthier, commercial farmers who have benefited most, and this is exacerbating contradictions between social classes, as tenants are driven off the land and employment possibilities are threatened for the rural, landless laborers. (6) The growth of unemployment in the countryside in turn threatens to result in increased migration to the cities and the creation of a vast unemployable lumpenproletariat. (7) The high support prices necessary to the success of the Green Revolution are intensifying the contradiction between consumer needs and producer profits. Successes in raising output are creating new tensions between potential ThirdWorld exporters and the developed countries, as the latter refuse to reverse their grain-trade position. (8) By tying increases in food output to a technology heavily dependent on environmentally disastrous chemical inputs, the new output gains, as well as the entire food-producing ecosystem, are endangered.

3. The Political Impact of the New Strategy

The most important effects of the Green Revolution on political tensions might be grouped into four categories: intensified regional conflict, changes in the forms of rural class struggle, the swelling of the urban lumpenproletariat, and the speed-up of the pace of change.

There can be little doubt that while the Green Revolution didn't cause the electoral victory of the Awami League in East Pakistan in 1971, it certainly added to the regional bitterness which did. The differential regional success of the new technology came on top of a history of exploitation of the East by the West. This exploitation has been

accomplished through capitalist institutions in a kind of internal imperialism. The Bangladesh revolt is that of one distinct group against another which cuts across class lines.

Are there more general lessons in this experience? How important for the prospects of revolution is the factor of regional exploitation and neglect? Eric Wolf has commented on the important role of “frontier areas” in his studies of revolution in Mexico, Vietnam, Algeria, and Cuba.⁷³ Today we can see this tendency to revolt by neglected or exploited regions within many of the Green Revolution countries: Bangladesh in Pakistan, Assam and West Bengal in India, the North and Northeast in Thailand, the North in Malay, West Irian in Indonesia, Guerrero in Mexico, as well as in countries untouched by the Green Revolution such as Eritrea in Ethiopia, the South in the Sudan, and the North in Chad. Ethnic and linguistic differences are also present in many of these cases and unquestionably add to the tensions. The potential of such regions as base areas for rural revolution in the rest of the country would seem to vary in relation to the degree of separateness involved. Where regions are isolated geographically, like Assam, West Irian, or East Pakistan, the chances of successful revolt may be greater but the chances of it spreading are less. Where cultural or agricultural differences alone separate regions, such as in Thailand, Malaya, Mexico, and some parts of India, the chances for spread are probably greater.

The impact of the Green Revolution on class structure, discussed earlier, will also have an influence on the form of revolutionary activity. A major restructuring of rural society would destroy the stability of both quasi-feudal and village relationships and lay a broader basis for two kinds of struggle: for land and for higher wages. Both kinds of struggle have been reported in a number of countries. The best known and most often cited is a clash between organizing laborers and strike-breakers, which occurred in the Green Revolution area of Tanjore, India, in 1968. Forty-three peasants were burned to death in a fight over wages.⁷⁴ India has also seen the rise of the Naxalites—apparently a coalition of Maoist intellectuals and landless peasants. This group (or groups, as there now are splinters) has carried on an increasing campaign of assassination and land seizure. They began in West Bengal and Andhra Pradesh but have now spread to many other areas and to the cities.⁷⁵ While both areas have been affected by the Green Revolution (though much less than the Punjab), the Naxalites seem to have developed before the new technology had been introduced. How much and what kind of influence it is having on their activities, support, and tactics is not known.

There is also the case of a massive attempt at land seizure in West Bengal, organized by the more conservative local Communist Party. How much this was due to rising peasant demand and how much to an attempt to outdo the Naxalites is not clear. But the support they received was certainly substantial: some 10,000 people were reportedly arrested.

In the Philippines, the spirit of the old Hukbalahap seems to be reincarnated in the New People’s Army. This guerrilla force is reported to be growing, both in the Green Revolution areas of the Central Luzon rice bowl and in the outer islands. Most of its recent activities have been centered on struggle against landlords and in defense of small farmers.⁷⁶ The Army is now linked to two urban groups: the Philippine Communist Party and the radical student group called the Kabataang Makabayan. This fight over land and tenure in India and the Philippines, as elsewhere in Asia, is not new. Peasant rebellion has a long history, and how much the Green Revolution is a factor in current struggles will only be learned after more research and time.

Perhaps the most important effect of the Green Revolution is on the rate of urbanization. Shifts in rural class structure call for a rethinking of optimal strategy in the countryside but do not call into question the basic Maoist or Cuban “models” of revolution based on peasant support. An increased rate of urbanization caused by unemployment and impoverished peasants pouring into the cities, however, raises serious questions about the continued applicability of these models in some countries. In the Third World the rate of change in the distribution of the population between countryside and city has been rapid. This has led some revolutionary groups to abandon the rural areas and try to develop new forms of urban guerrilla war. Best known of these are the Tupamaros in Uruguay, but there are other groups in Mexico, Argentina, Brazil, and Guatemala. In some countries like Mexico, where there are revolutionary groups in both the countryside and the capital, the choice of approach is still an open question. In others like Uruguay, the high degree of urbanization has already made a rural strategy obsolete.

A final and very important question raised by the Green Revolution is one of time. How fast are these effects taking place in relation to the development of revolutionary groups capable of leading revolt toward socialist goals? In Pakistan the independence of Bangladesh has come before such a political group, based on popular support, could

develop. The result, at least in the short run, will probably be a continuation of capitalism under a bourgeois government backed by India. Similarly in India itself, chaos seems to have come to Calcutta before the Naxalites. And finally, lurking ominously behind all the social turmoil is the ultimate question: Can capitalism be replaced in these countries before its profit-born technology, by poisoning the environment, destroys all hope for survival?

As for lessons for radicals in the developed countries, there is at least one. The Green Revolution provides a striking illustration of how imperialist intervention, no matter how well intentioned, can have far-reaching negative effects on the Third World. There may be a tendency among some to say, "So much the better, if the Green Revolution intensifies contradictions; then it is a step toward revolution." But, as I hope this survey has indicated, that is far too simplistic a reaction. The impact of these changes on revolutionary activity and potential is not at all obvious, but the adverse effects on wide segments of the populations concerned are. The problem of hunger in the capitalist world has rarely been one of absolute food deficits, particularly when the productive capacity of the developed countries is taken into account. It is one of uneven distribution caused by a system that feeds those with money and, unless forced to do otherwise, lets the rest fend for themselves. The lesson we seem to be learning too slowly is that opposition to military intervention is not enough. We must also resolutely expose and fight against imperialist attempts at social and economic engineering in the Third World.

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NOTES

1. There are some exceptions: see the brief discussions in Arthur MacEwan (1971) and Steve Weissman (1970) and the recently translated book by two Swedish journalists, Lasse and Lisa Berg (1971) .
2. There is no accepted (or possible?) definition of "high-yielding variety." This paper uses the term primarily to refer to those grains developed at the international research institutes, but national breeding programs have produced a large number of variations. For a short discussion, see Dana G. Dalrymple (1971),..
3. These new varieties have short, stiff stems which permit heavy fertilization and grain weight without breaking. The short height and sensitivity to the timing of watering necessitate the availability of carefully controlled irrigation. In some cases many more inputs are required: pesticides, more plowing, herbicides, etc. Since they have also been bred for shorter growing periods and reduced sensitivity to day length, they also permit considerable increases in yields per year through double and even triple cropping where there is adequate irrigation.
4. For the authoritative and detailed story of the early years of the Green Revolution, see E. C. Stakman et al. (1967) . For a radical review of the Rockefellers' involvement in saving Latin America. see Weissman (1970). For their interests in doing so, see NACLA (1969).
5. For background on the development of the Mexican northwest see Craig L. Dozier (1963) .
6. Data for 1952 and 1964 from the UN Food and Agriculture Organization (FAO).
7. The 2,900 figure is for the Rio Yaqui. Data from D. K. Freebairn (1969), p. 38.
8. Mexican wheat production quadrupled from 512,000 metric tons in 1952 to 2,100,000 in 1967. See FAO.
9. In 1953 Mexico imported some 164,000 metric tons of wheat and wheat flour. A decade later she was a net exporter of about 429,00 tons. FAO.
10. Edgar Snow (1971), p. 302.
11. There is no place here for a detailed analysis of the role of the different groups of the ruling class and of their technocracy which have been involved in managing the Green Revolution. I have used the term "elite" to designate all of those groups which have been concerned and which have had influence on the formulation of relevant foreign policy. This includes members of the corporate and political elite, foundation officials, and influential technocrats. For further discussion of the definitional problems see G. William Domhoff (1970).

12. Quote from John King (1953). A recent exception to the current habit of emphasizing humanitarianism is Clifton Wharton, an old Rockefeller associate who is now president of Michigan State University. He has taken to evoking the specter of Lin Piao's rural guerrilla strategy when calling for more work in the countryside. See Wharton (1970).
13. For the story of Hoover's use of food relief, see Walter Cohen (1971).
14. P.L.480 was designed for surplus disposal but it was never a giveaway. Under Title I food is paid for with the recipient country's currency, which is used to finance U.S. missions, multinational corporations, military assistance, and development projects. Under Title III food is bartered for strategic materials. Under Title IV it can be had only for U.S. dollars. Only under Title II are commodities granted to the poor, and even here they are mainly channeled through hardly neutral private groups like CARE and the Catholic Relief Services. For a radical critique of Food for Peace, see Israel Yost (1971). For a questioning review of the role of the international relief organizations Judy Carnoy and Louise Levinson (1972).
15. Hubert Humphrey, 4th Congress, First Session, Senate Committee on Agriculture and Forestry. Hearings: Policies and Operations P.L. 480, p. 29 1957.
16. For the early history of ADC activities in Asia see Wharton (1966). J. D. Rockefeller III is an old Asian hand. He directed the United China Relief from 1941 to 1946 and visited China in 1947. A year before he founded the ADC, he set up the Population Council. This was a similar organization, designed to help coordinate a whole other aspect of the hunger problem, that of population growth. Just as the elite has been working at fighting food shortages, so also has it been building support for a war against "excess population." The story of how the population control movement was built parallels that of the Green Revolution. For an introduction to this important topic see Weissman (1970), which links it to the Green Revolution.
17. The role of stateside elite training, generally subsumed under the heading "human capital" development in bourgeois economic literature, has long been an important part of U.S. foreign policy and deserves more attention from radicals. "The question is," wrote John Gardner (1952), "whether we can help the vigorous elements in these societies to discover how they can bring about needed social changes without resorting to Communism." For a description and data on the AID participant training program, see USAID (1970). For the Foundations' role see their annual reports.
18. For an account of the Rockefeller Foundation's various programs in India see Carroll P. Streeter (1969).
19. For a detailed examination of the IADPs see Dorris D. Brown (1971).
20. The short size of the new rices also created new problems of weeding and an inducement to use chemical herbicides. The famous IR-8 was first field-tested in 1965. Results of tests in 1966/67 showed yield increases of 30 to 90 percent in the Philippines. J. W. Willett (1969), p. 14.
21. See *BusinessWeek* (1966), p. 114, for a short analysis of the shifts in India's policies toward agriculture and foreign investment.
22. The data given below on acreage planted or harvested with the new varieties tell nothing about the utilization of other inputs and thus overstate the importance of the spread. For the stories of the introduction of the grains, country by country, see the AID Country Crop papers from the 1969 Spring Review of New Cereal Varieties.
23. The new push to get peasants to adopt manufactured inputs was preceded by the earlier, massive fertilizer campaigns carried on by the FAO, local governments, and AID. The "neutral" multilateral aid organizations have been prominent in this market-creation process. The FAO's far-flung Freedom from Hunger program joins FAO technicians with some \$19 million in cash and fertilizer donated by the international fertilizer industry to help widen the market for this product, USDA (1971), p. 6. The World Bank has been a major subsidizer of private fertilizer production through the International Finance Corporation and of farm machinery imports.

24. A. T. Mosher (1966), p. 34.
25. Resources for the Future (1971) .
26. Philip (1970) reports that contracts on public-financed investment in development infrastructure brought in over \$1.7 billion in 1969 to U.S. consulting firms. Fourteen U.S. construction companies, he adds, held \$3.5 billion in 1969 contracts for Lower Mekong development projects. "Given an acceptable political accommodation, work in Southeast Asia could dominate their market in the coming decade." pp. 64-65.
27. L. R. Brown (1970), chapter 7.
28. N. W. Philip (1970). Also see Martin Kriesberg (1969).
29. John L. Simmons (1971).
30. Foreign Commentary (1970), p. 84.
31. Sanford Rose (1970) and Robert D'A. Shaw (1971).
32. J. G. Gurley (1970).
33. Even within the Northwest the development has been uneven for the same reasons, favoring private buyers of newly opened land over the ejidos located on dry land or old broken-down irrigation systems. Dozier (1963) .
34. Ralph W. Cummings, Jr. and S. K. Ray (1969), p. A-167. The figure is for 1964/65 and is taken from Indian government sources. Willet (1969), p. 17, shows a higher percent of land under irrigation, about 25 percent in 1967/68.
35. Willett (1969), p. 18.
36. There has been some work in India on bajra and jowar, Cummings and Ray (1969) . In Turkey experiments are underway on the plateau with some American and Russian wheats. And in Lebanon there have been reports of a new dryland wheat being developed. Dalrymple (1969) .
37. Resources for the Future (1971).
38. Ladejinsky (1970), Brown (1970), Dozier (1963), etc.
39. Cummings and Ray (1969), and AID Country Crop Papers, 1969 Spring Review.
40. This shows up particularly in N.S. Shetty (1968), where adopters systematically showed higher characteristics like larger farm size, more education, more extension contacts, and more total assets.
41. P. V. Krishna (1969), p. 755; N. S. Shetty (1968), p. 1273; G. Parthasarathy (1969), p. 1520; and S. S. Acharya (1969), p. 1755.
42. Krishna (1969) .
43. R. E. Huke and J. Duncan (1969?), and Shetty (1968).
44. Max K. Lowdermilk (1971), cited in Refugio I. Rochin (1971), and Huke and Duncan (1969?).
45. Survey Unit (1970) cited in Rochin (1971).
46. There has been some discussion about creating new credit institutions for small farmers, but very little seems to actually have been accomplished so far. In India, a Small Farmer Development Agency has been set up, but its

ability to reach large numbers with effective aid is limited by its small size. The Indian Crop Loan System has also come under considerable criticism. Ghosal, et al. (1968) .

47. Floyd L. Corty (1969).

48. Ladejinsky (1970), p. 764.

49. Ashok Rudra, et al. (1969) . Also see Minhas (1970) on the rush to buy land.

50. See Richard H. Day (1967) and Carl Gotsch (undated) on tenant and labor displacement in the southern United States, and Shivamaggi (1969) on the displacement of tenants in India before the Green Revolution.

51. I. M. D. Little, T. Scitovgky, and M. Scott (1970).

52. For detailed discussions of the labor-creating effects of the Green Revolution and the labor-displacing effects of mechanization, see Bruce F. Johnston and John Cownie (1969), Robert d'A. Shaw (1970), Marin Billings and Arjan Singh (1969?, 1970), S. R. Bose (1970), and Randolph Barker, et al. (1971) .

53. Billings and Singh (1969?).

54. Many bourgeois economists are coming to see unemployment replacing food deficits as the “development problem of the 1970x.” See David Turnham (1970), James P. Grant (1971), and W. C. Thiesenhusen (1971).

55. For this side of the debate see Billings and Singh (1969?, 1970), S. S. Johl (1970), Thiesenhusen (1971), and R. P. Dore (1969).

56. On this side see Johnston and Cownie (969), B. F. Johnston and P. Kilby (1971), Shaw (1970), Brown 970), and John W. Mellor (1970).

57. Johnston and Cownie (1969) and Johnston and Kilby (1971) .

58. For reports on a wide variety of countries see the papers of the USAID 1970 Spring Review of Land Reform. They are available from AID, Washington, D.C.

59. Shivamaggi (1969), p. A-41.

60. Pranab Bardhan (1970), table 8, p. 1243.

61. *Ibid.*, p. 1239-1243. The only Green Revolution area in Burdhan’s study where real wages have been rising is Kerala and he notes that the existence of strong peasant organizations and a leftist government may account for the difference.

62. Brown (1970), Falcon (1970), E. Ray Canterbury and Hans Bickel (1971).

63. B. P. Dutia (1971), p. 15.

64. *Ibid.*, p. 15.

65. See Eric M. Ojala (1971) for details on rise in grain yields and production in both the Third World and the developed countries.

66. Banque de Montreal (1971).

67. Very little has been published on the Green Revolution and ecology, but see Paul R. Ehrlich (1970), *Time* (1971), and L. R. Brown (1971).

68. Dale Hattis (1971), pp. 14-23.

69. *Time* (1971).

70. Hattis (1971), p. 10.

71. Ojala (1971), pp. 5, 7, 11.

72. *Time* (1971).

73. Eric R. Wolf (1969).

74. *New York Times* (1968), p. 3.

75. On the Naxalites see Gautam Appa (1970), and Intercontinental Press (1970).

76. See AI Parsons (1971) and Amado Guerrero (1971) .

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