

Cuba, Mexico, And India: Technical And Social Changes In Agriculture During Political Economic Crisis*

John H. Perkins

John H. Perkins currently teaches environmental studies at the Evergreen State College in Olympia, Washington, and was formerly at Miami University in Ohio. He has published a number of articles plus a book (*Insects, Experts, and the Insecticide Crisis*, Plenum, 1982) on the history of American applied entomology. Currently he is working on a history of the green revolution in India, Mexico, the United States, and the United Kingdom. This article, plus an earlier one in Volume 7, are part of that project. He is a member of several environmental, scientific, and historical societies and currently serves as an Editorial Advisor for *Agriculture and Human Values*.

ABSTRACT Cuba entered a crisis in 1989 when its trading arrangements with the USSR and Eastern Europe collapsed. Their supplies of imported staple food and agricultural input supplies were severely curtailed. Thus the Cubans had to alter both the methods of farming and the mix of items produced. Despite differences in historical setting, the changes forced upon the Cubans are similar to earlier agricultural changes in Mexico and India. Three themes unite events in the countries: (1) National leaders wishing to industrialize their countries found it necessary to have agricultural productivities higher than subsistence levels. (2) Foreign exchange shortages were a major factor in promoting more intensive agriculture, (3) Lack of food self-sufficiency in wartime was a serious threat to a nation's security. Both Mexico and India chose to promote innovations needed for more intensive agriculture, even when this policy conflicted with ideologies and programs of social equality and justice. Current disruptions in the Cuban economy suggest that Cubans, too, will be forced to confront the tension between equity and production in agriculture.

I. The problem and its context

Cuba entered a profound political economic crisis after 1989 when its trading arrangements with the USSR and Eastern Europe collapsed. Loss of its socialist-block trading partners devastated the exchange value of Cuba's main export, sugar. Prior to 1989, Cuba usually obtained the equivalent of about 7 tons of petroleum for each ton of sugar. After 1989, Cuba obtained the equivalent of about 1.4 tons of petroleum for each ton of sugar.¹ Put bluntly, Cuba suffered a loss of value in its principal export commodity of about 80%. No country can endure such a change without substantial readjustments.

From 1959 to 1989, Cuba closely integrated its economy with other socialist countries. Sugar was the most important product, and Cuba traded sugar, tobacco, and other exports for food, machinery, petro-

leum, fertilizers, and pesticides. All of Cuba's citrus and starchy roots and fruits were home grown; but the country imported substantial amounts of staple foods such as rice (49%), wheat (100%), and beans (90%), plus fats, meat, milk, and livestock feed.² Cuba has a land base adequate for obtaining full or nearly full food self-sufficiency.³ Nevertheless, due to slow mobility of agricultural labor, machinery, and marketing structures, Cuba could not immediately switch from sugar to staple crops.⁴ Cuba thus could not afford to keep its economic system to obtain the customary imports of food, machinery, petroleum, fertilizer, and pesticides.

Cuba thus entered what the Cubans call "The Special Period" in 1989. Many problems faced them as they struggled to revamp their entire economic system. For their food and agriculture setup, they needed to find solutions for two problems:

(1) how do you immediately and regularly put enough food of the right kind on every Cuban's plate, and

(2) how do you rebuild an agricultural production system based on high fossil-fuel inputs into an arrangement that still has high yields but does not require the imported petroleum and petroleum products or foreign exchange?

Put somewhat differently, the Cubans were faced with the prospects of altering or reversing thirty years of agricultural change and finding new ways that were suitable for their biological, physical, cultural, and political economic conditions. Moreover, these adjustments had to be made under essentially wartime conditions due to the unending hostility from the United States government.

Daunting as these tasks were, and still are, the situation faced by the Cubans has similarities to rapid agricultural changes in other countries at other times, particularly Mexico and India. In economic terms, the question of interest might be phrased as, How have countries reacted to exogenous shocks that increased the need for the agricultural sector to supply staple foods and foreign exchange earnings?⁵ However useful an economic phrasing of the question is, Cuba's agricultural and food problems go far deeper than mere economic issues of food self-sufficiency and maintenance of production. At stake also are the strength and durability of national governments and the ideologies supporting them. This paper identifies themes common to Mexico, India, and Cuba. Substantial differences separate Mexico and India from Cuba, but the similarities in the situations faced by the three countries suggest that the Cubans will have to be very careful if they want to keep their revolutionary social changes while they adjust their agricultural practices.

II. An Analytical Framework: Mandated Agricultural Change

A straightforward theory connects agriculture, food security, and the survival of governments. In most countries, even heavily industrialized ones, agriculture is an essential if not a top industry. Thus a country's economy is in part based on agricultural production, on the supply of agricultural inputs, and on the processing of farm commodities. More vitally, however, is the fact that for most countries domestic agriculture is a major source of staple food products for its citizens. Any disruption of these food supplies threatens rapid destabilization of a government's ability to function, perhaps to govern. Thus for both pragmatic economic reasons and for more fundamental concerns, governments have an intrinsic interest in how agricultural land is controlled and used. Any ruling party that suffers a dysfunctionality of its agricultural sector runs severe risks of losing legitimacy and power, and its citizens are at severe risk of hardship.

A number of symptoms have been prominent when a country's agricultural sector has failed to produce sufficient food or when the economy as a whole produced insufficient earnings from exports to pay for food imports. Three symptoms have been of particular importance historically in terms of how they mandated change.

First, leaders seeking to industrialize their countries have discovered crucial links between the ability to promote industry and the state of the agricultural sector. If a high proportion of people are engaged in subsistence agriculture, each producing only small surpluses, then no labor force is available to staff the factories. In addition, no reliable, low cost food supply exists to feed factory workers. Finally no extensive rural savings exist that can be drawn into investment in new industries. In short, agricultural sectors that are not highly productive *per* hour of labor invested offer poor support for industrialization. Thus lack of support in promoting industrialization has been interpreted by leaders as a symptom of an inadequate agriculture.

One step up in severity has been a foreign exchange crisis. Various currencies in different periods have served as widely accepted media of exchange for international trade. After 1945, the major foreign exchange currency was the U. S. dollar. Countries that could not earn enough dollars had problems paying for imports. When the imports were staple food products, a shortage of dollars quickly translated into the specter of hunger, deprivation, and famine. Thus a foreign exchange crisis combined with the necessity for food imports has been a powerful symptom (1) that a country's agricultural sector was not producing enough domestic staples for food self-sufficiency, and (2) that the country's economy as a whole was not generating enough income from exports to pay for food imports. Food self-sufficiency might not be an optimum economic solution, but the need to import food means that a country is vulnerable to factors beyond its control. For physiological reasons, food imports create a special type of political economic vulnerability.

At the pinnacle of symptoms forcing a government to change agriculture has been the crisis of wartime. Governments at war need food for their armies and their civilians. A country that is self-sufficient in peace time may be strained in war due to the loss of labor from the farms with a consequent inability to make as large a harvest. Also, farmers may be reluctant to plant, given uncertainties about the future. Countries that rely on imports of staples during peace time are even more at risk, particularly if their supply lines are cut by the enemy. Perhaps no stimulus has been more powerful than the threat of defeat simply because not enough food was available. Thus wartime food security created the most potent symptom about the adequacy of a country's agricultural sector.

Since 1940, Mexico and India mandated changes for their agricultural sectors and thereby launched the "green revolution." Mexico in the early 1940s embraced the potential of agricultural modernization largely to promote a vision of industrialization and to stem a foreign exchange crisis. Colonial India endured a searing famine in the midst of the Second World War that profoundly influenced independent India after 1947. With independence came a foreign exchange crisis caused in part by the loss of traditional food production areas to newly independent and hostile Pakistan. After initial reluctance, by the 1960s India fully embraced the project of high yielding agriculture. In both Mexico and India, the technical changes adopted in agriculture had detrimental effects on social reforms.

Mexico

Mexico in 1941 created a deliberate policy favoring the development of high yielding agricultural practices and produced what came to be known later as the "green revolution." The Mexican experience was transferred directly to other countries including India.

Hunger was a chronic companion of the Mexican people from the time of the Spanish conquest in 1519 to the end of the Mexican Revolution in 1917.⁶ With the Revolution came the promise of land reform and greater social justice. Especially important was the rise to power of Mexico's President from 1934-1940, Lázaro Cárdenas.

Cárdenas had a platform dedicated to the egalitarian spirit of the Mexican Revolution.⁷ When he took office in 1934, he quickly moved on agrarian reform by redistributing land and breaking up large estates. This policy was intended to meet some basic needs of *campesinos*, not to increase aggregate national production. During his administration, between eighteen and twenty million hectares were distributed to about three quarters of a million people. This was an estimated sixty-five percent of all land distributed between 1917 and 1940. By 1940, thirteen percent of Mexican land had been redistributed to small holders.⁸

His reform actions brought Cárdenas into direct conflict with the United States. Some lands owned by Americans were confiscated. In 1938, he also seized oil properties belonging to American, British, and Dutch concerns.⁹ During his entire tenure as President, much of the correspondence between the American embassy and the State Department in Washington concerned claims of Americans who demanded compensation for property seized.¹⁰

Despite the dramatic initiatives made by Cárdenas in land reform and seizure of oil properties, his government also pursued avenues of change that were very different in character and, ultimately, had as much or more effect on the agriculture of Mexico. First, Cárdenas continued the development of large-scale

irrigation works, an effort that had its roots in the pre-revolutionary period.¹¹ Second, Cárdenas picked a successor who was less a fiery leader and more a conciliator with conservative elements within Mexico and with the United States. General Miguel Avila Camacho became President in 1940.¹²

Avila Camacho, in his campaign, stressed more the need to secure title to land ownership than the need for further land distributions. He also favored moves toward small proprietorships rather than the communal ownership of the *ejidos*.¹³ Avila Camacho also stressed the need for industry and modernization rather than further radical social reforms. He wanted foreign investment for Mexico and felt it was essential to reach a settlement with the Americans.¹⁴ The United States responded in kind, and President Roosevelt designated Vice President-elect Henry A. Wallace to be "Ambassador Extraordinary and Plenipotentiary" at the inauguration of Avila Camacho in 1940.¹⁵

Wallace served as a key catalyst to bring the technocratic instincts of Avila Camacho together with the Rockefeller Foundation, an American organization dedicated to social reform through science and technology. Foundation officers proposed to send three experts to Mexico: Paul Mangelsdorf, a geneticist and plant breeder from Harvard University; Richard Bradfield, a soils specialist from Cornell University; and Elvin C. Stakman, delegation leader and a plant pathologist from the University of Minnesota.¹⁶

The survey team toured extensively in Mexico in the summer of 1941. Their lengthy report recommended that the Rockefeller Foundation could best assist the improvement of Mexican agriculture by establishing a four-man commission in or near Mexico City to advise the Mexican Department of Agriculture. In priority ranking, the four men should be (1) an agronomist/soil scientist, (2) a plant breeder, (3) a plant pathologist or entomologist, and (4) an animal husbandman.¹⁷ Once the report was finished, the Foundation negotiated with the Mexican government for an invitation to provide assistance. Invitation in hand, the Foundation selected J. George Harrar as director of the program.¹⁸

Two specific research problems were identified by the Mexican government for research: wheat rust (a fungal disease that can cause catastrophic losses in wheat) and improvement of maize yields. Ironically, these two activities were different from what Stakman, the chief advisor to the Foundation, expected. The request for work on wheat was puzzling to Stakman, but he noted that the Minister of Agriculture, Marte Gómez R., felt that wheat rust was the most important single problem. Stakman did not agree, but he recognized that Gómez reflected the desires of President Avila Camacho, who wanted increased wheat area and production. Stakman therefore agreed that control of wheat rust should be the beginning of a general project

for wheat improvement and expansion of acreage,¹⁹ a decision that had important influences on the research program that led to the green revolution.

The Foundation and the Government of Mexico signed a Memorandum of Understanding on 10 February, 1943. Wheat rust and maize improvement were the top priority research items.²⁰ The Office of Special Studies (OSS)²¹ was thus established as a semi-autonomous research unit directly within the Mexican Department of Agriculture. Until its transformation in the 1960s to the International Center for Wheat and Maize Improvement (CIMMYT),²² OSS was the research center that stimulated a major transformation of Mexican agriculture.

Mexican aspirations for intensive research on wheat rust reflected a deep desire on the part of the ruling elite of Mexico to be one of the industrialized nations. At stake was whether Mexico would retain its economy of subsistence agriculture or whether it would develop the larger-scale, more commercially oriented agriculture found increasingly in the United States. If Mexico were to develop an industrial capacity, then some labor had to leave agriculture and become part of an industrial workforce. Agriculture thus had to adopt technologies that were more labor efficient. In addition, agriculture would have to provide at least part of the capital for Mexican industrialization, which it did from 1930 through the 1940s.²³

By emphasizing control of wheat rust, Mexico moved to make use of newly irrigated lands, primarily in the northwestern states of Sonora and Sinaloa (Figure 1), in which wheat rust regularly caused catastrophic losses.²⁴ These irrigation projects were initiated before the Revolution, but the Revolutionary governments, including Cárdenas's, had continued them, perhaps to assuage or even earn support from the emerging commercial and political elite that wanted industrialization and highly-capitalized agriculture.²⁵

Mexican leaders after 1940 were more in sympathy with the parts of Mexican society that wanted a new industrial economy. In all likelihood, it is this sort of reasoning that led President Avila Camacho to support more wheat production in Mexico, which in turn led to the Rockefeller Foundation's mandate to control wheat rust. The agricultural and industrial sectors were understood, at least intuitively, to be related and that neither could change without the other. It is also possible that by 1943 a second and more immediate concern influenced Mexican leaders: an acute shortage of food caused by diversion of land from food to industrial crops at the request of the United States as part of its war efforts.²⁶ Desires for industrial development, however, were of older origin and more lasting influence on Mexican thinking.

Robert Osoyo may have put the case most explicitly in 1968 at a symposium, "Strategy for the Conquest of Hunger," held at Rockefeller University in

New York. At the time, Osoyo was Director General of Agriculture in the Mexican Ministry of Agriculture, and during the 1950s and 1960s he had been a major administrator in agricultural modernization in the state of Sonora. After noting the rapid population growth rate of Mexico, then 3.2% per year, he went on to argue that Mexico had made great progress in removing labor from agriculture. In 1943, 65% of the labor force was in agriculture, but by 1968 this figure had dropped to 50%. He then went on to state:

We now nurture the hope that by 1970 not more than 45 percent of our active population will have to be engaged in agriculture.²⁷

A similar thought emerged from staff members of the Ford Foundation in the late 1960s. Eduardo L. Venezian and William K. Gamble argued that Mexico had developed a dualism in its agriculture. The large private farms of the northwest (Sonora and Sinaloa) and north were irrigated, used advanced technology, commercial, and export oriented. They were only one-fifth of all Mexican farms, but they were highly productive. The other part of the dualistic structure was the *ejidos*, which depended on rainfall, used low technology, were low in capitalization, and oriented towards subsistence maize and bean production. Venezian and Gamble felt that the small farms must

disappear if Mexican agriculture is to be fully modernized and rural misery is to be eliminated.²⁸

Perhaps in 1940 neither President Avila Camacho, his Secretary of Agriculture Marte Gómez R., nor the Rockefeller Foundation officers could have been so direct about the "need" to reduce labor in agriculture or the "need" to eliminate the *ejidos*. In subsequent years, little attention was paid to the destructive effects of new agricultural practices on many small-scale and subsistence growers or to the plight that rural migrants frequently faced in the growing cities. Nevertheless, Mexico became a net exporter of wheat by the mid-1960s. Increased area of wheat cultivation, more use of irrigation and fertilizer, and, after 1955, development by the Rockefeller Foundation of semidwarf, high-yielding varieties were the major engines behind this transformation.²⁹ Its export-oriented agriculture continued to grow in size after that time, even though wheat production was supplanted by fruits and vegetables. Making Mexico a more industrial country and reducing the drain on foreign exchange for wheat were prime motivations in the decision making in the 1940s, but social reforms languished.

India

India's formative experience in agriculture was, like Cuba's and Mexico's, shaped by the legacies of colonialism and imperial domination. India's devolution into a captive state began in the late 18th century when the British East India Company began to replace

the disintegrating power of the Mughul Empire, based in Delhi, by expanding its trading influence and becoming the local collector of taxes around Calcutta. After the rebellion of 1857, the British East India Company formally ceded its authority to the British government.³⁰

For a time in the late nineteenth century and early twentieth centuries, India had surplus wheat that was exported, mostly to Britain.³¹ During imperial rule, however, Britain was more interested in obtaining other types of agricultural exports from India, such as tea, cotton, and jute.³² Thus nonfood export crops began to supplant staple food production in India in the early decades of the twentieth century. This, combined with population growth, meant that India's food production steadily declined, both absolutely and *per capita*, during the last quarter century of British rule (1922-1947). India lived, at what may have been declining levels of nutrition, by imported grain, largely rice from Burma. In the decade 1931-1941, for example, India typically had annual net imports of 0.6 to 2.2 million tons of foodgrains.³³

As a result of the capture of Burma by Japan in the Second World War, the Government of India launched the Grow More Food Campaign, a set of programs that continued until and after independence.³⁴ Nevertheless, India's province of Bengal suffered a horrific famine in 1943.³⁵ Another scare of wheat shortages hit India and Europe in 1946-1947, which prompted intervention by the British, Indian, and American governments to avoid another devastating famine.³⁶ As a result of these interventions, therefore, the central government of India became fully involved with food production and the movement of foodgrains.

Britain abandoned its claims in South Asia in 1947, and India had more control of its own destiny. Independent India immediately faced a daunting series of challenges: Top leadership in the Indian National Congress wanted India to develop industrially. At the same time, India had to import foodgrains, paid with scarce foreign exchange, in order to eat.³⁷ That India's food imports came partially from hostile Pakistan completed the triangle of pressures on the new government.

Partition at independence was the proximate but not sole cause of India's problems. India lost major areas of irrigated wheat land in the west, vast rice producing areas in the east, and important agricultural research and education facilities. Events in the north-western province of Punjab (Figure 2) during partition dramatize the predicament India faced.

Punjab, meaning "The Land of Five Rivers," had been, since at least 4000 years ago, a civilization based on irrigation from the Indus, Jhelum, Chenab, Ravi, and Sutlej rivers. Archeological remains suggest that ancient civilizations had developed, and then lost, more extensive canals that carried water further into

the *doabs* or "lands between the rivers."³⁸ By the nineteenth century, however, most agriculture in this area was confined to areas near the rivers, with easy access to the water. Punjab was too far west to benefit from the monsoonal rains of the Indian subcontinent, and its population was sparse due to lack of developed water supplies.³⁹

When Britain annexed the Punjab in 1849, it consciously used development of irrigation works as a way to consolidate its control over India and other parts of the Empire.⁴⁰ Punjab's function under the British was to supply horses for the army. In addition, the newly irrigated land was given as grants to retired, loyal members of the army.⁴¹ Most importantly, irrigation allowed Punjab to become the most important center of wheat production in British India.

Britain's pattern of imperial management in Punjab thus created a major problem in 1947 when India gained independence. Before partition, the wheat production of western Punjab, now in Pakistan, passed easily to the more densely populated areas of British India, and the whole Indian economy was adjusted to this division of labor: western Punjab grew wheat, the rest of India concentrated on other work.

Unfortunately for India, about 50% of the canal irrigation works in Punjab went to Pakistan. Moreover, the irrigation works in eastern Punjab, now Indian Punjab, were intended only to prevent complete crop failure, not substantially to increase productivity. Thus "... partition had magnified the normal food deficit in India created by the separation of Burma and the War ..."⁴²

Not only did Pakistan receive the most productive land of Punjab, the western part of Punjab also contained the bulk of the agricultural research and education facilities of this part of British India. Of particular importance was the Agricultural College and Research Institute at Lyallpur. India's section of eastern Punjab had virtually no facilities for teaching and research.⁴³ Only the Indian Agricultural Research Institute at Delhi provided nearby expertise on this crop.

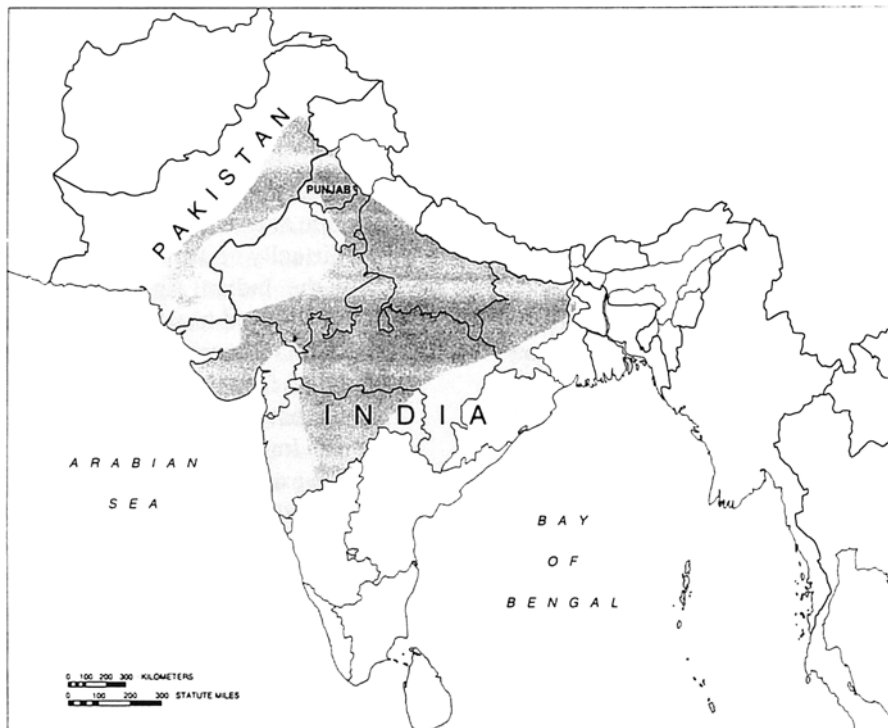
Without increasing its own production, India had no way to feed its population without importing wheat from what was now Pakistan, or from some other source. Imports from any source, however, required foreign exchange to pay for them, a fact that became a more severe problem. In September, 1949, Britain, in a chronic trade deficit with the United States, devalued its pound sterling from \$4.03 to \$2.80 *per* pound on September 18.⁴⁴ This move was designed to help the United Kingdom improve its exports to dollar trade areas and to stem the demand for imports from those areas. India, despite its independence, was economically still part of the sterling trade area and followed suit one day later by devaluing the Indian rupee.⁴⁵

Devaluation can be a sensible, indeed essential, move if a currency is overvalued and the country runs

Figure 1. Wheat growing areas of Mexico (shaded portions) and the States of Sonora and Sinaloa.



Figure 2. Wheat growing areas of India (shaded portions) and the Punjab.



a chronic trade deficit. Nevertheless, necessity to devalue also erodes the purchasing power of a currency for imported goods. India's need to devalue may have made importing foodgrains more difficult. On the other hand, within one year India turned a trade balance from deficit into surplus with countries in both the dollar and sterling trade areas.⁴⁶ In any case, being forced into currency devaluations while relying on imported food sent a signal to central government authorities that a more productive agriculture was needed.

Further difficulties came from the outbreak of war with Pakistan over control of Kashmir in 1947. This conflict began three decades of Indo-Pakistani tension, which flared into open warfare again in 1965 and in 1972.⁴⁷ Shortage of foreign exchange made it awkward to be dependent upon Pakistani wheat for subsistence. That India and Pakistan were in chronic and sometimes open hostilities made it even more difficult for the Government of India to rely on food supplies from "the enemy."

At independence in 1947, therefore, the food situation in India can be characterized as follows. A pattern of increasing reliance on imports of foodgrains was standard behavior in the sense that existing trade channels expected to make the imports in order to satisfy consumer demand. At the same time the Government of India was acutely conscious of its vulnerability on the food issue. Failure to assure adequate supplies at acceptable prices would have damaged the legitimacy of the new national government as surely as the Bengal Famine had severely tarnished the British-controlled government.⁴⁸ Imports of food could satisfy demand, but they were a drain on foreign exchange, exacerbated by the devaluation of the Rupee, which was needed for other projects. In addition, Indian leaders surely did not like to be dependent for supplies on Pakistan.

Independent India's first steps in managing the food situation were derived almost entirely from policies of the last years of colonial government. In September, 1947, the government appointed a Foodgrains Policy Committee, which recommended that the central government of India work towards an orderly reduction of its commitments for rationing and controlled distribution of food. They also concluded that the Grow More Food campaign, begun during the Bengal Famine in 1943, was inadequate as implemented but could be made useful. The Committee recommended a planned reduction of imports over a period of five years and an increase of 10 million tons *per year* (about 15-20% of total Indian production at that time). In addition, the committee urged the government to build a reserve of up to one million tons of grain, mostly wheat and rice.⁴⁹

Although the Committee had recommended a gradual withdrawal of the central government from the

control of grain purchases and distribution, the moral objections of Indian nationalism's soul and leader, Mohandas Gandhi, to control of the food trade led the new government in December, 1947, to end suddenly the control of foodgrain transactions. Gandhi was assassinated in January, 1948, and thus removed from Indian politics. Gandhi's absence, plus a continued deficit in domestic production, were probably the key considerations to reimposition of central government control of foodgrains in September, 1948.⁵⁰ Under the policy, the central government would prohibit imports and exports of grains between provinces except on a government-to-government basis. Provincial governments would procure grains at prices set by the center, all dealers would be licensed, and rationing would be extended to cover more people.⁵¹

Control of the movement and price of foodgrains was one part of the Government of India's agricultural policy. The other was the Grow More Food campaign that had its origins in the Bengal Famine of 1943. Explicit in the plan was the conclusion that India had the natural resource base to be self-sufficient in food, provided those resources were mobilized properly. Despite a desire to achieve self-sufficiency, however, the Grow More Food program from 1943-1951 was not successful.⁵² Between 1947 and 1951, the effort led to an increase in domestic production of about three million tons, but imports held steady or increased in that same time period and reached 4.8 million tons in 1951.⁵³ Thus during these first years of independence, India continued to suffer foreign exchange shortages, which led it in 1949 to hold extensive conversations with the United States on the possibilities of low priced or barter trades of Indian minerals for wheat.⁵⁴ India wanted to keep grain prices low, but dependence on the United States for supplies carried dangers for its national autonomy.

India became a republic in 1950 with its own constitution that framed India as a democratic, secular nation. Under Jawaharlal Nehru's leadership, the government launched in 1951 the first of India's Five Year Plans.⁵⁵ Food self-sufficiency, the end of India's drain on foreign exchange to finance foodgrain imports, and the release of under employed rural workers were integral aspects of economic planning.⁵⁶ In keeping with India's announced intention of promoting equality, the First Five Year Plan emphasized the importance of egalitarian development. In other words, Indian leaders professed not to want economic growth that was concentrated among only a few people or only in a few selected parts of the nation. The Indian National Congress, which had led the independence movement, however, was not unanimous in its enthusiasm for equality. A minority of Congress members were far more worried about the rights of property owners than equality, and they pushed for an overtly capitalist or Hindu revivalist future.

One of the outgrowths of adherence to egalitarian growth was formalized by the Grow More Food Enquiry Committee in 1952. They recommended that efforts to promote more domestic food production should address the improvement of village life as a whole.⁵⁷ From thinking of this sort came the Community Development programs of the national and provincial governments. India thus put its development efforts into two different categories, (a) Community Development aimed at improving village agriculture, health, water supplies, schools, and other rural infrastructure, and (b) urban development intended to turn India into an industrial giant with an increased proportion of its population living in cities. Community Development reflected Gandhi's sense that India should be an agrarian civilization in which self-sufficiency and simple prosperity came to all villages. Industrialization reflected Prime Minister Jawaharlal Nehru's fascination with industrial science and technology and the project of making India into a modern, industrialized nation.⁵⁸

Possibly these two visions for economic development were not supportive of one another and may even have been contradictory. Nevertheless, they coexisted in the programs of the central government for nearly a decade. As part of the efforts to promote egalitarian, rural development, India launched fifty-five Community Projects in 1952, an effort assisted by an agreement with the U. S. Technical Cooperation Administration and the Ford Foundation.⁵⁹ From these initial projects came the Community Development Programme, which was a concerted effort to bring expertise to all the villages of India.⁶⁰

Despite these substantial efforts to promote general development in the hundreds of thousands of India's villages, by the end of the 1950s it was clear that domestic production of foodgrains was still not rising fast enough to take India to food self-sufficiency and obviate the need for food imports. Thus the drain on foreign exchange did not end, and India's vision of creating a modern industrial state continued to be hampered. Moreover, after 1956 India became increasingly dependent on U. S. wheat through the P. L. 480 plan, a program that undermined Indian independence. One type of solution to the continued shortfall of domestic foodgrain production, nevertheless, continued to be resisted by Nehru and others within the government: substantial intensification of production in agricultural areas well-endowed with good soils, irrigation, and access to fertilizers and other resources. Despite the fact that intensification was recognized as a solution to low domestic production long before 1959, the Government of India was ambivalent about the implications of moving to this solution.⁶¹

Intensification that was unequal among farmers and among areas of India violated two aspects of the Gandhian vision for rural India. First, it was not in

keeping with the vision of a simple, agrarian self-sufficiency. Intensive production methods required an industrial base to produce machinery, chemicals, and irrigation works. Simple farmers could not continue living a simple, good life if they were dependent upon the trappings of a fully developed industrial state. Second, unequal development, in which better endowed farmers and areas would make the investments needed to intensify production, would split villages within and among each other. Nehru's India was reluctant to make such a switch. Community Development entailed promotion of better production practices, but it also aimed at the uniform uplifting of whole villages, indeed all villages of India. Perhaps these were unrealistic hopes for Community Development, but ideologically the egalitarian promise of Community Development was powerful.

Barriers to intensification of production began to crumble in the mid-1950s. In some ways the most telling of India's moves toward acceptance of intensive agricultural production came in the period 1955-1956, when India made serious movement to introduce American agricultural science and technology. In order to enhance its teaching and research in agricultural science, India accepted American advice to create an Indo-American team to study the structure and functioning of Indian agricultural universities. This committee recommended that India organize its agricultural education and research efforts more in line with the American land grant university.⁶² More directly to enhance its agricultural research, India signed in 1956 an agreement with the Rockefeller Foundation. The Foundation agreed to supply scientific advisors and funds to improve cereal production in India and to upgrade the Indian Agricultural Research Institute in Delhi.⁶³

Despite these overtures to more capital-intensive modes of agricultural development, India continued to resist the intensive agricultural technology known in the United States. One national committee, for example, reemphasized the importance of democratic decentralization in a 1956 report.⁶⁴ Nevertheless, in 1959, the balance of power in the debate over modes of development in Indian agriculture made a shift that was not to be reversed. With Ford Foundation collaboration, the Ministries of Food and Agriculture and of Community Development and Cooperation organized a committee, consisting entirely of Americans, to examine the problems with Indian food production practices.

Their report, *India's Food Crisis & Steps to Meet It*, abandoned strict adherence to egalitarian development envisioned in the Community Development projects. Instead, the committee emphasized the importance of getting high quality fertilizers, improved seeds, pesticides, credit, irrigation, and expert advice to those growers who were capable of using all these

resources immediately in order to get higher yields on their lands.⁶⁵ In reaching these conclusions, the committee focused on the rapid growth of India's population, the inability of India's foreign exchange reserves to meet demands by imports, and the consequent vulnerability of India to radical communist reform if its food system became massively dysfunctional.

From this report came the central government's willingness to support the Intensive Agricultural District Program. States identified one district for participation in agricultural intensification. The report urged that the Community Development organization be re-oriented to concentrate on agricultural production and that all people within the district be enabled to help increase production. Inability of some growers to participate, however, was no longer to be a barrier to helping other farmers achieve high yields *per hectare*.⁶⁶ Nehru himself may never have fully embraced this approach to increasing India's total agricultural production, and the IADP effort only marginally improved India's total national yields in its first years of operation. Growers who participated made substantial improvements in their personal incomes; small farmers and landless laborers had mixed benefits and losses from the intensification program.⁶⁷

Nehru died in office in 1964, and in addition India suffered two serious drought years in 1965-66 and 1966-67. Nehru's departure muted a possible barrier to a full embrace of capital-intensive, high-yield agriculture, and the drought forced India onto the world markets for the most massive imports of cereal grains in history. Over ten million tons, mostly wheat from the United States, were imported in 1966.⁶⁸ Moreover, in return for the wheat the American government pressured the Indian government, unsuccessfully, to mute its criticisms of the American war effort in Indochina.⁶⁹ The autonomy of India's foreign policy was threatened by its dependence on imported foodgrains.

Quite possibly it was the erosion of India's autonomy and the sense that it had lost control of its own destiny that led the country into a complete and unambiguous endorsement of moving to high yielding agriculture, regardless if this was equitable development or not. A prominent Indian plant breeder, M. S. Swaminathan in 1963, had initiated Indian interest in the Mexican wheats developed by Norman E. Borlaug of the Rockefeller Foundation. Then in 1965 and 1966, the Minister of Agriculture approved the importation of massive amounts of seed of the improved Mexican wheats, 18,000 tons in 1966. Land area planted with the new varieties rose from 4 hectares in 1964 to four million in 1971.⁷⁰ Indian breeders, coordinated by the revamped Indian Council for Agricultural Research and the Indian Agricultural Research Institute, made the Mexican wheats even more effective by crossing them with varieties adapted to Indian conditions.

After the early 1970s, India moved increasingly to

self-sufficiency in foodgrains, at least in years with good monsoon rains. In particularly good years, India was a small net-exporter, and in dry years the country had sufficient buffer stocks to avoid famine.⁷¹ However, malnutrition in India was not ended, development was not egalitarian, and a strenuous debate raged over the meaning and significance of the inequalities. Nevertheless, considerations of national security and autonomy and the preservation of foreign exchange for other purposes had moved the government to adopt intensive agricultural practices. The vision of a simple agrarian Indian socialism held by Gandhi, and to a lesser extent by Nehru, was gone.

III. Conclusions

Cuba, Mexico, and India show some striking similarities in the ways in which they have shaped their national agricultural policies during the past half century. Cuba's case is particularly interesting because of the need to revamp its agricultural sectors twice since 1959. Throughout all of these shifts in policy, the themes of importance were using agriculture (1) to support industrialization, (2) to conserve foreign exchange, and (3) to preserve national integrity in the face of hostile foreign powers.

Mexico was first to reshape its agriculture. Use of land reforms by the Cárdenas administration may have helped the ruling party garner supporters and voters in the rural areas and was thus important to consolidating the revolutionary party's legitimacy. Land reform was a program that helped poor people achieve a modicum of dignity and security, but it did not do much to raise aggregate, national production. Redistributed land was used for small-scale, subsistence agriculture, and few new marketable surpluses came from the *ejidos* to the urban areas. Furthermore, people who could earn a subsistence living in their communal groupings may not have been inclined to leave the rural areas in search of industrial jobs.

Land reform, therefore, did not satisfy the visions of those Mexicans who wanted to see Mexico take its place among the industrialized nations of the world. President Avila Camacho understood this, and probably President Cárdenas did, too. Technical reform, not land reform, was needed to enable intensive, large-scale production to begin and thus create an agriculture supportive of industrialization. Large surpluses grown with little human labor created the conditions that would both enable and require small-scale subsistence producers to head for the cities in search of a better life (although in fact they often did not find it). Strong domestic production also eased Mexico's foreign exchange problem.

India's agricultural transformation differed from Mexico's in that India achieved both its political independence and its higher yielding agriculture almost simultaneously. Nevertheless, the themes of industri-

alization and preservation of foreign exchange emerged as decisive in India's decision to intensify its agriculture. Social reform programs (some land reform and the Community Development) were promoted as India struggled to raise aggregate production levels. Within thirteen years of independence, however, the consensus of India's ruling party, plus its technical advisors of the Ford and Rockefeller Foundations, was that socially based programs were inadequate to meet India's production goals. Technical reform was needed to provide an assured, low cost food supply for the urban areas, to stem a serious drain on foreign exchange for imported grains, and to provide a food supply that was not drawn from hostile neighbors or a major power that might threaten national independence.

Cuba from 1959 to 1989 went through these same issues.⁷² Cuba's government wanted the country to have the economic advantages that come with a larger industrial capacity, which meant that some Cuban labor needed to leave agriculture and enter the urban work force. Cuba was about 55% urban in 1960 but about 75% urban in 1990.⁷³ Although revolutionary Cuba launched powerful social reforms in land tenure, housing, education, and health care, it is also necessary to see that Cuba rapidly embraced the technical reforms much as had Mexico and India. Mechanization, the adoption of synthetic fertilizers and pesticides, development of irrigation, and use of improved varieties all entered Cuban agriculture as a matter of government policy. These technological changes were successful in raising Cuba's aggregate national production levels and in releasing labor to enter the urban areas.

Cuba after 1959 also had to worry about how its agriculture supported the conservation of foreign exchange and the protection of national security. Here the Cuban situation differed in detail but not in substance from events in Mexico and India. Conservation of foreign exchange was obtained by obtaining good bartering arrangements of Cuban sugar for petroleum, petrochemicals, manufactured items, and imported foodgrains and feedgrains. These trade arrangements were inextricably tied to Cuba's military and ideological alliance with the USSR. Cuba's protection of its national integrity against the hostility of the United States was thus completely dependent, economically and militarily, upon the productivity of its agricultural sector, particularly sugar.

All of these arrangements came crashing down in 1989 when the communist parties of eastern Europe and the USSR lost their legitimacy and authority. Demise of the bartering arrangements forced Cuban sugar back into capitalist trade networks, which historically had not been good for the Cuban economy and, based on the current terms of trade, seem still not to be good. Therefore, Cuba once again is trying to restructure its agriculture through a combination of

social and technical reforms. What binds these current changes to earlier events are their objectives to support an industrial economy, to conserve foreign exchange, and to protect national security.

In the Special Period, Cuba is doing a number of things to maintain agriculture's ability to promote a Cuban industry. Overall, the biggest component of the Special Period's technical changes are aimed at keeping high, national aggregate yields of crops. Efforts to find biological inputs that substitute for synthetic fertilizers and pesticides are the keys to keeping yields high. Similarly, further development of irrigation potential and use of improved varieties also aim to keep aggregate production levels high. If production can be maintained, then Cuba may have enough surplus to support an industrial work force. A supplement to keeping rural yields high is the program of urban gardens and promotion of vegetable production in the Province of Havana.

Labor resources are perhaps the largest problem for Cuba. From 1959 to 1989, Cuba had a substantial rural to urban migration, just as did Mexico and India. Cuba now, however, needs more labor in the rural areas. Loss of petroleum and machinery imports has forced Cuban agriculture back to animal traction and more intensive labor use in other aspects of production. Unfortunately, people who live in cities cannot work in the countryside. Moreover, once people have tasted city life they often don't want to work in agriculture, and they quickly lose needed skills. For these reasons, Cuba has programs to entice people back to the rural areas. Moral incentives and financial benefits make a package that draws urban workers for short or long-term stints in rural labor.

Movement of labor back into agriculture is the technical change that seems most like a reversal of the "green revolution," and this clearly separates the stories in Mexico, India, and post-1959 Cuba from post-1989 Cuba. Nowhere in the world has such a reverse labor flow occurred on such a scale, and it remains to be seen how extensive this will have to be in Cuba and how successful the Cuban government will be in promoting the reverse exodus.

It should not be thought, however, that the reversal of labor flows in post-1989 Cuba make the changes of the Special Period technically simple. Cuban efforts to reconstruct its agriculture in the Special Period are extremely "high-tech" changes. For example, the searches for biofertilizers and biopesticides require remarkably sophisticated abilities to manipulate biological organisms. These changes will not be done without an educational infrastructure to train scientists and technicians. Production facilities for biofertilizers and biopesticides will also be "factories" needing highly skilled workers. Even the reversion to animal traction in Cuba is likely to have sophisticated technical angles to it as Cuban engineers search for better implements.

What remains to be seen is whether Cuban efforts to reform its agriculture can provide the surpluses needed to keep a substantial industrial work force in place. Cuba is also still dependent on foreign food-stuffs, which is currently creating an enormous drain on very limited foreign exchange reserves. Should the Cubans de-emphasize sugar production, which earns foreign exchange, in favor of more domestic food production? That is a difficult question, but it lies at the heart of what Cuban agricultural planners must consider.

Ultimately the success of the Special Period may be determined by its ability to keep Cuban agriculture productive enough to defend against the hostility of the United States. Promotion of national security will require adequate provision of domestic food supplies, support of an industrial and military apparatus, and the preservation of limited foreign exchange. These are the types of questions faced earlier by Mexico and India, and each of those countries adjusted their economies in response to these issues. In both Mexico's and India's case, technical reform replaced social reform, to the detriment of many Mexican and Indian citizens. On the other hand, vulnerability due to lack of agricultural produce also hurt the citizens of the two countries. What remains to be seen is whether Cuba will succeed in maintaining its revolutionary social ideals in the face of their current crisis.

Notes

* I am indebted to several people who have worked hard as Research Assistants: David Giglio, James Jenkins, Michael Kent, Linda Knight, Michael Macsems, and Mariusz Twardowski. Tim Knight prepared the maps in Figures 1 and 2, based on maps from the National Geographic Society. I am grateful to Tim and to the Society for permission to make use of their maps. Financial assistance came from the National Science Foundation (DIR-9012722, DIR-8911346, SES-8608372), the Smithsonian Institution, and The Evergreen State College. The staffs of the Rockefeller Foundation Archives, the Ford Foundation Archives, the U. S. National Archives, and the National Archives of India all helped to find pertinent documents. Many librarians at The Evergreen State College, the University of Washington, the University of California at Berkeley, the Indian Agricultural Research Institute, the Delhi School of Economics, the International Center for Maize and Wheat Improvement, and Imperial College of London gave much assistance. To Peter Rosset goes credit for getting me involved in a trip to Cuba, organized by the very capable staff at Global Exchange, San Francisco. My colleagues Peter Bohmer, Lin Nelson, Gil Salcedo, José Suarez, and Tom Womeldorff gave me many helpful com-

ments on a draft of this paper. While I could not answer all of their questions and challenges in this paper, their reactions to it were most helpful. To all of these people and organizations, I am deeply indebted. All mistakes and errors of judgment, however, remain my responsibility.

1. Personal communication, Dr. Enrique Pérez Marin, Cuban Ministry of Agriculture, 21 November, 1992.
2. Diana Deere, *Socialism on one island? Cuba's national food program and its prospects for food security*, (The Hague: Institute of Social Studies, June, 1992), pp. 11-14, Table 2.
3. Some simple calculations give insights into how much land would have to be used, if Cuba were to be self sufficient on a vegetarian diet. To be conservative, we will estimate these needs for the year 2025, when Cuba's population is predicted to be about 13 million people. Currently Cubans number somewhat under 11 million and the population is increasing at about 0.73% per year.

If each person had an average of 0.8 kg of rice per day, the *per capita* caloric supply to each person would average 2888 kcal per day, which is the standard achieved for the Cuban diet in 1987. This amount of rice would provide about 65 g of vegetable protein each day, which is slightly less than the 1987 achievement of 78 g per person per day.

To allow for seeding and wastage, we assume a need to provide 1 kg per person per day of rice, 20% of which will not be directly consumed as food and 80% of which (0.8 kg) will be eaten. To achieve 1 kg per person per day for a population of 13 million would require the use of 1.36 million hectares of land, or about 40% of all arable land in Cuba, based on the yields achieved in 1986, 3.6 tons per hectare. If yields were lower, then more than 40% of the arable land would be required to produce the needed harvest. In addition to the use of arable land for rice production, Cuba would also have the remainder of the arable land plus the animal products of pastures.

Although this calculation of arable land needed for a rice-based diet is simplistic in terms of the actual conditions of Cuba's agriculture and dietary needs, it provides one critical insight: Cuba has more than enough land area for self-sufficiency in a cereal-based diet, provided it can come reasonably close to the average per hectare yields obtained in 1986.

4. Deere summarizes the results of the early revolutionary decision, in 1961, to diversify Cuba's agriculture by reducing land in cane and substituting domestic food crops. Cane production fell more than was expected and food production never met expectations. Between 1962 and 1965, the Cuban government made a series of decisions that put sugar back in first priority for Cuban agricul-

- ture. That decision was never reversed. Carmen Diana Deere, *Socialism on one island? Cuba's national food program and its prospects for food security* (The Hague: Institute of Social Studies, Working Paper Series No. 124, June 1992), pp. 8-11.
5. I am indebted to my colleague Tom Womeldorff for this observation.
 6. James E. Austin and Gustavo Esteva, *Food Policy in Mexico, The Search for Self-sufficiency* (Ithaca: Cornell University Press, 1987), p. 25.
 7. Leonel Duran, ed., *Lázaro Cárdenas, Ideario Político* (Mexico: Ediciones Era, 1972), p. 9; Trens Agency, Cárdenas Address at Queretaro Convention, in *The Mexican Government's Six Year Plan* (Mexico City: Trens Agency, [1934], pp. 77-83; Cárdenas, Lázaro, The President's address, *Modern Mexico*, January 1937: pp. 5-8.
 8. Roger D. Hansen estimates that 17.9 million hectares were distributed to 811,000 people (*The Politics of Mexican Development* (Baltimore: The Johns Hopkins University Press, 1971), pp. 33-34. Venezian and Gamble estimate that 20 million hectares were given to 750,000 people during the Cárdenas administration (Eduardo L. Venezian and William K. Gamble, *The Agricultural Development of Mexico, Its Structure and Growth Since 1950* (New York: Frederick A. Praeger, 1969), pp. 54-62.
 9. Government of Mexico, *The True Facts about the Expropriation of the Oil Companies' Properties in Mexico*, (Mexico: Government of Mexico, 1940), 271 pp.
 10. Purport files, M 973, Roll 371, RG 59, National Archives, Washington, DC. Seizure of oil properties was particularly important to the Roosevelt administration. U. S Secretary of State Cordell Hull asked for daily reports from Ambassador Josephus Daniels on the situation surrounding the oil properties (Hull to Daniels, April 12, 1938, 812.6363/344OA, RG 59, National Archives, Washington, DC.)
 11. Cárdenas made clear from his inauguration that land reform was only one of the avenues of change he intended to pursue. In addition, he wanted to build irrigation works, improve farming practices through new technology, and develop communication and transport facilities. See *The Mexican Government's Six year Plan, 1934-1940* (Mexico: Trens Agency, [1934]), 84 pp.

As an example of his personal interest in these matters, in the summer of 1934 President Cárdenas visited the Yaqui Valley with General and former President Plutarco Calles. Support for water development in this valley was strong, and surveying began in 1935. (812.6113/94, [July 8, 1934]; 812.6113/96, September 4, 1934; and 812.6113/100, January 30, 1935; all in RG 59, National Archives, Washington, DC.)

12. Albert L. Michaels, *The Mexican Election of 1940* (Buffalo: Council on International Studies, State University of New York, 1971), 52 pages, mimeo; Albert L. Michaels, The crisis of Cardenismo, *Journal of Latin American Studies* 2 (1970): 51-79.
13. *Ejidors* were parcels of land distributed to Indian villages, and the land was owned in common, not by individuals.
14. Albert L. Michaels, *The Mexican Election of 1940* (Buffalo: Council on International Studies, State University of New York, 1971), 52 pages, mimeo; Angus Wright discussed the theme of using agriculture as a source of capital for industrialization at some length in *The Death of Ramón González* (Austin: University of Texas Press, 1990), pp. 171-172, 264-272.
15. Hull to Daniels, November 12, 1940, 812.001 Camacho Manuel A 122A, RG 59, National Archives, Washington, DC.
16. Stakman, E. C., Richard Bradfield, and Paul C. Mangelsdorf, *Campaigns Against Hunger* (Cambridge: Harvard University Press, 1967), pp. 22-23; Stakman, E. C., *The Reminiscences of E. C. Stakman*, pp. 941-943, RG 13, Rockefeller Foundation Archives.
17. "Agricultural conditions and problems in Mexico," Report of the Survey Commission of the Rockefeller Foundation, 1941, Rockefeller Foundation Archives, RG 1.1, Series 323, Box 5, Folder 37, Rockefeller Archive Center.
18. Warren Weaver, *Scene of Change* (New York, Charles Scribner's Sons, 1970), pp. 96-97; Oral History, Rockefeller Foundation Program in Agriculture, Interview with J. George Harrar, Rockefeller Foundation Archives, Series 923/Oral History/Volume XIII, Rockefeller Archive Center. Documents in the Rockefeller Foundation Archives suggest that the Foundation did not consult with Mexican officials about the hiring of Harrar. See Raymond B. Fosdick to Marte Gomez R., March 17, 1943, Folder 63, Box 10, Series 323, RG 1.2, Rockefeller Foundation Archives.
19. Report on Agricultural Activities in Mexico, February 3 to May 20, 1943, E. C. Stakman, Folder 60, Box 10, Series 323, RG 1.2, Rockefeller Foundation Archives.

Stakman's wording in the report revealed the surprise at the inclusion of wheat rust and the importance of Avila Comacho's ideas:

"Rather unexpectedly, the Secretary of Agriculture and others . . . [believed] the control of wheat rust as the most important single problem. . . Although it is doubtful whether this actually is the most important single problem, it probably is the most important one which has received virtually no attention. . . . [T]he President of the

Republic is very desirous of increasing the acreage; therefore this is the policy of the Department of Agriculture also. Obviously then, the control of wheat rust should be the beginning of a general project for wheat improvement and expansion in acreage."

Ironically, when Norman Borlaug, the chief wheat breeder for the Rockefeller Foundation recounted, in 1957, the progress of the Foundation's program, he stated, "When the Mexican agricultural research program was organized in 1943, it was clear that wheat was one of the crops on which a concentrated research effort should be made" (Norman E. Borlaug, *The impact of agricultural research on Mexican wheat production*, *Transactions*, New York Academy of Sciences 20 (1958): 278). Borlaug's published description of how the program came into being is simple compared to the unpublished correspondence from Stakman.

20. Henry M. Miller, Jr., to Frank Blair Hanson, February 10, 1943, Folder 63, Box 10, Series 323, RG 1.2, Rockefeller Foundation Archives; Raymond B. Fosdick to Marte Gomez R., March 17, 1943, Folder 63, Box 10, Series 323, RG 1.2, Rockefeller Foundation Archives.
21. OSS is often referred to as "OEE," the acronym for its Spanish name, Oficina de Estudios Especiales.
22. CIMMYT is the Spanish acronym for Centro Internacional de Mejoramiento de Maiz y Trigo.
23. Eduardo L. Venezian and William K. Gamble, *The Agricultural Development of Mexico, Its Structure and Growth since 1950* (New York: Frederick A. Praeger, 1969), pp. 54-62; for a more extended discussion of the links between industrialization and agriculture in Mexico, see Angus Wright, *The Death of Ramón González* (Austin: University of Texas Press, 1990), pp. 171-172, 264-272.
24. Norman E. Borlaug, "The impact of agricultural research on Mexican wheat production," *Transactions of the New York Academy of Sciences* 20(1958): 278-295; Norman E. Borlaug, personal communication, 21-22 June, 1989.
25. From the 1880s, Díaz encouraged irrigation and agricultural development for wealthy investors (Clifton B. Kroeber, *Man, Land, and Water: Mexico's Farmlands Irrigation Policies, 1885-1911* (Berkeley: University of California Press, 1983), pp. 219-220).

Reed Hertford of the U. S. Department of Agriculture argued that Mexican agricultural production "took off" in the mid-1930s and was associated with but not necessarily caused by the social reforms of the Cárdenas years. In addition, Hertford speculates that the land reform plus the general price inflation of the 1940s and 1950s allowed a minority of farmers to make the transition from traditional subsistence modes to highly

capitalized forms of production (Reed Hertford, "The development of Mexican agriculture: a skeleton specification," *Journal of Farm Economics* 49 (December, 1967): 1171-1187). From a different vantage point, Eduardo L. Venezian and William K. Gamble of the Ford Foundation argued that the price inflation for most farmers may have amounted to an extraction of forced savings, which were used to finance industrial development (*The Agricultural Development of Mexico, Its Structure and Growth since 1950*, New York: Frederick A. Praeger, 1969), pp. 54-62).

26. Stephen R. Niblo, *The Impact of War: Mexico and World War II*, Melbourne: La Trobe University, Institute of Latin American Studies, Occasional Paper No. 10, 1988, 39 pp.
27. Rockefeller Foundation, *Strategy for the Conquest of Hunger, Proceedings of Symposium*, 1-2 April 1968, Rockefeller University (New York: Rockefeller Foundation, [1968]), p. 8.
28. Eduardo L. Venezian and William K. Gamble, *The Agricultural Development of Mexico, Its Structure and Growth since 1950* (New York: Frederick A. Praeger, 1969), p. 62.
29. Norman E. Borlaug, "The impact of agricultural research on Mexican wheat production," *Transactions of the New York Academy of Sciences* 20 (1958): 278-295; Norman E. Borlaug, personal communication, 21-22 June 1989; Henry Hopp, Mexico joins wheat-exporting nations of the world, *Foreign Agriculture* June 8, 1964, pp. 3-4.
30. Percival Spear, *A History of India* (Harmondsworth: Penguin Books Ltd, 1970), Vol. 2, pp. 70-144; Stanley Wolpert, *A New History of India* (New York: Oxford University Press, 1982, 2nd ed.), pp. 168-239; Bipan Chandra, et al., *Struggle for Independence, 1857-1947* (New Delhi: Penguin Books (India) Ltd, 1989), pp. 31-40.
31. K. N. Chaudhuri, Foreign trade and balance of payments (1757-1947), in *The Cambridge Economic History of India* (Delhi: Orient Longman, 1982), Vol. 2, p. 851; George Blyn, *Agricultural Trends in India, 1891-1947: Output, Availability, and Productivity* (Philadelphia: University of Pennsylvania Press, 1966), p. 97.
32. George Blyn, *Agricultural Trends in India, 1891-1947: Output, Availability, and Productivity* (Philadelphia: University of Pennsylvania Press, 1966), pp. 107-111.
33. R. N. Chopra, *Food Policy in India: A Survey* (New Delhi: Intellectual Publishing House, 1988), p. 26.
34. R. N. Chopra, *Food Policy in India, A Survey* (New Delhi: intellectual Publishing House, 1988), pp. 68-75.
35. Some analysts, including the official inquiry, ascribed the cause of the famine to a shortage of grain caused by the capture of Burma plus bad

- weather in the 1942 crop year (India, Famine Inquiry Commission, *Report on Bengal* (Delhi, 1945), pp. 103-104). Other scholars have argued persuasively, however, that no substantial shortage of grain existed. Instead, the famine was caused by a deterioration of the exchange value of wages, primarily among landless, rural laborers (Amartya Sen, *Poverty and Famines, An Essay on Entitlement and Deprivation* (Delhi: Oxford University Press, 1981), pp. 52-85).
36. U.K.-U. S. guiding principles for solving world food problems, *Department of State Bulletin* 14 (May 26, 1946): 895-897.
 37. India, Fiscal Commission, *Report of the Fiscal Commission* (Delhi: Manager of Publications, 1950), Vol. 1, pp. 11, 23. India also had to import cotton and jute from Pakistan in order to supply its textile manufacturing industries.
 38. Stanley Wolpert, *A New History of India* (New York: Oxford University Press, 2nd edition, 1982), pp. 2-14.
 39. J. J. De Blij and Peter O. Muller, *Geography, Regions and Concepts* (New York: John Wiley & Sons, Inc., 6th ed., 1991), pp. 451-459.
 40. Imran Ali, *The Punjab under Imperialism, 1885-1947* (Delhi: Oxford University Press, c. 1988, 1989), pp. vii-5.
 41. Imran Ali, *The Punjab under Imperialism, 1885-1947* (Delhi: Oxford University Press, c. 1988, 1989), pp. 3-5, 109-157.
 42. Quote and information on division of irrigation works is from S. Thirumalai, *Post-War Agricultural Problems and Policies in India* (New York: Institute of Pacific Relations, 1954), pp. 48-55. Other authors concur with Thirumalai's conclusions and note that the Indian section of Punjab was food deficit with poor irrigation works, poor livestock, backward peasants, low literacy, and low urban population, compared to the Pakistani section of Punjab (Gurdev Singh Gosal and B. S. Ojha, *Agricultural Land-Use in Punjab, A Spatial Analysis* (New Delhi: The Indian Institute of Public Administration, 1967), pp. 1-2). For another concurrence, see also Bhupendra B. Hooja, "Planning priorities and development policies with reference to Indian agriculture," in Hoshier Singh, ed., *Agriculture Administration in India* (Jaipur: Printwell Publishers, 1986), pp. 22-60.
 43. K. L. Dua, ed., *Review of Agricultural Research in the Punjab, from 1947 to 1963*, Vol. VI, Part IX, *Plant Breeding and Agronomy* (Ludhiana: Punjab Agricultural University, 1967), pp. i-ii.
 44. Dow, J. C. R., *The Management of the British Economy 1945-1960* (Cambridge: Cambridge University Press, 1964), pp. 42-44; New York Times, "Text of Cripps' Speech Announcing Devaluation of the Pound," September 29, 1949.
 45. India, Fiscal Commission, *Report of the Fiscal Commission* (Delhi: Manager of Publications, 1950), Vol. 1, pp. 43-44.
 46. Office of the Economic Adviser to the Government of India, *Monthly Survey of Business Conditions in India*, 19: 2(1951): 49-52.
 47. W. Norman Brown, *The United States and India and Pakistan* (Cambridge: Harvard University Press, 1963), pp. 180-181; Judith M. Brown, *Modern India, The Origins of an Asian Democracy* (Delhi: Oxford University Press, 1985), pp. 366-369; Stanley Wolpert, *A New History of India* (New York: Oxford University Press, 2nd ed., 1982), pp. 352-354, 374-376, 387-390.
 48. Jawaharlal Nehru began his *The Discovery of India* with an eloquently painful recounting of the Great Bengal Famine of 1943. At the time he wrote this (1944), he was a political prisoner of the British in Ahmadnagar Fort (*The Discovery of India* (New Delhi: Oxford University Press, 1946, c. 1982), pp. 15-17). In Nehru's mind, it was clear that failure to provide adequate food at acceptable prices was an unforgivable indication of the illegitimacy of British rule.
 49. R. N. Chopra, *Food Policy in India: A Survey* (New Delhi: Intellectual Publishing House, 1988), pp. 62-64; Kumar, Virendra, *Committees and Commissions in India, 1947-73* (Delhi: K. K. Publishing House, 1975), Vol. 1, 24-33.
 50. Some uncertainty surrounds the question of how large was the deficit in domestic production. In its *Interim Report*, the Foodgrains Policy Committee of 1947 believed that the system of controlled purchases and distribution of food were likely to perpetuate a sense of food crisis "... in an artificial manner" (p. 11). They believed the statistics of production were too small and the estimates of deficit too large. Furthermore, the prices at which the central government was procuring grains were too low, which exacerbated the tendency of producers of grains not to report and deliver their surplus production. Government announcements of over 140 million persons being under rationing also vastly exaggerated the sense of crisis, because the actual government procurement of around 4 million tons of grain per year was in no way adequate to feed such a multitude. In fact, most people said to be under rationing were obtaining much of their food in the uncontrolled market. Building domestic production, reducing imports, saving foreign exchange, and gradual disengagement from running the food system were the Committee's preferences for reform of India's food situation. (Foodgrains Policy Committee, *Interim Report*, Delhi: Manager of Publications, 1948, pp. 3-13)
 51. R. N. Chopra, *Food Policy in India: A Survey* (New

- Delhi: Intellectual Publishing House, 1988), pp. 64-67, 71.
52. Although the Grow More Food campaign was not successful in ending imports of foodgrains by India, several commentators noted that the steady increase in the Indian population plus some improvement in living standards both tended to increase demand for food. Thus the GMF program was always aiming at a target, "needed domestic production," that itself was continually increasing.
 53. R. N. Chopra, *Food Policy in India: A Survey* (New Delhi: Intellectual Publishing House, 1988), pp. 68-74, 395.
 54. Records of the Indo-U. S. discussions in 1949 are in 845.61311, starting with 7-2249, Record Group 59, U. S. National Archives. See also a summary report, Department of State, *India: Problems and Prospects*, OIR Report No. 5052, October 4, 1949, 53 pp.
 55. Francine Frankel, *India's Political Economy, 1947-1977* (Princeton: Princeton University Press, 1978), 600 pp., provides a thorough review of the clashes between socialist planning and capitalist thinking in the first thirty years of Indian independence.
 56. India, Fiscal Commission, *Report of the Fiscal Commission* (Delhi: Manager of Publications, 1950), pp. 87-94; Sib Nath Bhattacharya, *India's Five-Year Plans in Theory and Practice* (New Delhi: Metropolitan Book Co. (P) Ltd., 1987), pp. 32-33.

A comprehensive pamphlet issued by the Ministry of Information and Broadcasting in about 1950 stated the case most explicitly:

But imports are no solution of India's food problem. They are a severe drain on the country's foreign exchange resources which must be conserved to purchase capital goods and machinery. Considerations of defense and prestige also demand that we cease to look to other countries for food. Food shortage is at the root of many of our problems. In fact, if the country is to progress we must grow all the food we need. (Publications Division, Ministry of Information and Broadcasting, *Agriculture in India* (New Delhi: Ministry of Information and Broadcasting, [1950]), pp. 4-5).
 57. Virendra Kumar, *Committees and Commissions in India, 1947-1973* (Delhi: DK Publishing House, 1975), Vol. 1, pp. 217-219.
 58. For a review of Gandhi's discomfort with modern, industrial civilization, see Raghavan Iyer, *The Moral and Political Thought of Mahatma Gandhi* (London: Concord Grove Press, 2nd ed., 1983), pp. 23-36. See also Bharatan Kumapappa, ed. of M. K. Gandhi, *Food Shortage and Agriculture* (Ahmedabad: Navajivan Publishing House, 1949), pp. iii-v. P. L. Dhar argues that Gandhi had an alternative vision of technology, one to support rather than destroy village life (The Gandhian vision of technology, *Gandhi Marg*, January, 1989, pp. 648-655).

Nehru, in contrast, was much more inclined to embrace the promise of science. For example, he said in a speech to Allahabad University: "I am myself a devotee of science and believe that the world will ultimately be saved, if it is to be saved, by the method and approach of science." (Jawaharlal Nehru, *Independence and After, A Collection of the More Important Speeches of Jawaharlal Nehru from September 1946 to May 1949* (Delhi: The Publications Division, Ministry of Information and Broadcasting, 1949), p. 117. At the same time Nehru realized that science was not entirely sufficient to guide human affairs. Nevertheless, he believed scientific values had to predominate over religious beliefs (Jawaharlal Nehru, *The Discovery of India* (New Delhi: Oxford University Press, 1946, c. 1982), pp. 509-515).
 59. K. P. A. Menon, *Indian Agriculture, Administrative and Organisational Constraints* (New Delhi: Sreedeeep Publications, 3rd ed., 1987), pp. 48-51; M. S. Randhawa, *A History of Agriculture in India* (New Delhi: Indian Council of Agricultural Research, 1986), Vol. IV, pp. 61-68; New Delhi to Department of State, January 21, 1953, 891.20/1-2153, Record Group 59, National Archives, Washington, DC; Douglas Ensminger, Oral History Transcript, A.1., Introduction, Ford Foundation Archives, New York, NY.
 60. Shriram Maheshwari, *Rural Development in India: A Public Policy Approach* (New Delhi: Sage Publications, 1985), pp. 36-40.
 61. Douglas Ensminger was the Ford Foundation representative in New Delhi after 1951. His oral history transcripts contain much discussion of his efforts to persuade the Government of India that intensification was needed. Ensminger saw many factors against more intensive agriculture, including ideological opposition based in Indian socialism, Gandhian ideas of rural self-sufficiency, and lack of institutions that could supply credit, expertise, and physical inputs like seeds, fertilizers, and water (Douglas Ensminger, Oral history transcript, Parts A.3. (The Ford Foundation's Relations with the Planning Commission), A.8. (Relationships with Nehru), A.13. (Need for understanding the Gandhian philosophy...), and B.3. (The Foundation's Persistent Concern and Role in Assisting India Achieve a Status of Food Enough for Its People), Ford Foundation Archives, New York, NY).
 62. Appointment of the First Indo-American Team brought to fruition a recommendation made by the

- University Education Commission in 1949 to create agricultural universities. This idea languished for a number of years, perhaps in deference to Gandhian ideas about simple village self-sufficiency. The Team was appointed in 1954 and involved five Indians and three Americans, who made visits to each others countries in 1955. Their report in 1955 endorsed the notion that each Indian state should establish an agricultural university. See B. P. Pal, "Organization, management and progress of agricultural research in India," *The Indian Journal of Public Administration* 15 (1969): 374-384; M. S. Randhawa, *A History of Agriculture in India* (New Delhi: Indian Council of Agricultural Research, 1986), Vol. IV, pp. 183-184; and Hadley Read, *Partners with India, Building Agricultural Universities* (Urbana-Champaign: University of Illinois College of Agriculture, 1974), pp. 25-26.
63. John H. Perkins, "The Rockefeller Foundation and the green revolution, 1941-1956," *Agriculture and Human Values* 7 (3&4) (1990): 6-18.
 64. Virendra Kumar, "Team for the study of community projects and national extension service, 1956," in *Committees and Commissions in India, 1947-73* (Delhi: DK Publishing House, 1976), Vol. 2, pp. 115-119.
 65. The Agricultural Production Team, *Report on India's Food Crisis & Steps to Meet It* (New Delhi: Government of India, 1959), 259 pp.
 66. The Agricultural Production Team, *Report on India's Food Crisis & Steps to Meet It* (New Delhi: Government of India, 1959), see especially pp. 29-30.
 67. Expert Committee on Assessment and Evaluation, *Modernising Indian Agriculture, Report of the Intensive Agricultural District Programme* (New Delhi: Ministry of Food, Agriculture, Community Development & Cooperation, 1969), pp. vi-xi, 6-9, 11-28; *The Ford Foundation and Agricultural Development in India* (New Delhi: Ford Foundation, 1965; copy in Ford Foundation Archives, New York, NY), pp. 3-6; Francine Frankel, *India's Green Revolution, Economic Gains and Political Costs* (Princeton: Princeton University Press, 1971), pp. 191-200.
 68. R. N. Chopra, *Food Policy in India, A Survey* (New Delhi: Intellectual Publishing House, 1988), pp. 138-142.
 69. C. P. Bhambhri, *The Foreign Policy of India* (New Delhi: Sterling Publishers Private Limited, 1987), p. 37.
 70. M. S. Randhawa, *A History of Agriculture in India* (New Delhi: Indian Council of Agricultural Research, 1986), Vol. IV, pp. 368-371.
 71. R. N. Chopra, *Food Policy in India, A Survey* (New Delhi: Intellectual Publishing House, 1988), Table 11, p. 395.
 72. Much of the discussion on Cuba's agriculture is drawn from the report of a study trip in which I participated, November, 1992. See Peter Rosset and Medea Benjamin, eds., *Two Steps Backward, One Step Forward: Cuba's Nationwide Experiment with Organic Agriculture* (San Francisco: Global Exchange, 1993), 67 pp. See also Carmen Diana Deere, *Socialism on one island? Cuba's national food program and its prospects for food security*, (The Hague: Institute of Social Studies, June, 1992), 49 pp. + notes and tables.
 73. World Resources Institute, *World Resources 1992-1993* (New York: Oxford University Press, 1992), p. 264.

John Wiley & Sons, Inc
Announce the publication of
Food for the Future.

Conditions and Contradictions of Sustainability
edited by Patricia Allen

Food for the Future presents a new direction in agricultural research and education, addresses the central questions regarding what sustainability means in a broad context, and discusses how it can be achieved. The authors delve into the theoretical and practical aspects of a transformation to sustainability — issues that have been obscured by an emphasis on primarily production-level technical skills. Contributors include Frederick H. Buttell, Lori Ann Thrupp, Kenneth A. Dahlberg, Tom Regan, Carolyn Sachs, Michael Redclift, Miguel Altieri, Harriet Friedmann, David Goodman, Katherine L. Clancy, Garth Youngberg, Neill Schaller, and Kathleen Merrigan.

Order from John Wiley & Sons
605 Third Avenue
New York, NY 10158, Attn: Barbara Timmerman

Price: \$39.95