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SOCIALISM ON ONE ISLAND? CUBA'S NATIONAL FOOD PROGRAM AND ITS PROSPECTS FOR FOOD SECURITY

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I. INTRODUCTION

The central question motivating this paper is whether Cuba can "go it alone." Can a socialist island--organized by the principles of economic planning, rather than by the logic of the market, and committed to meeting its population's basic needs--survive in a capitalist sea after the historic demise of the socialist bloc? Moreover, can a country abruptly cut off from its main benefactor, and still facing an economic blockade imposed some thirty years ago by its closest neighbor and natural trading partner, the USA, maintain its commitment to socialism?

Whether Cuba can continue to reproduce, much less further, its socialist revolution seems to depend on at least the following factors: whether it can rapidly deepen the process of import substitution to at least maintain the level of "basic human needs" upon which its population has come to depend; whether it can continue to diversify its exports and its trading partners in order to generate the foreign exchange to purchase petroleum and other critical consumer and capital goods which it can not hope to produce in the medium- or long-run; whether it can generate an investivable surplus internally to maintain minimum investment levels, given the sharp reduction in the flow of foreign aid and loans and the uncertainty of attracting increased investments from the capitalist world as joint ventures; and, last, but not least, whether the revolutionary regime can maintain the force of nationalism as the "ideological glue" behind this unique socialist experiment, sustaining the historically high level of popular support for the revolution.[1]

This paper does not pretend to tackle all of the above issues. Rather, it focuses on the one that I consider to be among the most critical: whether Cuban planners can guarantee adequate food consumption levels to the population in the face of rather abrupt declines in food, fuel, and fertilizer imports.

For over thirty years, the Cuban population has been able to withstand all sorts of inconveniences in daily life given its commitment to the principles of the revolution--particularly, national independence and socio-economic equality. Moreover, after the initial disruptions of the 1960s, economic conditions always seemed to be improving. For example, over the last two decades Cuba has achieved exceptionally high levels of average food consumption by Third World standards: in 1989, per capita daily consumption reached 2,834 calories and 76 grams of protein.[2] It seems likely to me that the Cuban population will also be able to withstand the additional aggravations imposed by what is known as "the Special Period in Peacetime." However, one condition could become intolerable: if adequate food supplies are not guaranteed to all at a reasonable price.

Cuba does have a number of factors in its favor in terms of generating food security and near food self-sufficiency: it has a favorable person to cultivable land ratio--being three times the size of The Netherlands with a population of less than eleven million.[3] After thirty-two years of revolutionary government, it has one of the Third World's most highly educated populations, including an impressive cadre of natural scientists; the agricultural sector, alone, employs some 49,400 university graduates and 83,300 mid-level technicians (Cardet 1991:49). Over the last few decades it has developed a highly modern farming system in terms of the degree of mechanization, modern input use, genetic development, and agronomic management. But here also lies one of the major challenges in the current period: can Cuba deepen import substitution in foodstuffs, facing severe reductions in normal petroleum deliveries as well as of fertilizer, pesticide, machinery, and spare-parts imports?

In many ways, the very success of the Cuban revolution in the agricultural sector (if defined in terms of modernization) constitutes its main albatross. Nonetheless, I will argue that Cuba's investment in human capital over the last thirty years will likely pay off, allowing it to overcome many of the current limitations of having developed a highly modern agricultural sector, and, perhaps, even paving the way for a more ecologically-sound model of tropical agriculture.

The main aim of this paper is to provide a tentative assessment of Cuba's National Food Program, one of the major initiatives designed to cushion the country through this period of transition from dependency on the ex-socialist bloc. The first section describes the evolution of the Food Program; the next, summarizes the initial efforts of the revolutionary government to diversify agriculture, explains why it returned to its primary emphasis upon sugar, and assesses Cuba's current degree of food import dependence. In the third section I provide a detailed assessment of the targets and initial results of the National Food Program, examining five different product areas: viandas and vegetables, grains and legumes, dairy production, poultry, pork and fish production, and the sugar industry. The reader who is more interested in agrarian policy than in the more technical aspects of the Food Plan is advised to skip on to the fourth section. There, I highlight some of the innovations in Cuban agrarian policies which have resulted from "the Special Period in Peacetime," such as the need to develop an ecologically-benign agriculture, the relationship between material versus moral incentives and new forms of organization of work, the role of the private sector, and the new economy-wide stress on self-provisioning. Finally, I offer some tentative conclusions with regard to the Food Program's prospects for assuring Cuban food security.

II. AN OVERVIEW OF THE NATIONAL FOOD PROGRAM

The National Food Program (Programa Alimentario) is a broad-ranging, and constantly evolving program, that, by 1990 covered almost every product of the Cuban agricultural sector. While the term "Programa Alimentario" was not coined until late 1989--subsequent to the disintegration of socialist Eastern Europe--and the program tends to be associated with the country's intense effort to increase the production of viandas (a Cuban term for root crops and plantains) and vegetables--following the 1990 demise of COMECON (The Council of Mutual Economic Assistance, or CMEA) and the growing instability in Soviet-Cuban trade--many of its components date back to the "Rectification" campaign initiated in 1986.

At the extended Third Congress of the Cuban Communist Party (December 1985 to February 1986), Fidel Castro announced that the party was

commencing a process of "rectification of errors and negative tendencies." The rectification process has been variously treated as Fidel Castro's stubborn alternative to Gorbachev's Perestroika; an abandonment of the SPDE (System of Direction and Planning of the Economy, which is associated with material incentives and enterprise financial autonomy, a planning system initiated in 1975) in favor of moral incentives; and/or as a response to Cuba's hard currency debt and fiscal crisis.[4] But the rectification process also has encompassed a number of major new agricultural development programs which have received scant attention in the literature.

Probably the most important new investment program announced at the Third Party Congress centered on irrigation. An ambitious hydraulic investment plan was revealed to double Cuba's dam capacity by 1995, with hundreds of kilometers of major and minor canals also to be built. In addition, new integral development programs were announced for dairy and citrus production. While both of these sub-sectors had been the focus of intense development efforts in the early 1970s, the pace of investment had subsequently slowed, leading to low growth rates in production in the 1980s. Now, they were again to command center stage. Finally, a major program was unveiled at this time to renew efforts to develop the mountainous regions of Cuba, a program known as the Plan Turquino. Designed both to spur coffee and cacao production and slow out-migration from the mountains, significant investments were announced in both social and economic infrastructure.

Following the Congress, the party initiated a major review of the role of the private sector in Cuban agriculture,[5] and in May of that year, the free peasant market--which had been opened in 1980--was closed. At the concluding session of the Second Congress of Production Cooperatives--where the decision to close these markets was taken--Fidel Castro argued that these had acted as a corrupting influence, led to too much peasant enrichment and inequality, and stifled incentives for peasants to join the new agricultural production cooperatives.[6] Over subsequent months, a major overhaul of the state food procurement and distribution was begun and an in-depth assessment of the performance of the agricultural sector commenced.

During 1987, as rectification gained steam, rice was added to the list of priority sub-sectors. Again, rice had been one of the other rubrics prioritized for development in the late 1960s/early 1970s, which had tended to stagnate by the 1980s. The goal of becoming totally self-sufficient by 1995 was announced, largely to result from massive investments in new irrigation schemes. Then, in 1988, Fidel Castro personally took over as Chair of the Executive Committee of the Council of Ministers, and took up the problem of reviewing Cuba's agricultural deficiencies. Two more special programs were announced later that year: a poultry development plan for 1988-93, and a pork development plan for 1989-93 (Poder Popular 1991:6).

However, it was not until after the collapse of the Berlin Wall that the Cubans once again turned their attention to one of the main-stays of the Cuban diet, viandas, as well as vegetable production. After Soviet wheat deliveries faltered in January 1990, causing shortages of bread, what was now becoming known as the National Food Program, increasingly focused on the goal of increasing vianda and vegetable production, and, moreover, of attaining self-sufficiency in the province and city of Havana. The two Havana provinces[7] account for approximately 30% of the population of the country, and have traditionally relied upon other provinces for well over half of their vianda, vegetable, grain and fruit consumption requirements.

All of these plans to increase agricultural production were drawn up when Cuba still had access to relatively normal supplies of imported fertilizers and oil. But by late August 1990, Cuba had entered "the Special Period in Peacetime" as a result of what turned out to be a 3.3 million ton shortfall in contracted Soviet oil deliveries for 1990. Drastic energy-saving measures were announced, a number of factories shut down or to work with reduced shifts, and the rationing system extended to include most industrial products and foodstuffs.[8] The Food Program took on a new urgency and became explicitly focused on not only reducing Cuba's food import dependence, but also on food security: assuring the population adequate levels, if not the normal composition, of calories and proteins. By the end of 1990, when the program was evaluated by the National Assembly

of Poder Popular, Cuba's legislature, the Food Program included not only most food crops, but also, complementary targets for the sugar, fishing, food processing, animal feed, and supporting manufacturing industries.

Already in November 1990 plans had been drawn up both to transfer excess urban labor into permanent agricultural work, and for a major mobilization of Havana city residents for the weeding and harvesting of the expanded acreage in winter crops. The former initiative is known as the contingentes (contingents), and follows the model of work previously developed in the construction industry, where workers volunteer for a two-year stint to work twelve-hour or more days for a higher wage and above-average living conditions. In contrast, the mobilizaciones (mobilizations) are made up of urban volunteers who go to the country-side for two-week periods. In order to assure that urban workers, indeed, volunteer, major investments have been made throughout Havana province in new and attractive campamentos (camps), which offer quite decent accommodations. Also, to entice members of the contingents to remain in the country-side once their terms are over, it was decided that the only new housing construction to be initiated in "the special period" would be in new agricultural communities, situated near state farms.

By early 1991 the Food Program was nearly fully in place in Havana province. During that year, the mobilizations were extended to other provinces of the country as part of a nation-wide effort to increase vianda and vegetable production. Moreover, the contingent model was initiated in Santiago province. As the projected shortfall in oil, fertilizer, animal feed, and food imports grew in dimension, a major campaign was launched for households and enterprises, alike, to put in garden or self-provisioning plots, whether collectively or individually, resembling the World War II "victory garden" effort in Britain.

It is now estimated that in 1991 Cuba was able to import only 8.6 million tons of oil, down from the below-normal 1990 level of 10 million tons. Moreover, during 1991, Cuba received only $1.67 billion worth of imports from the Soviet Union, its main trading partner, 60% less than 1990 deliveries of $4.13 billion.[9] Among the main casualties, in terms of the agricultural sector, were imports of fertilizers, pesticides, agricultural

machinery, and animal feed. For example, as of September 1991, Cuba had received only 16% of the contracted fertilizer deliveries, 38% of the agricultural equipment, and 45% of the grain deliveries from the Soviet Union. Moreover, in the 1991 trade agreement, Cuba had only planned on importing the machinery and equipment considered essential to the Food Program.

Prospects for 1992 are bleak, with Cuba guaranteed only some four to six million tons of oil imports.[10] Current plans are based on the expectation of zero fertilizer or animal feed imports during 1992.[11] Before turning to the actual goals of the Food Program, and a more detailed analysis of its constraints and possibilities, it is useful to first consider Cuba's food dependence in historical perspective.

III. CUBA'S FOOD DEPENDENCE BEFORE AND AFTER THE REVOLUTION

On the eve of the Cuban revolution, food imports made up on the order of one-fifth of the country's total import bill (see Table 1). Although significant gains had been made in food import substitution in the 1930s (as a result of high tariffs) and again in the early 1950s (through a concerted effort to expand rice production), in the second half of the 1950s food production was basically stagnant. According to Bianchi (1964:71-73), the author of one of the more careful studies of Cuban agriculture in the early revolutionary period, after 1956, imports of foodstuffs which could be produced in Cuba were growing at an even faster rate than total food imports. At the same time, as a result of the predominance of sugar cane production in the island's economy and the highly concentrated land tenure pattern, Cuba was characterized by significant amounts of idle land and un- and underemployed rural labor, particularly during the "dead season" in sugar production.

Within the year of the Revolutionary government's coming to power, Fidel Castro announced that the diversification of agriculture would be one of the revolution's top priorities. Diversification was to proceed following what has been termed the "golden rule" of French agronomist Rene Dumont, one of the main advisors to the Cuban government in this period: "never a crop-farm without livestock, never a cattle-farm without crops"

(Ibid.:129). Unfortunately, according to most analysts of this period, Dumont's advice was taken too literally, and led to one of the first major economic blunders of the revolution.

Diversification efforts had commenced almost immediately on the expropriated cattle estates, which while nominally called cooperatives, were managed by INRA, the National Institute of Agrarian Reform. By May 1960 INRA had reportedly already added some 175,000 hectares to the area planted in crops, as a result of bringing idle lands into cultivation, and by reclaiming land which had been taken over by marabu, a pernicious shrub which had been decimating natural pastures over the previous decade. Most of the expansion in acreage focused on import substitution crops such as rice, cotton, potatoes, onions, soya, and peanuts. Most notably, this expansion in acreage took place without significantly affecting the area devoted to traditional export crops: sugar, coffee and tobacco (Ibid.:116). Moreover, the early efforts at diversification provided increased employment possibilities for the previously seasonally unemployed--allowing the government to meet one of its other goals (Boorstein 1968:53). During 1961, the year the non-cane cooperatives were officially turned into state farms (granjas del pueblo), INRA had brought some 830,000 has., some one-third of their total area, into crop production. By then, as well, the stock of Cuban cattle had been severely reduced, partly as a result of indiscriminate slaughtering as well as the government's decision to meet the increased demand for meat that resulted from income redistribution.

The expropriated sugar plantations at this time were organized into 622 cane cooperatives, which, while also under the supervision of INRA, according to Bianchi (Ibid.) functioned more along cooperative lines. The initial efforts at diversification on these focused on introducing dairy cattle to provide milk for workers and their families, and on the production of some foodstuffs for local consumption. But in December 1960, Fidel Castro had also announced that 1961 would be the great year of agricultural diversification on the cane cooperatives. And 1961 was quite a year, indeed.

The goal was for the cane cooperatives to plant some 165,000 has. in food crops and another 40,000 has. in improved pastures. To meet the

target, some 130,000 has. of cane were uprooted following the record 1961 harvest. The official rationale was that too high a proportion of cane had been traditionally left unharvested each year, and that it was much more economical to simply uproot the cane and dedicate the land to crop production rather than to open up new lands. Moreover, it was expected that sugar cane yields on existing land could be raised quickly, thus not affecting overall raw sugar production (Bianchi 1964:130). Moreover, given the U.S.'s 1960 cancellation of the Cuban sugar quota in the U.S. market, prospects for Cuban sugar sales at reasonable prices on the world market were bleak, indeed.

The results of the decision to rapidly diversify the agricultural sector were rather disastrous. Sugar production in 1962 fell to 4.8 million tons, some 30% below 1961, and the lowest level since 1955. Although only about 10% of existing cane lands had been demolished, the overall effect on cane production was more severe, since the cane lands which had been uprooted included some of Cuba's best sugar cane lands (those which had been under the direct management of the former plantations). Moreover, compounding the problem were draught conditions which lowered yields; a growing labor shortage--which slowed the pace of the harvest and thus, industrial yields; and the general disorganization of the cane cooperatives--which now had to contend not only with sugar cane production, but also with diversified crop production (Ibid.:132-133).

The diversification campaign also produced disappointing results in terms of food production. While food production had increased favorably in the initial two years of the revolution, during 1961 and 1962 there were significant declines in rice, potato, and vianda production, among other crops. It became clear that a major reappraisal of agricultural strategy was called for, which, according to Bianchi (1964:141-142) began in March 1962.

There was a growing consensus that, while agricultural diversification and import substitution would remain as long-term goals of the revolution, they could not be achieved at the cost of sugar cane production and the foreign exchange generated by sugar exports. While the Soviet Union had largely accommodated Cuba's record-level 1961 harvest, in

1962, as a result of its reduced cane harvest, Cuba had been unable to even meet its sugar sale contract with the USSR. Further, by 1962 Cuba was experiencing a growing balance of payments problem (Boorstein 1968: 201-203). If the country were to meet its still-held ambitious industrialization targets, and to increase the level of capital good imports needed to modernize the agricultural sector, reliance upon sugar exports was increasingly seen as a necessity.

It was also recognized that Cuba could not shift quickly from extensive to intensive cultivation of cane, and significant investments in irrigation and agronomic research would be required to increase yields substantially. Along with this, came growing awareness that early Cuban planning had assumed there were no resource constraints (Ibid.:53). By 1962 it was becoming apparent that Cuba was facing a growing labor shortage in the agricultural sector (partly as a result of the expansion of education, and the growth of the construction industry and defense efforts), and that further agricultural development hinged on mechanization, particularly of the cane harvest (Pollitt 1992).

The reappraisal resulted in the decision to replant 200,000 has. in cane during 1962. Moreover, it was decided to convert the cane cooperatives into state farms, partly because of their disarray in this period, and because it was thought that the state could implement a more rational use of lands with direct control over all the expropriated lands (Bianchi 1964:147-152). The main foreign advisors to Fidel Castro in this period, such as Dumont, Boorstein, and Bettelheim, concurred with the decision to refocus efforts on sugar cane production, although there is some disagreement among them and other writers, on when the decision was actually made. Bianchi's account (1964:141-152) places the reassessment of priorities in 1962, the year that rationing was introduced on a broad scale. Boorstein (1968: 201-203) reports that the leadership did not pick up on the sugar problem until late 1962, when balance of payments problems were recognized as a major concern and when it was evident that the 1963 harvest would be even lower than that of 1962 (it fell to 3.9 million tons). He also pinpoints Fidel's announcement of a 10 million ton sugar production goal as coming in the spring of 1963.

Dumont (1970:104, 142) who authored the diversification plan, eventually came to consider the diversification efforts as excessive and praised Fidel Castro's speeches of August and November 1963 for the renewed emphasis they gave to sugar in Cuba's development strategy. Mesa-Lago (1971:297-298) sees the policy change taking place as a result of Fidel Castro's trips to Moscow in mid-1963 and early 1964, when the Soviet Union agreed to increase its purchases of sugar from two million tons in 1965, to five million tons in 1968-70. Most writers are in agreement that by 1965, Cubans had given up on both food self-sufficiency as well as on industrialization as a short to medium-term goal. And clearly, by that year, all efforts began to concentrate on meeting the 10 million ton goal set for 1970.

As Table 1 shows, in 1970 Cuba's food import bill represented about the same share of total imports as before the revolution. Since 1975, however, Cuba has made important gains in reducing its dependence on food imports and the share of foodstuffs in the total import bill, reducing this latter ratio to an average 9.5% in the 1986-1988 period.

Pérez-López (1991:206-7) has questioned whether these gains have been real, noting that since 1980, total import data include a growing quantity of fuel imported from the Soviet Union which Cuba then re-exports for hard currency sales. He thus presents estimates of food imports as a share of non-fuel imports, and shows this ratio declining from 20% in 1980 to a low of only 14% in 1986 (Ibid., Table 44). While the trend is similar to that presented in Table 1, the declining share of food imports in the total import bill is certainly less impressive than reported above.

A better measure than Perez-Lopez's, which takes into account his concern, is to consider Cuba's imports net of oil re-exports. As seen in the last column of Table 1, this more precise estimate of the "real" import bill[12] produces an estimate of the share of food in the import bill only slightly higher than my original estimates. In other words, the explanation for the decreasing share of foodstuffs in total imports must be found elsewhere than in the benefit Cuba enjoyed of re-exporting Soviet petroleum for hard currency sales.

The declining food import ratio is a result of the following four factors: First, as Cuba began to run into balance of payments difficulties in 1986, it sharply decreased both total imports and food imports, as Table 1 shows, with foodstuffs initially taking a disproportionate share of the reduction.[13] But, second, world market prices of some of the key food import items were falling in this period, so the country was cushioned against sharp reductions in quantities of food imports while benefiting from lower import values. For example, the unit import cost of corn fell from 132.28 pesos[14] per ton in 1985 to a low of 80.38 pesos/ton in 1987, while for beans, the decrease was from 419.26 pesos/ton to 318.84 pesos/ton in the same period.[15] Unit import costs for both products increased slightly in 1988, and then sharply in 1989.

A third factor is that Cuba did accomplish some real food import substitution, particularly between 1975 and 1985. As Table 2 shows, the greatest gains were related to Cuba's expanding food processing industry. Wheat imports were increasingly substituted for wheat flour as Cuba's domestic milling capacity increased over this period. Similarly, important gains were made in the dairy industry, with domestically-produced cheese and butter increasingly replacing imports. Moreover, during this period, the value of Cuba's imports of both wheat and powdered milk fell, the latter the result of expanding domestic milk production. A similar trend can be found with respect to canned meat, with the country also becoming a net exporter of live animals. The latter development is the final factor explaining the declining share of foodstuffs in total imports. Since 1980 Cuba has become a net exporter in the product category of coffee, tea, cacao, and spices, with the value of imports approximately halved since 1975. Beginning in 1985 the country also became a net exporter of potatoes and of certain vegetables (onions and green peppers).

Notwithstanding the above gains, Cuba was still importing an average annual $719 million pesos worth of foodstuffs and animal feed annually in the 1986-88 period (CEE 1989:Table XI.10). Moreover, and more important to the current analysis, in the late 1980s Cuba was importing an estimated 44% to 57% of its per capita caloric requirements (Pérez and Muñoz 1991:2; Cardet 1991:50).

The bulk of food imports were from the Soviet Union, and among the top items were products which Cuba can not easily produce. In descending order of average annual value, the major food imports in 1986-88 were: wheat (134 million pesos), lard and oils (109.5 m.p.), canned meat (52 m.p.), corn (50 m.p.), rice (47.5 m.p.), beans (39 m.p.), butter (28 m.p.), wheat flour (26 m.p.), powdered milk (24.5 m.p.), frozen chicken (24 m.p.), condensed milk (18 m.p.), and cheese (13 m.p.). If animal feed were included in this listing, it would rank third (81 m.p.), after lard and cooking oils.

Of the top thirteen items (which account for 75% of the value of food imports), the ex-Soviet Union supplied fifty percent or more of the tonnage of nine items, including all of the wheat flour, condensed milk, and fish, and 89% of the wheat (CEE 1988:Table XI.18). Eastern Europe was much less important than the Soviet Union in terms of Cuban food supplies, with food imports of any quantitative significance coming primarily from Bulgaria and East Germany. Bulgaria supplied 29% of the cheese, 20% of the lard and 4% of the canned meat; East Germany provided 6% of the lard and butter imported in these years and a significant share of the powdered milk.[16]

Cuba's food vulnerability centers on five rubrics: wheat, animal grains and feed, lard and cooking oils, beans, and rice. Cuba does not produce wheat, a crop unsuited to the tropics. Bread, nonetheless, is a standard component of the Cuban diet. Shortfalls in Soviet deliveries of wheat have already caused domestic problems, principally in January 1990, manifested in a rise in the price of bread and long lines at bread shops, since bread was not yet rationed.

As Table 2 shows, Cuba is, inexplicably, very dependent on imported corn. While domestic corn production has increased steadily since 1980, production levels are considered to be way below those prevailing in the 1940s and 1950s. Apparently, Fidel Castro made the decision early on in the revolution that Cuba did not hold a comparative advantage in corn production, and the country has yet to develop high-yielding varieties. The corn which is imported is primarily used for animal feed, since corn oil or corn flour are not major consumption items. Cuba's growing self-sufficiency in poultry and dairy production (Table 2), as well as the

reported steady increase in the per capita production of eggs, chickens, and milk (CEE 1989:Table VIII.1), has depended upon growing volumes of not only corn, but also animal feed imports.

While the country has reduced its dependence on imported lard and cooking oils since 1970, particularly, by more than doubling the domestic production of refined vegetable oil, the country still depends on imports for some two-thirds of its domestic consumption. It is generally felt, however, that good prospects exist for considerably deepening import-substitution in this sub-sector, particularly in terms of lard production.

Black beans are another essential item in Cuban diets. While domestic production has increased steadily over the last decade, the country is far short of being able to meet internal demand. Most experts consider that Cuba could rapidly expand bean production, for current production levels are far below the levels that prevailed in the 1930s.[17] Similarly, good prospects exist for furthering import substitution in terms of rice. In the revolutionary government's initial attempt to diversify the agricultural sector, rice production was expanded quite rapidly, lowering import dependence in the early 1960s. Import substitution was abandoned as cheap rice became available from China and the country refocused efforts on sugar. After the Cubans broke with the Chinese in 1965, however, attention again turned to expanding rice production, so that by 1970, import dependence was slightly reduced below the late 1950s level, calculated as 54.7%, from data reported in Chonchol (1963:83).[18]

Turning to agricultural inputs, Cuba is quite import dependent in terms of fertilizer, pesticides, and agricultural machinery. While substantial strides have been made with respect to the import substitution of fertilizers during the 1980s, in the 1986-88 period Cuba imported an average 47.7% of its apparent consumption of manufactured fertilizers, spending $129.9 million pesos a year. Import dependence is even greater in terms of pesticides and herbicides, with imports averaging 82.4% of apparent consumption in the late 1980s. In terms of machinery, while Cuba now produces tractors, trailers, harrows, combines, and Fregat irrigation systems, as well as most agricultural implements, imports of these items and spare parts averaged some 231 million pesos annually in 1986-88.

The country's food and fertilizer import bill increased considerably in 1989, the last year for which a Statistical Yearbook was published. Food imports increased by 26.7% over 1988, to 925 million pesos, a much greater increase than that reported for the value of total imports (7.1%), and thus a major reason behind the increase in Cuba's trade deficit for that year. The primary reason was not a sharp jump in the quantity of food imports, but rather, one in the price that Cuba now has to pay for food.[19] Cereals were among the products most affected, with the value of imports increasing by 40%; and, for example, whereas the quantity of corn imports increased by only 14.7%, the value of corn imports increased by 63.6%. A similar trend can be found for wheat, wheat flour, rice, beans, canned meat, animal feed, and fertilizers. The most significant jump in physical quantities imported was in terms of frozen chicken, with imports increasing by 63.4% while the value of chicken imports increased by 71.8% over 1988 levels.[20]

IV. TARGETS AND TRENDS OF THE FOOD PROGRAM

According to Minister of Agriculture Adolfo Díaz, in his presentation of the Food Program to the National Assembly of Poder Popular in December 1990, the targets of the Food Program (see Table 3) were designed to not only maintain 1989 per capita daily consumption caloric and protein levels, but to increase consumption levels for a population estimated to reach 11.1 million by 1995. In what follows, I do not pretend to be provide a comprehensive assessment of Cuba's National Food Program. Rather, I will attempt to assess the degree to which Cuban planners' goals under the program are realistic, given past and current trends. The analysis will necessarily be limited to five of the main components of the National Food Program: viandas and vegetables, grains and legumes, dairy production, poultry, pork and fish, and the sugar industry.

Viandas and Vegetables

Cuban production of viandas and vegetables expanded substantially in the 1970s--increasing fourfold--a result both of more than a doubling in the area under cultivation and of productivity increases (see Table 3).[21] In the first half of the 1980s official statistics report this sub-sector growing by an average annual 2.8% a year, and primarily as a result of

expanded acreage. From the mid-1980s on production of viandas and vegetables was generally stagnant, with the normal annual variations depending on weather conditions. In 1987, after the closing of the free peasant market, the state initiated a major push to expand vianda and vegetable production on state farms as well as on production cooperatives. Between 1985-89 the acreage planted in this rubric increased by an average annual 11.5%. In 1988 an all time high production level, of 1.7 million tons, was officially reported, dropping somewhat the next year.

The target of the Food Program is to produce 1.9 million tons of viandas and vegetables by 1995, a 16% increase over 1988 levels of output, and a 23% increase over 1989 levels. Much of the increase is to come from increased vegetable production, particularly of egg plants, tomatoes and onions.[22] Among the viandas, plantain production is to increase most rapidly, primarily because as a perennial, it saves on planting costs; moreover, plantains are harvested year-round, thus stabilizing food supplies. Potato production is slated for a decrease, since its production is heavily dependent on imported inputs (seed, as well as fertilizer and pesticide).

In order to reach the 1.9 million ton goal, land previously dedicated to sugar cane has been turned over to vianda and vegetable production; the amount of irrigated land is being increased substantially; and the labor force committed to agricultural work has increased dramatically in size. Each component of the program will be discussed in turn.

In 1990 294,569 has. were encompassed in the vianda and vegetable plan; 50% of the acreage corresponded to state farm land, 31% to that of production cooperatives, and 19% to the land of individual peasant producers. By the end of that year, some 20,130 has. of sugar cane land had been turned over to vianda and vegetable production. But rather than representing a shift out of cane production, there are renewed efforts to increase sugar cane yields (primarily through investments in irrigation and drainage) on remaining cane fields. The hope is that the overall level of sugar cane production will remain at least the same, yielding a minimum of 8 million tons of raw sugar annually.

Approximately half of the cane lands turned over to vianda and vegetable production have been in Havana province, the province targeted for the largest increase in vianda and vegetable output (a more than doubling of production by 1995).[23] In 1989 Havana province already produced a much larger share of the national output of viandas and vegetables (38%), than the corresponding crop area (13%), a product of its more favorable natural endowment (the province counts with some of the most fertile lands in the country) and its larger share of irrigated lands.[24] Under the Food Program, Havana province will continue to receive a disproportionate share of new investments in irrigated land for vianda and vegetable production, given the target of achieving self-sufficiency for the two Havana provinces.

In 1983 the nation counted with only 63,000 has. of irrigated land dedicated to the production of viandas and vegetables, amounting to 7.6% of Cuba's total irrigated area. The goal is to double the irrigated area dedicated to viandas and vegetables.[25] The national hydraulic development program has already considerably increased both dam capacity and the required irrigation infrastructure of primary and secondary canals, with much of this expansion dedicated to land in the vianda and vegetable plan. By the time of the disintegration of COMECON, the Cubans had reportedly completed 53 large dams, 156 smaller dams, and 200 kilometers of major canal works.[26] As a result, between 1983-89, the amount of irrigated land in the vianda and vegetable plan grew 38.7%; by that latter year vianda and vegetables accounted for 9.7% of total irrigated land and 25% of vianda and vegetable production was carried out on irrigated land.

Expanded irrigation facilities should significantly increase vegetable production levels since the most productive season for vegetables is the relatively dry winter, when yields depend heavily on irrigation. Also, irrigation allows a quicker turn-around time in land use which should facilitate the stabilization of production levels. Much of the increment in irrigated land is also being dedicated to new plantings of plantains and bananas irrigated with the "microjet" system, involving irrigation equipment produced domestically. The aerial microjet irrigation system is reported to quadruple plantain yields. Some 8,052 has. of irrigated

plantains were planted in 1990, with an additional 9,164 has. targeted for 1991.

Results--The first year of the vianda and vegetable plan, 1990, turned out to be a disappointment. Total production actually dropped below 1989 levels, to an estimated 1.3 million tons of viandas and vegetables. Much of the tomato crop in Havana province was lost due to a serious attack by the pest, mosca blanca, and the potato crop suffered due to unfavorable weather conditions. It must also be taken into account that many of the new investments, such as in irrigated plantain production, take time to mature, and would not have produced compensating production increases to off-balance specific natural calamities. It is unclear what blame for the fall in output can be placed on the instability of fertilizer, pesticide, and petroleum deliveries, since this sub-sector has been prioritized, even over sugar cane production, in the allocation of scarce inputs.

Part of the explanation for the disappointing 1990 outcome was that the plan was overambitious. While the acreage planted in vianda and vegetable production expanded considerably, no plans had been made to augment the size of the labor force to weed and harvest the expanded plantings. In Fidel Castro's own evaluation he notes that it was not until the weeds had taken over many vianda and vegetable fields, that the leadership understood that the real problem facing vianda and vegetable production was insufficient labor. When the first mobilization of Havana city residents for agricultural work took place in July 1990, it was already too late to save much of the summer crop.[27]

This deficiency was more than made up for in 1991 through the massive mobilization of Havana citizens to the fields, and the completion of the facilities to house them in the countryside. As mentioned earlier, there are two main forms of labor mobilizations, the permanent workforce organized in contingents, and temporary "mobilized" workers who spend two weeks at a time in agricultural work. The number of volunteer urban workers mobilized for two weeks at a time from Havana city fluctuated from 3,600 in February 1991, to 26,000 in the peak weeding and harvesting months of March and April, to 17,000 in June 1991.[28] It was reported that in the first year of the mobilization campaign, some 146,000 Havana City residents

participated; 57% of these volunteers were members of either the Communist Party (PCC) or the Communist Youth Organization (UJC).[29]

The housing plan for temporary workers was largely achieved by the first quarter of 1991. The target was to build 61 new camps with a capacity for 3,310 workers each. In early 1991 some 53 of these had been finished, and the remaining were completed by September 1991. Five of the camps are located on production cooperatives, reflecting the government's commitment to assure this sector the necessary labor force to meet its commitments under the plan.[30]

In terms of additions to the permanent agricultural labor force, some 5,631 urban workers had been organized into 24 contingents by February 1991, in time for the winter harvests and spring plantings of viandas and vegetables in Havana province. By September of that year there were 32 of these, comprised of 7,600 workers.[31] While some of the contingents have been assigned to irrigation works or the construction of dairy installations, the great majority are working in the vianda and vegetable plan.

The contingents are thus far being housed in the new camps constructed for the temporarily mobilized urban workers. In order to entice the contingent workers to continue in agricultural work once they have completed their two-year commitment, some 44 new agricultural communities are to be constructed in Havana province, to house some 10,000 households. The housing in the new communities is to be most attractive, built in the style developed for the summer 1991 Pan American Games community. The first new community, with some 400 homes, was completed in May 1991 and at least two others were under construction at that time.[32]

The dedication and perseverance of the contingents has, reportedly, served as a stimulus to increased productivity among state farm workers and temporarily mobilized urban workers, alike.[33] But in 1991, labor shortages were not the main constraint on rapidly increasing Cuba's food output. The country now had to contend with significantly fewer fertilizer, pesticide and petroleum imports than in the previous year.

Nonetheless, the available data suggest that results in the first quarter of 1991 were quite satisfactory. It was reported that 25% more

viandas and vegetables were being delivered to Havana city markets than in the same period of the previous year, which was visually apparent to this observer during the month of February.[34] Part of this increase in food supplies was due to improvements in the food distribution system. A number of new investments in refrigeration facilities for fresh fruits and vegetables had come on stream by late 1990, increasing capacity by 24% in one year.[35]

The only year-end figures for 1991, provided by Fidel Castro in his televised speech to the closing of the UJC Congress on 5 April 1992, suggest that 1991 was almost as disappointing as 1990.[36] He reported that while, nationally, state farm deliveries of viandas and vegetables to the state marketing agency, ACOPIO, had increased 15.8%, lower deliveries by both the cooperative and peasant sectors had resulted in only a 1.5% net increase in deliveries.[37] This disappointing performance is partly explained by the heavy rains that plagued the spring plantings of viandas and vegetables. By early June only 76% of the targeted planting had been completed.[38]

Nonetheless, despite the bad crop year, state farms in Havana province had increased their deliveries to ACOPIO by an impressive 67.1%.[39] While Havana province production cooperatives and peasants followed the national trend of reduced deliveries to the state, the fall was less severe, so that overall, the provincial increase in deliveries was on the order of 10%. Fidel's conclusion from the differing performance of the state and private sectors was that too much peasant production was finding its way onto the black market.[40]

Notwithstanding the relative success of the provincial vianda and vegetable program in 1991, the two Havana provinces are still only 50% or so self-sufficient in agricultural products.[41] To deepen efforts, since provincial self-sufficiency is still seen as the main way of rapidly reducing transportation and thus energy costs, it was planned to again increase the acreage in vianda and vegetable production in the winter 1992 plantings in Havana province, with the target a 25% increase in acreage planted by February 1992.[42] From my observations of Havana city markets (and kitchens) in April 1992, it seems that the target was most likely met,

for the city was literally saturated with viandas, vegetables, and fruits.[43]

Grains and Legumes

The target in terms of rice production is to reach self-sufficiency by 1995, the only product currently being imported for which total self-sufficiency is a stated goal. Some strides in import substitution were made in the early 1960s (when irrigated cane land was turned to rice production), and more systematically, in the late 1960s, as a result of significant investments in irrigation systems. But few new investments were made subsequently, and rice production behaved erratically in the decade of the 1980s.

The new rice plan announced in 1987 requires a virtual doubling of production levels by 1995, so that some 1.07 million tons of rice (in husk) yield 610,000 tons of rice for human consumption, completely substituting imports, if achieved. The plan centers on the modernization of the existing irrigation and drainage systems, to increase yields, as well as on an expansion of the cultivated area under irrigation.[44] In 1983 rice production accounted for 14.8% of total irrigated lands, with approximately 82% of rice lands under irrigation. After the national hydraulic program had been under way for three years, and the rice program for two, the share of irrigated rice lands in the national total had increased to 18.3%, with approximately 98% of production on irrigated lands.

It is estimated that achieving self-sufficiency will require some 181,170 irrigated has. under cultivation, an increase of 27% over 1990 acreage. Much of the increase in targeted output is expected to result from increased yields generated by the improved irrigation system known as the "engineering system". It is estimated that this system potentially doubles yields as a result of its more efficient manner of maintaining the rice seedlings evenly drenched in water. The goal is to bring practically all of Cuba's rice acreage under the new engineering system, with the target of between 160,000 to 175,000 has. cited in press reports.[45] In 1990 142,300 has. of rice were planted, with only 2,000 has. under the new system. By the end of that year 15 brigades (each consisting of around 120 workers) were dedicated full time to constructing these new systems; it was

estimated that each brigade could bring into production 1,000 has. per year. It had been planned to have 25-27 brigades putting in the new irrigation systems in 1991, but only 16 were assigned to this task because of the shortage of fuel to maintain the heavy equipment this task requires in operation.[46]

At the current pace, it seems quite doubtful that self-sufficiency in rice will be achieved in less than ten years, if such depended only on the pace of putting in the new engineering system. Moreover, Fidel Castro announced at the closing session of the UJC Congress that the work of the rice irrigation brigades had been brought to a temporary halt in April 1992 due to the petroleum shortage. Apparently, the beginning of the spring rains slowed down their productivity and thus it no longer made sense to continue directing scarce resources in their direction.

Not much attention is specifically being given to corn and bean production under the National Food Program. Nonetheless, after falling dramatically in the 1960s, production of both crops has recently been on the rise. Bean production doubled over the decade of the 1970s, as a result of an increase in the area under cultivation, and thereafter production has increased at a steady pace. Corn production did not register significant gains until after 1980, when again, more land was dedicated to its cultivation. The area dedicated to both crops expanded in the late 1980s, so that as a result, the area in bean production was 30% greater in 1989 as compared with 1985, and corn, 43% greater. The official data report a corresponding increase in total production over this period (Table 3).

While there is some evidence that the national research centers are dedicating more attention to bean production, there is less interest in corn production. As noted earlier, Fidel Castro apparently decided in the early years of the revolution that Cuba did not have a comparative advantage in corn production, and it still is not seen in official circles as a promising source of animal feed. In my interviews with peasant producers, they strongly disagree, and consider corn production in the spring months to be an essential component of any rationale plan for the self-provisioning parcels they each maintain.

Changes in cultivation practices, particularly, those now required by the drastic reduction in fertilizer imports, might bring about steady increases in bean production. Once Cuba started to mechanize sugar cane cultivation, the traditional practice of inter-planting beans with sugar cane was strongly discouraged, since such inter-planting interfered with the pace of the cultivators. Now that the shortage of petroleum has required Cuban planners to rely on manual cultivation practices, such inter-planting is again being tolerated. According to a private farmer who I interviewed in Malena del Sur in June 1991, this is a good thing, for it not only leads to increased bean production, but enhances soil fertility at a time when fertilizers are extremely scarce. There are also indications that state farms are being encouraged to plant beans in rotation with their principal crop (sugar cane or rice), as a means of enhancing soil fertility in the Special Period, which could also result in steady increases in bean production.

Results--Unfortunately, data are as yet unavailable on bean and corn production since 1989. Preliminary data on rice production for 1990 suggests that production has increased steadily since the rice development plan went into effect; nonetheless, in 1990 total output was still below the historic 1986 harvest level (see Table 3).

Dairy Production

The development of the dairy industry, and the sharp increase in per capita consumption of milk, has long been heralded as one of the major triumphs of the revolutionary period.[47] Although milk production grew steadily up through the mid-1980s, per capita production levels had been falling in recent years and, thus, it was decided that it was time to once again invest heavily in this industry.[48] The target became to more than double domestic milk production by 1995, to some 1.98 billion liters per year.

This target is to be achieved through significant new investments in dairy cattle installations and a multiple-based strategy to increase the supply of animal feed: by increasing the acreage of cultivated pastures; by developing new domestically produced feeds such as legume "protein banks;" and by intensifying the production and use of residuals from the sugar

industry. In early 1990, as Cuba began to brace itself against an uncertain future, the decision was made to completely change the prevailing system of cattle management in favor of the system known as "Pastoreo Racional Voisin," named after the French agronomist who had initially proposed it in the early 1960s. Each element in the program will be described in turn.

While the value of the new investments announced in 1986 has not been revealed, the magnitude of these is impressive. The number of dairy stables, for example, is to almost double, with 1,913 of these to be built between 1986 and 1995 with an incremental capacity for 366,000 head (almost as great as the average number being milked in the 1986-89 period). By the end of 1990 325 of these were expected to be finished, 17% of the total planned number. At least another 5,290 installations were also to be built by the Ministry of Construction (MICOIN), including a number of integral breeding centers, new corrals, and special installations for the raising of calves, etc. By the end of 1990 34% of these were completed, suggesting that the investment program got off to a good start. The dairy investment program also called for the construction of new storage facilities, aqueducts, and secondary roads on the ranches, in addition to 8,000 new housing units designed to stabilize the permanent work force; some 1,012 units had been finished by 1990.

While beef production in Cuba has always been seen as a by-product of milk production (beef lines are generally limited to male dairy cattle), the 1986 plan also called for a modernization of these installations to increase the capacity to handle the increased numbers of cattle resulting from the plan to increase dairy production. The Ministry of Agriculture was to construct some new 876 stables and 4,135 other installations, as well as 1,384 windmills, in order to fulfil the plan by 1995. By the end of 1990 some 165 stables were finished, along with 871 other installations, and 372 windmills. It is unclear if the beef development program has continued, however, because the growing petroleum shortage led to a re-appreciation of the need for field oxen as animal traction (an alternative to the use of tractors for ploughing, cultivation, and transportation). In 1989 there were only 199,000 oxen in the whole country, down from the

546,300 counted in the 1973 census, as a result of the heavy mechanization of agriculture over this period (AEC 1989:Table VIII.27).

In 1990 cultivated pastures made up 41% of the land held by the state cattle ranches; 42% consisted of natural pastures and 17% was considered to be unusable. The agricultural component of the dairy development plan calls for some 993,080 has. of land to be ploughed up and planted with improved pastures between 1990 and 1993. In the 1985-89 period an average annual 202,642 has. were planted each year; the plan for 1990 and after calls for a 33% increase, to a new annual rate of 268,400 has. per year. Due to the petroleum shortage, in 1991 only 90,039 has. were ploughed up and planted.[49] In order to save on future labor and other inputs, there is a growing tendency to plant pasture varieties, such as King grass, which reproduce themselves aerially, so that they do not require replanting. In 1990 these type of seeds comprised 35% of the new plantings and were to comprise 52% in 1991.

Complementing the improved pastures will be "protein banks" of legumes especially grown as cattle feed. Cuban agronomists have spent years trying to adapt these to the tropics and finally two varieties, glicinia and leucaena, have been adapted to local conditions. By the end of 1990 some 5,368 has. were planted in these crops. It is hoped that the country will be self-sufficient in these seeds by 1992; if so, it is thought that their cultivation could be expanded rapidly. The goal is for these new feed crops to eventually encompass 30% to 45% of the area of each dairy unit.

Sugar by-products have long been an important complementary animal feed in revolutionary Cuba, but now their development and expansion has taken on a new urgency. In the winter dry season of 1989-90 the Ministry of Sugar provided the state cattle enterprises with some 1.5 million tons of by-products, including 386,700 tons of cachaza, 349,500 tons of pre-digested bagacillo, 190,700 tons of combined bagacillo-sugar honey-urea, and 29,500 of a new product, humid saccharine.[50] In order to take advantage of the residuals (cane tops, leaves and straw) in the sugar cane cleaning centers, some 700,000 head of cattle were stabled at these centers in 1990, with some 1 million head scheduled to be so in 1991. The 1991 plan also called for the Ministry of Sugar to provide some 4 million tons

of animal feed, including 1 million tons of saccharine.[51] Meeting this target will require renewed efforts to increase sugar cane yields, a plan reviewed in a subsequent section.

While the Ministry of Sugar is to play a key role in developing sugar and cane by-products, in 1990 it was decided, as a result of the petroleum shortage, that the dairy and cattle ranches themselves should also go into sugar cane production to generate some of their own sources of animal feed and, thus, to save on transportation costs. By the end of 1990 some 60,390 has. of cane had been planted on Ministry of Agriculture ranches, and these were experimenting with the production of an artisan form of humid saccharine. As the shortage of petroleum became a growing constraint, the goal of each dairy and cattle ranch planting 13.42 has. (1 caballeria, the traditional Cuban land measure) of cane grew in resonance. The production of rudimentary mills for the processing of cane into saccharine was stepped up, and in the 1991 plan, it was hoped that saccharine production on these ranches would reach 300,000 tons annually.

Finally, as noted above, a new system of cattle management was introduced on the dairy enterprises in 1990, known as the Pastoreo Racional Voisin (PRV).[52] This system involves the dense concentration of cows on an improved pasture lot (fenced off with electrical wiring) until the pasture is completely grazed, whereupon the herd is moved on to the next pasture. The advantage of this system is that the dense concentration of animals results in a very large amount of organic matter, speeding the return and yield of the next pasture growth. It is thus considered the ideal way of substantially improving Cuba's pastures at a time of extreme fertilizer scarcity. However, for this system to result in high milk yields (on the order of 10-12 liters per day), it requires as complementary feed inputs, both the protein banks and ample supplies of saccharine.

In May 1991 Fidel Castro announced that the goal was to have the PRV system installed on all dairy and cattle ranches by the end of that year (some 7,500 units); at the time of his announcement only 300 dairy units were using the system. By the beginning of 1992 some 60% of the cattle units were reported as using the PRV system.[53] The installation of the new system is heavily dependent on the production of electric cable to wire the

fences separating the enclosed pastures; electrified fences have been found to be cheaper than the installation of fences strong enough to actually keep the cattle to an enclosed pasture. Pasturing animals in this manner, however, also increases the requirements for the provisioning of water (since they cannot be walked to a watering station). The production of rubber hoses, troughs, small wells and windmills have thus also joined the list of new priorities.

Results--As Table 3 shows, by 1989 sustained increases in milk production were still not forthcoming from the dairy development plan initiated in 1986. To my knowledge, no data has officially been published on milk production in more recent years. Nonetheless, it is clear that domestic milk production levels are way down, as are domestic milk supplies, the latter also a product of the reduction in imports of powdered milk. Before 1990 approximately 23,000 tons of powdered milk was usually imported from the Soviet Union and East Germany which was reconstituted as 400 million litres of milk, an important share of the liquid milk sold (Castro 1991). Domestic milk production was largely destined for the dairy industry, and reflected in the steady increase in the domestic production of cheese, butter, yoghurt and ice cream noted previously.

The relatively cheap powdered milk imports from the socialist bloc had allowed Cuba to sell the rationed quota of milk at the very low price of 0.25 pesos per liter, and to offer unlimited quantities of milk to consumers who desired to consume more at the domestic cost of production, or 1 peso per liter. One of the first casualties in the Cuban food system as a result of the demise of socialist Eastern Europe was the dairy industry. As imports of powdered milk fell, domestic milk production began to be diverted to providing the population with fresh milk, reducing supplies of dairy products on the official parallel market; by 1991 cheese, butter and yoghurt were being produced only to service the tourism sector. During 1991, as well, milk sales "por la libre" (in unrestricted quantities at a higher price) ended; more drastically, by January 1992, the rationed quota of milk for the elderly was eliminated, signalling the severity of the supply problem.

From my interviews, it seems that the problem is that Cuba's highly bred dairy herd has been unable to adjust quickly to the change in diet from imported animal feed to pasture and cane or saccharine. Reportedly, milk yields have dropped to two to three liters per day, approximating the yields of non-improved dairy cattle breeds. It is unclear whether the dairy herd will once again learn to eat grass, or whether this is a real genetic problem which could take years to solve. Currently, it remains as another of the major albatrosses of the Food Program.

Poultry, Pork and Fish Production

Before the demise of COMECON, the Cuban state had already decided that Cuban animal protein consumption would largely center on eggs, chicken, pork, and fish, launching ambitious plans for all three sub-sectors in 1988. These products have become all the more important since the development of the petroleum shortage in 1990, given the urgent need to increase the supply of oxen, thus lowering beef production below its traditionally unsatisfactory level.

The poultry industry is one of the success stories of the revolution. Egg production almost tripled between 1964 and 1965, and grew by a steady 3.8% yearly between 1970-88, generally satisfying domestic demand, for eggs went off the ration in the mid-1970s.[54] Chicken production also increased substantially over this period, increasing five-fold. While significant import substitution took place, frozen chicken is still a major import item, and chicken has never gone off the ration card.

The aim of the 1988-93 poultry development plan was to further the import substitution of chicken, and to increase per capita consumption of eggs from 221 in 1987 to 274 by 1993 (Poder Popular 1991:37-42). These targets were to be achieved through substantial investments in new production facilities. Between 1988 and 1992 some 2,127 new chicken coops were to be constructed, which would increase capacity by 36%. Nine new slaughter houses were to be built and another four remodelled and expanded, increasing slaughtering capacity by 55%. Finally, six new incubation plants were planned, increasing capacity by 40%. It was calculated that these new investments would allow egg production to grow by an annual average 6.4%, and chicken production by 10.1%, over the plan period.

The investment plan got off to an excellent start. By the end of 1990 72% of the planned chicken coops had been constructed, including all of those destined for egg production; two of the incubation plants were also operational with another two in construction.

In terms of the pork industry, it was not begun to be developed until the late 1960s. Subsequently, the production of pork meat more than tripled over the decade of the 1970s, and grew vigorously in the early 1980s. Nonetheless, the supply scarcely meets the demand for what is among Cubans' favourite meats.

The national pork production program was launched in 1988 with the aim of increasing supplies of pork by 10% per year, to 187,000 tons (measured on the hoof) in 1994--not quite a doubling of production in six years. This target was to be met through heavy investments in production facilities and in a major expansion of the factories producing liquid hog feed (Poder Popular 1991:25-33). The 1989-93 pork development plan called for MICOIN to build 124 new production facilities, including a number of specialized hog reproduction and genetic experimentation centers, 15 liquid hog feed plants, and 50 plants for the treatment of food residuals; 45 of these facilities were to be completed by the end of 1990. The Ministry of Agriculture was responsible for building 1,599 new pig corrals, and it was ahead of schedule, completing 1,055 during 1990 and expecting to complete the remaining corrals during 1991. This part of the investment program, thus, seems to be well advanced.

In terms of animal feed, the strategy is to concentrate on the production of liquid hog feed and sugar cane by-products and derivatives. Liquid hog feed is produced from the food wastes collected from restaurants, hospitals, public cafeterias (of which there are many), etc., and from the residuals of the slaughter houses. In 1989 there were 24 liquid hog feed plants in operation and the first task was to increase the volume of waste and residuals currently collected since the plants were not yet operating at full capacity. In the 1986-89 period an average one million tons a year of liquid hog feed was produced; the aim is to produce 1.8 million tons by 1994. This seems like a reasonable target since the raw material is readily available. The other important source of hog feed

is the sugar industry, which supplies protein honey (miel proteica, or molasses mixed with torula yeast).

Before the revolution the Cuban population hardly ate fish; but habits change with supply conditions, and per capita consumption grew steadily as Cuba developed its fishing fleet in the late 1960s and 1970s. Apparently, it is now considered more economical to develop aquaculture that to expand Cuba's fishing fleet. Under the Food Program, the aim is to rapidly develop fresh-water fish production. The overall target is to produce 222,000 tons of fish annually by 1995, of which 60,000 tons would be fresh-water fish.[55] In 1990 Cuba produced 21,900 tons of fresh fish; it is hoped that this figure can be doubled by 1992, and tripled by 1995 (Poder Popular 1991:92-103).

Meeting the plan targets will require expanding the actual area in ponds and dams for fish production by 69,000 has., to 136,000 has. The production of fingerlings must increase from 49 million in 1990 to 188 million in 1992. But the main obstacle at the moment to quickly expanding production seems to be refrigeration capacity. Thus 18 new ice factories are to be constructed along with six new fish processing centers.[56] Along with fresh-water fish, Cuba is also expanding its cultivation of shrimp and oysters, with these products destined for the lucrative export market and the tourist sector.

Results--Of the three sub-sectors, the outlook for poultry production is perhaps the most problematic because it is the most import-dependent, with no major efforts yet under way to develop alternative sources of poultry feed, such as corn and fishmeal. As a result of declining imports of feed grains, the new investments made in the poultry industry have not yet significantly raised production growth rates. In both 1989 and 1990 egg production grew by only 2.5% annually; chicken production, which grew by 2.9% in 1989, actually fell by 6.3% in 1990. The disappointing performance was blamed on the instability of feed grain imports, with the priority being assigned to egg production.

In early 1991 eggs were put back on the ration card, an event which shocked Habaneros after so many years of having eggs freely available. The ration has ranged from 4 to 5 eggs per person per week over the last year.

Chicken has continued to be rationed at the quota of 0.75 to 1 pound per person every nine days (depending on the region). During 1991 and early 1992, most Havana city stores were one to two months' behind in their ability to deliver on the quota, as a result of faltering imports of both frozen chicken and poultry feed, and thus of falling domestic production. Until attention is turned to finding domestic substitutes for imported poultry feed, such as corn and fish meal, the prospects of attaining the targets of the poultry plan look quite bleak.

Notwithstanding the generally good prospects for the pork industry, in 1990 pork production fell below the average 1986-89 level, to an estimated 94,300 tons. Sufficient hogs were apparently on hand to meet the planned target, but due to a shortage of animal feed, the animals were not reaching their appropriate weight for slaughter. Rather than slaughter the underweight animals, it was found preferable to accept lower production levels. Since the aquaculture program only got under way in 1990, data is not yet available to judge its progress.

The Sugar Industry

Underlying many of the targets of the National Food Program is a significant increase in sugar cane yields. The sugar sector is giving up land for the increased production of viandas and vegetables, while expected to at least maintain if not increase total sugar cane output. Moreover, the increased production of by-products for animal feed--destined for dairy and beef cattle as well as hog production--requires increased levels of sugar cane milling, and thus growing cane output.

The targets set for this industry in 1988 were as follows: to count upon 1,342,000 has. (100,000 caballerias) of harvestable cane each harvest; to reach average yields of 100,000 arrobas per caballeria (or 1,863 quintals per hectare); and to thus harvest 10 billion arrobas (or 636.6 million quintals) of cane per harvest, yielding from 10 to 12 million tons of raw sugar.[57] In the last three harvests for which data is available (the harvests ending in 1988, 1989 and 1990), the average yield was 62,100 arrobas per caballeria (1,157 quintals per ha.), with 6.5 billion arrobas harvested on average each year; raw sugar production averaged 7.9 million tons. While these figures represent important increases over the late

1970s, they suggest that the targets for the sugar industry are most ambitious.

The Cubans are relying on two main strategies to increase yields, and to increase production by 30% to 50% by 1995: a greater area of irrigated cane land; and a greater area of land prepared with new drainage systems (Poder Popular 1991:121-134). In 1990 some 383,906 has. of cane land were irrigated; the target is to have 761,223 has. under irrigation by 1995, a 98% increase over 1990. Initially, only 5 brigades were charged with this task, but by the end of 1990, 45 brigades had been constituted for this purpose and between 20,000 to 24,000 has. had been brought under irrigation. According to Agriculture Minister Adolfo Díaz, 55 brigades would be deployed to construct the new irrigation systems in 1991, and they were expected to complete 66,000 has. per year.[58] At this rate, the targeted acreage would be reached during 1996.

The irrigation of cane lands also depends on the acquisition of modern, large-scale irrigation machines, only some of which are produced in Cuba. By mid-1990 166 of these machines were in operation; it was hoped that by the end of 1990 more than 500 of these machines would be in place, with ten to twelve thousand of these machines required to achieve the program's targets.[59]

Work on the new drainage system for cane fields has proceeded more speedily than on the irrigation system. In 1989 121 brigades completed work on 55,035 has. During 1990 the number of brigades was increased to 201 and they were expected to complete between 53,680 to 80,000 has. per year.[60] By the end of 1991 some 155,349 has. were reported as completed, almost tripling the 1989 area.[61] The pace of work, 50,157 has. per year, was slightly less than the minimum targeted, however, due to shortages of petroleum and spare parts for the large excavators employed for the levelling of the cane fields. It appears that progress in the construction of the new drainage systems will be considerably slower in 1992, due to the continuing and, perhaps, even more severe shortages of fuel and spare parts.[62]

Results--The target for 1991 had been to reach 8 million tons of raw sugar production; the plan fell short 5%, and total sugar output was reported as

7.6 million tons. The shortfall in sugar production was blamed on various causes: the insufficiency of fertilizers; the lengthening of the zafra as a result of shortages of petroleum, lubricants and spare parts (which lowers industrial yields); and the inefficiency of a certain group of aging sugar mills. But from Fidel Castro's closing comments at the special session of the National Assembly of Poder Popular dedicated to evaluating the sugar industry in June 1991, it is also clear that the new strategies designed to raise sugar cane yields were being implemented at a slower pace than called for by the plan.[63]

V. NEW DIRECTIONS IN AGRARIAN POLICY

In addition to the specific agricultural development plans reviewed above, there have been a number of innovations in the Cuban planning framework in recent years which are encompassed in the National Food Program. Some are the direct outcome of the rectification process, while others are a product of the "Special Period" and the Cubans' attempt to deal with the force of circumstance. In this section, I will briefly review four areas of change: what appears to be a new appreciation of ecologically beneficial agricultural practices; new forms of work organization, including increased reliance on material incentives, on the one hand, and the contingent model on the other; a growing public recognition of the productive role of the private sector; and the new nation-wide stress on self-provisioning.

Towards an Ecologically-benign Agriculture

As should be evident from the discussion above, achieving the goals of the National Food Program under the conditions of the Special Period have required Cuban planners to re-evaluate their "modernization of agriculture" strategy of the past several decades.[64] This strategy was quite import dependent and was facilitated by the favorable terms of Cuban trade with COMECON. But no longer can "more" be better, and the use of not only chemical fertilizers and pesticides, but also mechanization, is under careful scrutiny.

Probably most advanced is Cuba's switch from chemical pesticides to biological pest control. As far as I can surmise, biological pest control

methods only began to be taken seriously in the mid-1980s, when the Citrus Research Center began applying biological methods to fight plagues on five state farms. By 1990, however, each province of the country has its own laboratory to diagnose plagues and diseases and some 201 centers were producing beneficial predatory insects; the number of these centers was to increase to 254 by the end of 1991. According to the National Plant Health Director, by necessity, the 1991 winter plantings consumed the lowest level of pesticides in fifteen years. In his press report he noted that, due to the application of biological pest control methods, the reduced use of pesticides did not negatively affect yields.[65]

The search for alternative means of maintaining soil fertility is most visible in the sugar industry. One of the main innovations, which actually dates from the early 1980s, is a change in the way in which sugar cane is harvested. Whereas previously, the fields were burnt prior to the harvest to facilitate mechanized harvesting, by the 1980s there was growing awareness that burning the cane wasted organic matter that could potentially be composted or consumed as fodder. If the straw of the cane plant is left in the fields, it also serves to reduce the growth of weeds, precluding the need for herbicides or back-breaking work in weeding; moreover, mulching maintains moisture in the soil, particularly important during draught years (Pollitt 1992). In the recently completed zafra, 87% of the crop was harvested green. The cane stalks are then transported to cleaning centers where the leaves and tops are removed to serve as cattle fodder. Other residuals and by-products of sugar cane processing are also going into the chemical fertilizer substitution effort. Ashes from the huge furnaces of the sugar mills are being recycled to the fields as are the mineral-rich waters used in processing.[66]

Intense research has gone into finding the most effective composting techniques, not only in the sugar industry, but on plantain plantations as well, and has brought forth the age of worm cultivation. Approximately one kilo of worms are necessary to turn one square meter of cane or plantains residues into humus. My field visits in the provinces of Villa Clara and Havana suggest that this practice is spreading rapidly, and on state farms and production cooperatives alike.

The use of herbicides has declined dramatically over the past two years since the lack of foreign exchange has precluded imports. The massive labor mobilizations have been the main substitution for imported herbicides, as well as for mechanized cultivation practices. Interestingly, hand weeding of cane has been found to significantly increase yields as compared to the use of mechanical cultivators. Also, hand weeding not only saves on scarce petroleum, but as noted previously, has the added benefit of allowing beans to be inter-planted with cane, thus adding nutrients to the soil while increasing bean production.

Similarly, the switch from tractors to animal traction has been found to increase labor productivity. For example, after a heavy rain, it is difficult to plough with a tractor for three or four days; in contrast, a wet field can be ploughed with a team of oxen after one or two days of heavy rain. Ploughing or harrowing with a team of oxen has been found to have the additional benefit of being able to plough areas where tractors could not be used, such as steep hillsides. With such good results, and the worsening fuel shortage, some 100,000 oxen were domesticated in 1991, with a similar number targeted for 1992.[67]

As Fidel Castro (1991:31) has argued, Cuba "must use science and technology to keep the Food Program going," as well as traditional practices, and there is intense activity in the nation's agricultural experimental stations to develop everything from vegetable seeds which do not require fertilizer, to more efficient worms for composting. Cuba's well developed biotechnology industry is also playing a crucial role in the agricultural sector, developing biofertilizers and biostimulants such as azotobacters (bacteria that capture nitrogen in the air) (Ané 1992:15).

The above examples are only illustrative of some of the ecologically-sensitive practices that have developed in response to the crisis. The rapidity of the Cuban response to adverse economic conditions is worth noting, for it speaks well of the Cuban educational system and the nation's scientific research centers. Nonetheless, there are intense debates in agricultural circles over whether the new practices will affect crop yields, and by how much the lack of fuel and fertilizer will compromise Cuba's ability to meet the targets of the Food Program.

Material Incentives and the Organization of Work

While the rectification process has generally been viewed in the literature as a return to moral incentives, there is now good evidence coming from the agricultural sector that material incentives have not been discarded altogether. Rather, the task of "rectification" was to evaluate the errors in the SPDE system and to design improved forms of work organization and remuneration. For example, one of the major criticisms directed at the state farms under this process, was the unrealistic structure of "norms" to which the previous system of bonuses and prizes had been linked.[68]

The new system (officially called the "Sistema Tecnológico, Organizativo y de Pago por los Resultados Finales de la Producción") appears designed to strengthen the role of material incentives by making work-teams (sometimes, but not always, referred to as brigades) directly accountable for all aspects of production in a given area, so that remuneration can be directly linked to productivity as well as production (Poder Popular 1991:83). The new system was first developed in 1990, on the farms which were putting in banana and plantain crops with the microjet irrigation system; on these farms, the work teams were charged with putting in the irrigation system, planting the new plants, and with their subsequent care and harvest. Each team's final annual wage is determined according to the yields which they achieve in their area.

During 1990 the Council of Ministers approved extending the new system to the dairy and pork industries, and there were plans to introduce the system in rice and poultry production. The idea is to go slowly, implementing the revised system only after the required studies of how best to make production accountable to a group of workers have been carried out. The new system is designed not only to increase labor productivity, but also to streamline the use of labor on the state farms, getting rid of excess workers and bureaucrats, and reassigning them to where they can be more productive. For example, on the 533 dairy enterprises that had introduced the system by May 1991, it was found that the workforce could be reduced by 30%. The system has been found to be so successful in plantain, dairy, and pork production, that in June 1991 it was announced that it was

being extended to rice and poultry as well as citrus and coffee production.[69]

What is encouraging about these results is that the rationalization of labor use provides a complementary, if not alternative, means to the use of mass mobilizations for securing sufficient labor to carry out the ambitious plans of the Food Program. While for now, the mobilizations of urban volunteers will continue, they are not considered nearly as productive as regular agricultural workers nor, particularly, as the contingents.

The contingent mode of labor organization contrasts with that of the new system of remuneration in that the former relies more on moral rather than monetary material incentives. The contingents are also assigned a given area of a state farm to farm and they alone are responsible for the organization of work, but their remuneration is not tied to production results. Rather, the very fact of joining a contingent embodies a commitment to be a "super worker" in return for a reasonably high wage, generally good living conditions, and the promise of new permanent housing should workers remain in the agricultural sector beyond their initial two-year commitment.

In January 1992 I had the opportunity to spend the night at a camp in the municipality of Guines. The camp had a capacity to house 299 workers, and at this point, housed one permanent contingent, the "Pedro Ortíz" contingent, and some 125 two-week volunteers. The contingent was responsible for all aspects of production on 215 hectares of the Mixed Cropping Enterprise of Guines and had recently requested the additional temporary workers in order to meet its ambitious production targets. The 150 or so permanent members of the contingent ranged from 20 to 60 years in age, with perhaps the mode on the order of 30 years old. They came from all walks of life--including unemployed elevator operators, construction workers and government workers, ex-soldiers, and retirees. The great majority of members of this contingent were men, but included women of all ages.

The higher salary many would earn during their two years in the countryside was an important inducement for many to join the contingent.

If their previous salary was less than 100 pesos a month (90 pesos/mo. being the prevailing minimum wage), they earned 225/mo. while a member of the contingent. If they previously earned over 100 pesos/mo., they earned their same, historic salary. Other reasons were thus as important for many to be willing to spend two years of their life in agricultural work.

Probably the most frequently cited reason in my informal conversations with these workers was that joining a contingent offered "plentiful and assured meals." The food is, indeed, quite good, and includes imported products as well as products not generally available to the population through rationing, such as canned meat and garbanzos (among the imported products), and cheese and yoghurt (among the latter). A few others cited the relatively generous availability of cigarettes (15 pacts can be purchased monthly at the rationed price of 0.30 per pack, as compared with the rationing quota of four packs per month), the general amenities of the camp (there are dances on week-ends, and a barber and beautician are brought in), or that moving to the camp solved their temporary housing problem (important, to at least one recent divorcee I spoke with). Not infrequently, moral incentives, so stressed throughout the "rectification" campaign, were mentioned: "when they finish with their obligation they leave with merit, with a new standing in the eyes of society" (comparable to having volunteered for military service in Angola). But for these perceived benefits, the members of the contingent work at least twelve hours a day, seven days a week (with only Sunday afternoon off), and receive a 48 hour pass to return to Havana every twelve days.

The Role of the Private Sector

One of the major changes of the last few years is that efforts have basically ceased to persuade individual farmers to join the production cooperatives, the CPAs. Instead, individual farmers appear to be getting much better attention from the state in terms of access to services and scarce inputs. One also senses that individual farmers are being treated with a new respect.

Both moral and material incentives are being used to encourage the CPAs and individual farmers to increase their production of viandas and vegetables under the Food Plan. The main moral incentive is emulation. In

1990 53 CPAs had committed themselves to the target of producing 100,000 quintals of viandas, vegetables and grains annually; in 1989 only fourteen production cooperatives had produced at such a level (Poder Popular 1991:195). The emulation program was extended to individual members of credit and service cooperatives (CCS) in 1991, and by the end of that year some 2,408 peasant farmers were participating in a program to grow at least 1,000 qq. of viandas, vegetables and grains annually.[70]

Rarely in the past has an individual farmer been featured on the pages of Granma as an example of an outstanding agriculturalist. During 1991 and early 1992, such stories began appearing with increasing frequency, as more and more farmers joined the emulation campaign. Moreover, a new program was initiated whereby outstanding farmers would be named as "advisors" to state farms and research centers. But in addition to moral incentive, it appeared in my interviews that peasants who joined the emulation campaign were being given priority access to fertilizer, and petroleum and pesticides, when needed. In fact, the president of a CCS whom I interviewed in Santo Domingo, Villa Clara province, in April 1992, told me that because many of the members of his CCS were in the emulation program, "we haven't even experienced the effects of the Special Period here."

According to Orlando Lugo, the president of ANAP (the national farmer's organization), both the production cooperatives and the CCSs are being given much more autonomy in deciding what, where, and when to plant.[71] There is a general orientation that crops are to be planted in the season in which they do best in order to maximize yields and save on inputs, something peasants are assumed to know intuitively.[72] In addition, cane farmers are being allowed to switch out of cane production and into vianda and vegetable production, if they so wish. I have interviewed several who have turned down the opportunity, noting that while vianda and vegetable production was more lucrative than cane, these crops required much more work, and hiring additional labor was expensive. In Havana province, private wage workers can earn up to 20 pesos a day, an extremely high figure when one considers that the national average daily wage of state agricultural workers in 1989 was on the order of 7.8 pesos. And while volunteer urban labor has been assigned to work on the production

cooperatives on equal terms with state farms (until recently, this labor was unpaid), this benefit has not been extended to individual farmers.

Finally, a rather striking policy change is that ANAP and the state are finally paying attention to the thousands of part-time farmers, those who have access to land but who are not registered as "peasants" with ANAP. A 1988 land census of the private sector discovered that there were some 140,000 of these, holding some 295,000 has.[73] A recent study found that most of these part-time farmers were wage workers or retired people and that while most were long-time property owners, their numbers included squatters on unused state land and even sharecroppers (Figueroa, et. al., 1990). With an average two hectares or so each, these part-time farmers are increasingly seen as potential contributors to the Food Program.

The Stress on Self-provisioning

A major campaign has been launched for state enterprises and other organizations to either speed up or initiate plans for their own self-provisioning, and for households to plant gardens and raise small farm animals. Since 1980 the Ministry of Sugar (MINAZ) had been setting aside land on the sugar cane state farms for the production of viandas and vegetables as well as animals. Initially intended to make the farms' canteens self-sufficient in these products, plans were drawn up to increase production in order for these farms to sell foodstuffs to their own workers. It has been reported that between 1985-1990 production of foodstuffs and animals for self-provisioning grew by 54% and 15%, respectively, making the MINAZ canteens self-sufficient in rice, beans, and pork, and providing growing amounts of viandas for sale to the workers.[74] Similarly, the state farms of the Ministry of Agriculture also set aside a certain area for self-provisioning of the canteens; these were reported as being self-sufficient in vianda and vegetable production in 1989. The plan was to double the quantity of agricultural products sold to workers in 1990. Almost all of the agricultural production cooperatives also have an area dedicated to self-provisioning, with the majority of the produce sold to the membership at cost.

As the crisis deepened in 1991, a number of the mass organizations, and many state enterprises, began to cultivate self-provisioning plots, or

at least to put in gardens, to supply their lunchrooms and to sell surpluses to workers. Also, a model program for municipal self-sufficiency in basic foodstuffs, initiated in 1989 in Santo Domingo in the province of Villa Clara, was extended nation-wide. This program is run by the municipal government and consists of large vegetable gardens worked by volunteer labor; the output is designed to augment local supplies of vegetables sold in local state markets. The municipal plots also produce vegetable seed which is then sold to households that want to put in vegetable plots.

The number of household gardens has increased remarkably, both in rural and urban areas. The Federation of Cuban Women (FMC) has been quite active in promoting these, distributing seeds and organizing organic gardening classes for its members. In the province of Las Tunas, I found that in one of the communities linked to a state sugar cane brigade, almost every single worker's home had a garden planted outside it, if only three or four plantain plants, attributed to a particularly energetic FMC activist.

I also found that in Las Tunas, as well as in Villa Clara, state farms were loaning little strips of unused land (along the roads or river banks, for example) to anyone who wanted to plant viandas, vegetables or rice. In fact, I interviewed one state farm worker who had actually been given a land title to about .25 has. of land near the river; he was planning to build his house there, but meanwhile, had the entire holding planted in tomatoes.

VI. CONCLUSION: PROSPECTS FOR CUBAN FOOD SECURITY

To the credit of the Cuban leadership, they turned their attention to the deficiencies of the agricultural sector well before the demise of the socialist trading bloc. This gave them several crucial years before the drastic plunge in import levels to engage in some of the investment schemes which might sustain increases in agricultural output. Of the initiatives begun under "rectification," probably the most important in terms of the long-run prospects for this sector, and the most far-along in terms of meeting its targets, is the hydraulic initiative. Investments in

facilities and other infrastructure for expanded dairy, pork, and, particularly, poultry production, were also well under way by 1990. However, without stable supplies of animal feed, the expanded facilities for these sub-sectors, alone, can not guarantee much in the way of sustained increases in output.

As I have pointed out in previous sections of this essay, the Cubans are tackling the animal feed constraint from multiple angles and with a good dose of both science and ingenuity. However, there is still no indication that they have considered expanding corn production, a crop that could be essential to the successful maintenance of the poultry industry. At the moment, the best prospects in terms of animal feed supplies are for the pork and dairy industries, although with respect to the latter, the switch to the PRV system still seems like a gamble, particularly given the slow progress in extending cultivable pastures, and the stubbornness of Cuban dairy herds in accustoming themselves to eat grass. The most secure source of feed for both industries appears to be the sugar cane industry, but as the Cubans well know from recent experience, cane and its by-products alone cannot sustain either milk or pork production.

The pivotal role of the sugar sector in the National Food Program, should be apparent from the earlier discussion, both because of its contribution to animal feed supplies, and the fact that it is turning over land to vianda and vegetable production while expected to maintain, if not increase, sugar cane production. The enhanced hydraulic capacity allowed an expansion in irrigated cane lands; however, work on the more modern irrigation system in cane was not very far along before the constraints of the Special Period made themselves felt. Although progress on the new drainage systems was more advanced, it is questionable whether these relatively modest accomplishments can make a significant dent on cane yields and total production. Similarly, while the rice sub-sector has benefited from an expansion in the irrigated area, work on the more modern engineering irrigation system does not seem sufficiently far along for the goal of rice self-sufficiency to be viable in the short- to medium-run.

In my opinion, probably the most promising element in the National Food Program at the moment is the vianda and vegetable plan. This is the one

rubric were production levels appear to be increasing, irrespective of the shortage of fertilizer, pesticides, petroleum, etc. But it too, faces a number of potential problems, centering on maintaining an adequate labor force; reducing losses in the distribution system; and bringing about changes in consumer preferences.

Over the last two years the Cuban leadership has demonstrated its continued ability to organize mass mobilizations in pursuit of shared goals. They have also shown that more human labor and better crop cultivation practices can be a good substitute for large quantities of fertilizer and pesticides as well as mechanized cultivation. But can the Cuban population continue to withstand two-week sojourns to the countryside? As noted earlier, the majority of those who have volunteered thus far have been members of the party or of the UJC, whose militancy basically requires them to volunteer. While in 1991 they seemed to accept their turn quite willingly, and were joined by tens of thousands of non-party members, in recent months I have noticed considerable less enthusiasm among those about to leave for the country-side. The prospect that these mobilizations will continue indefinitely leave some of my Cuban acquaintances with a sense of despair.

Then, there is the question of the sustainability of the contingents as stable increments to the permanent agricultural labor force. After their initial formation in 1991, they do not seem to be expanding in numbers, even with rising under- and unemployment in Havana city. Part of the problem is that word of the slow-down in the construction of the new agricultural communities has got around, diluting one of the major incentives for people to make the commitment to become agricultural workers.[75] Nonetheless, the example of the contingents, plus the efforts of the Ministry of Agriculture to improve the conditions of permanent workers on the state farms (better and more plentiful food at the canteens, a steady increase in the amount of products sold to workers from the self-provisioning effort, and a recent wage increase), have seemed to stabilize the permanent labor force in this sector. Nonetheless, it seems that the goal of achieving food self-sufficiency for the Havana provinces will continue to depend on the mass mobilizations for some time to come.

A second problem has to do with Cuba's still deficient food distribution system, which historically has been characterized by high rates of spoilage, poor quality produce, and insufficient storage capacity to maintain supplies of perishables much beyond the harvest period. While this is not the place to provide a detailed evaluation of the changes introduced in the distribution system since 1986,[76] let me simply note that considerable head-way has been made in augmenting refrigeration capacity for fruits and vegetables, and four new large wholesale storage and distribution centers have now been completed in Havana city. Nonetheless, the Cubans are still having difficulties finding the most efficient way of getting fresh produce to market, a problem compounded by the fuel shortage. A major on-going point of debate is whether state farms and cooperatives should supply the retail distribution centers directly, and a whole series of experiments have been tried without definitive results.[77] Probably, the most crucial question--given the fact that viandas and vegetables are likely to become an increasing component of the diet of most Cubans--is whether the storage capacity is in place to maintain fairly stable year-round food deliveries, at the very least, of viandas.

This brings me to the final issue: How will the Cuban population respond to what is most certainly to be a change in the composition of the calories and proteins to which they have become accustomed? In a 1987 national survey carried out by the Institute of Internal Demand, Cubans revealed that their most favourite menu consisted of rice, beans, and viandas with either meat, fish, or eggs (Pérez and Muñoz 1991:17-19). Beef led the preference ordering of meats, followed by poultry and then pork, while plantains led the preference ordering of viandas, followed by malanga and potatoes.[78] It seems pretty clear that what Fidel Castro has in mind is that the increased consumption of viandas and vegetables should at least partly substitute for traditional consumption levels of rice and wheat products, both of which had been sustained through high import levels.[79] While the increased supplies of viandas and vegetables in early 1992 were very well received by most Cubans, it will be difficult for the Cuban leadership to wean the Cuban people away from rice or to convince them to substitute vegetable for animal protein. At the same time it seems strange

that more emphasis has not been given to bean production in the Food Program, since black and red beans play such a crucial role in Cuban diets and represent the most acceptable form of vegetable protein.

In sum, a sufficient number of elements of the broad-ranging Food Program are in place so that, notwithstanding the problems noted earlier, Cuba should be able to maintain food security: adequate, if not normal levels of food supplies. Perhaps the most pressing question is for how long the Cuban people will be forced to accept changes in their diet? And here the answer depends not only on the resiliency of the Cuban people and the efforts of Cuban planners, scientists, technicians and agricultural workers, but also, as stated at the outset of this paper, on a broader set of factors. Perhaps the most important factor influencing the prospects for Cuba's National Food Program is whether the U.S. government will continue attempting to strengthen its economic blockade of the island, rather than, in recognition of the post-Cold War era, lifting it.

NOTES

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1. Cuban socialism differs drastically from its former counterpart in Eastern Europe in that it is intensely related to Cuba's struggle for national independence and autonomy from United States' dominance. Moreover, the U.S. economic blockade of the island, and repeated U.S. support for military adventures by counter-revolutionary groups based in Miami, have very much maintained a sense of unity and common-purpose. Thus, for most Cubans, socialism still represents Cuban independence.

2. The consumption figures are reported in Minister of Agriculture Adolfo Díaz's presentation of the National Food Program to the National Assembly of Poder Popular; the text was published in Granma, 27 December 1990. In 1960 per capita daily consumption was of 2,550 calories and 57 grams of protein (Cardet 1991:44-45).

3. Cuba's cultivable land per capita is on the order of 0.5 has. per person, significantly above the world average of 0.3 has. (Pérez and Muñoz, 1991:2). However, given its tropical location in the Caribbean it is subject to periodic draughts and devastating hurricanes.

4. For varying perspectives of the rectification process, see Eckstein (1990), Mesa-Lago (1990) and Bengelsdorf (1992).

5. The private sector in Cuban agriculture in 1990 consisted of 123,505 peasant farmers and 62,130 members of 1,305 production cooperatives, all of whom are members of ANAP, the National Association of Small Farmers, and some 148,000 non-peasant smallholders (who are not ANAP members). In 1989 the private sector accounted for 17.7% of Cuba's land surface, 25.7% of the agricultural land, and 22% of the cultivated land (Deere, Meurs and Pérez 1992). The remaining land is comprised of state farms.

6. The Cuban leadership did not begin to actively promote the collectivization of individual peasant producers until after 1977. See Deere, Meurs and Pérez (1992) for a detailed account of this process. On the Cuban experience with free peasant markets, and why these were closed after only six years, see Deere and Meurs (1992).

7. The province of the city of Havana is administratively independent from the province of Havana which physically surrounds it.

8. These measures are described in Deere (1991).

9. The Soviet Union had contracted to deliver $5.13 billion worth of goods in 1990 and $3.76 billion in 1991, so that in both years, actual deliveries were significantly below the agreed-upon levels. The data are drawn from Fidel Castro's inaugural speech to the IV Congress of the Cuban Communist Party, 10 October 1991, reprinted in Bohemia (subsequently cited as Castro 1991), and Fidel Castro's closing speech to the National Assembly of Popular Power, 27 December 1991, as reported in Granma International, 12 January 1992.

10. Data from interview with Carlos Lage, a member of the Politburo, in Juventud Rebelde, cited in Cuba Info., Vol. 4, no. 2, February 18, 1992, p. 6.

11. Fidel Castro's closing speech to the Fifth Congress of the Agricultural, Animal, and Forestry Workers' Union, Granma 26 November 1991.

12. Of course, Cuban imports are measured in pesos with what are generally considered to be unrealistic rates of exchange with regard to the ruble, and more particularly, to the dollar. I do not make any attempt here to correct for such deficiencies. See Pérez-López (1991) and Zimbalist and Brundenius (1989) on the debate on how the value of Cuba's foreign trade should be measured.

13. On Cuba's growing debt crisis in the mid-1980s see Zimbalist and Brundenius (1989: Chpt. 9) and Eckstein (1990).

14. The exchange rate used for foreign trade by the Cuban National Bank since 1987 sets the Cuban peso equal to the U.S. dollar.

15. Calculated from CEE (1989: Table XI.10).

16. Unfortunately, in the last few Statistical Yearbooks in which country-disaggregated data was published on sources of imports, the ex-GDR was included in the category of "other" suppliers. However, recent press reports indicate that East Germany followed the Soviet Union in terms of the quantity of dried powdered milk supplied.

17. In the 1935-40 period Cuba reportedly produced an average 43,700 metric tons of beans, but by the decade of the 1950s, this figure had been halved (Bianchi, 1964: Table 4).

18. Both Pérez-López (1991: Appendix 6) and Zimbalist and Brundenius (1989: Table 7.4) report more significant gains with respect to import substitution in rice than shown in Table 2. This is because they took production figures for rice from the agricultural section of the Statistical Yearbook, which is for un-milled rice (arroz con cascara), rather than the more appropriate figures, those for milled or processed rice, ready for human consumption. The latter figures are reported by the Ministry of Food Processing in the industrial section of the Yearbook. Imports of rice, of course, are of milled rice ready for human consumption.

19. Unfortunately, however, the 1989 Cuban Statistical Yearbook does not include data on the origin of imports by country, data published in previous yearbooks as Table XI.18. Thus, it is impossible to systematically trace the increase in the price of food imports by country of origin, and thus to ascertain whether Cuba was paying more for imports from Eastern Europe or having to pay higher prices for food imports from non-socialist countries.

20. As a result of rising prices, the ranking of food imports in terms of foreign exchange outlay differed in 1989 as compared with the average over the 1986-88 period. Wheat imports remained the top import item (150 m.p.), followed by lard and oil (110 m.p.), but they were now followed by corn (72 m.p.), canned meat (69 m.p.), rice (65 m.p.), beans (55 m.p.) and frozen chicken (44.5 m.p.). Animal feed would maintain its third place (109 m.p.), if included in the ranking. Fertilizer imports rose to 157.8 million pesos.

21. Cuban production figures understate total production since, for the private sector, they include only sales made by peasants and production cooperatives to the state (see CEE/AEC 1989:180). Since peasants may plant up to three hectares for self-provisioning, this is a significant source of underestimation. Moreover, the production cooperatives usually set aside a significant amount of land for their self-provisioning as well. Finally, up until recently, the CEE has made no attempt to estimate production by non-peasants (landowners who are not members of ANAP). The result of this underestimation is that Cuban food supplies considerably exceed the published estimates of food production, perhaps by as much as 10%.

22. Unless otherwise noted, this section draws largely on Poder Popular (1991:11-23), complemented with my informal conversations on the topic over the last two years with state farm workers and managers, production cooperative members, individual farmers, and ANAP activists.

23. Deduced from data published in Granma 10 September 1991 and 29 October 1991.

24. The former estimate is based on press reports that Havana province produced 6 million quintals (600,000 MT) of viandas and vegetables in 1989 as compared with the national figure (presented in Table 3) of 1,582,800 MT for 1989. The crop area is for the total amount of land dedicated to the vianda and vegetable plan, respectively, as reported in Poder Popular (1991: 14, 19). In 1989 the two Havana provinces counted with a population of 2.7 million, or 26% of the nation's total (CEE, 1989: Table II.4).

25. Granma 1 October 1990; according to another source (Pérez and Munoz 1991:6), once the hydraulic development program is completed, vianda and vegetable production will account for 19% of irrigated crop land.

26. Minister Adolfo Díaz's report to the National Assembly of Poder Popular, Granma, 27 December 1990. Cardet (1991:53) reports that the level of investment totalled 672 million pesos between 1986-90, resulting in a tripling in the number of Cuba's large dams and a six-fold increase in water storage capacity. The investment plan for 1991-95 was to total 792 million pesos.

27. Fidel Castro's closing speech to the Provincial Assembly of the Cuban Communist Party, Havana city, Granma 3 February 1991.

28. Reported in Granma 1 February 1991 and 18 May 1991.

29. Granma 11 June 1991. It should be noted that approximately 10% of the Cuban population belongs to either the Party or the UJC.

30. Granma 1 February 1991, 7 June 1991, 18 May 1991, and Castro (1991:35).

31. Granma 1 February 1991; Granma 10 September 1991. In a speech given during the Party Congress in October 1991, Fidel Castro mentions that there are 15,000 workers in the contingents, but that number seems too large since at the first anniversary meeting of the contingents in September, Fidel gave the figures cited in the text.

32. Granma 16 May 1991; 31 May 1991.

33. Granma 10 September 1991.

34. Granma 26 May 1991.

35. In 1990 Cuba had counted with 25 refrigerated storage centers with a total capacity of 491,800 cubic meters; capacity increased by 158,000 cubic meters in 1990. By the end of 1991, the country should count with 33 of these with a total capacity of 649,800 cubic meters (Poder Popular 1991: 22-23). The four new wholesale markets being constructed in Havana city will also have refrigerated chambers.

36. Fidel Castro's speech was televised on 6 April 1992; my references to it are based on my notes from watching it.

37. Deliveries to Acopio are usually lower than total production figures, since they exclude production consumed on the state farms as self-provisioning, direct sales by the state farms to other state enterprises, and on-farm losses. In the case of the private sector, sales to ACOPIO should be equal to contracted quotas by production cooperatives and individual farmers; it is the former figure which usually appears as private sector production in the Statistical Yearbooks.

38. Granma 7 June 1991.

39. This figure seems reasonable since in November 1991 it was reported that the state mixed cropping enterprises (Cultivos Varios) in Havana province had produced 50% more in 1991 than in 1990. See Granma 26 November 1991.

40. It seems strange to me, however, that private sector deliveries to the state actually fell, since peasants and production cooperatives, alike, tend to take their contracted delivery quota very seriously, and usually do everything possible to comply. The black market tends to be supplied out of the crops grown on peasants' self-sufficiency parcels.

41. Granma 12 November 1991.

42. This target is not totally unrealistic, since it includes plans to increase the turn-around time on the expanded acreage in irrigated lands. However, it is still yet not clear how reduced fallow periods will affect soil fertility, at a time of extreme conservation in the use of fertilizers. The outcome in terms of yields will surely depend on how well Cuban agronomists have worked out appropriate plant rotation schemes.

43. In his 5 April 1992 closing speech to the UJC Congress, Fidel Castro also reported that a record 2.4 million qq. of viandas, vegetables and fruits had been delivered to Havana city in March.

44. This section, unless otherwise noted, draws on Poder Popular (1991:61-64).

45. See Granma 27 December 1990 for varying estimates by Minister of Agriculture Adolfo Díaz and Fidel Castro.

46. Granma 26 November 1991.

47. Milk production per capita almost doubled from 26.3 litres in 1962 to 42.7 litres in 1970; per capita production peaked in 1981 and has since been on a down-slide (CEE 1974:63,22; and CEE 1989: VIII.35 and II.1).

48. This section draws on Poder Popular (1991: 45-54), unless otherwise noted.

49. Granma 17 May 1991.

50. Cachaza is the first froth of the cane juice when it is boiled to make sugar; according to Perez-Lopez (1991:100-109), it is called filter mud in English. Bagasse is what is left of the trunk of the cane stalk after it is milled; bagacillo refers to bagasse milled in small pieces; Perez-Lopez refers to this as sugar cane pith. Predigested bagacillo consists of a mixture of bagacillo, sodium hydroxide and molasses. Humid saccharine appears to be a by-product produced from molasses which may be what Perez-Lopez terms sacchoramyces yeast.

51. Granma 3 July 1991.

52. This system was actually introduced in the mid-1960s, with apparently, poor results, and thus abandoned until recently (Huberman and Sweezy 1969:172-173). It is still unclear to me why it is now expected to be much more successful.

53. Granma 17 May 1991; 21 May 1991; and 2 January 1992.

54. Egg production per capita increased from 187.9 in 1970 to a high of 270.9 in 1984; it subsequently decreased in the mid- and late 1980s, reaching a decade-low 254 per capita in 1989 (CEE 1989:Table VIII.1).

55. Granma 27 December 1990.

56. It is unclear to me from available reports whether these will be combined processing centers which produce both canned fish and fishmeal. If the processing centers were to produce animal feed, this would certainly brighten the prospects for the poultry industry.

57. Granma 5 July 1991.

58. Granma 27 December 1990.

59. There are some important differences in the targets presented in the report on the Food Program issued by Poder Popular (1991:124-125) and in Minister Díaz's presentation to the National Assembly of Poder Popular (printed in Granma 27 December 1990). For example, in the report it is noted that the goal was to install 1,000 of these large irrigation machines per year, but in Díaz's presentation he states that the goal is to have 12,000 of these machines installed during 1991.

60. The lower target is reported in Poder Popular (1991:124), the higher one by Minister Díaz (Granma 27 December 1990).

61. Granma 28 June 1991; 26 November 1991.

62. Fidel Castro's closing comments to the UJC Congress, 5 April 1992.

63. Ibid., p. 4

64. For example, in 1989, before the fertilizer shortage developed, the Cubans were applying an average 460 kgs. of balanced fertilizer per hectare planted in sugar cane; in 1975, the corresponding figure was 341 kgs./ha.

65. Granma 23 May 1991.

66. Granma 21 May 1991; 19 June 1991.

67. Granma, 7 June 1991; 26 November 1991.

68. The application of the SPDE in the agricultural sector is well described in Kay (1988) and Meurs (1992).

69. Granma 17 May 1991; 26 June 1991.

70. Granma 25 December 1991.

71. Interview in Granma 19 June 1991.

72. But in order to assure that crops are not planted in "the wrong" season, the wholesale price structure is also being changed so that the same price reigns year-round. Previously, the highest prices were paid during the off-season, for example, for vegetables, during the very rainy summer months, to encourage their production during months of general scarcity. The new policy will, of course, reduce the diversity of vegetables available to consumers.

73. Granma 15 January 1991.

74. Granma 5 July 1991; 13 July 1991; Poder Popular (1991:185).

75. In his closing speech to the UJC Congress in April 1992, Fidel Castro also announced that the pace of construction of the new agricultural communities had to be slowed because of the lack of fuel and cement. He noted that the planned communities would now be built over a five to nine year period.

76. See Deere and Meurs (1992) for a description of the changes introduced in the distribution system as a result of the closing of the free peasant markets.

77. See the discussions in Granma 10 September 1991 and 12 November 1991, for example.

78. Viandas were also high on the list in an earlier survey carried out by this same group. When asked which of 24 products they would like to consume more of, over 80% of those surveyed indicated meats, fruits, and viandas, followed by beans, lard, potatoes, rice, and vegetables (Perez and Muñoz 1991:15-16). Bread, canned beans and vegetables, and eggs were way down on the list (less than 22% of the respondents indicated an interest in consuming more of these products). However, this survey was taken in 1986 when all of the latter products were in abundant supply, so it is not a totally adequate measure of consumer preferences in the current period.

79. Granma 26 November 1991.

Table 1: Cuba's Food Imports as a Share of Total Imports

YEAR	IMPORTS (in current 000s pesos)			FOOD AS % OF:	
	Total	Net of Petroleum Re-Exports	Food	Total	Net of Petroleum Re-exports
1924-29	n.a.	n.a.	n.a.	37.8	n.a.
1935-39	n.a.	n.a.	n.a.	26.7	n.a.
1955-57	754,000	754,000	168,000	22.3	22.3
1958	777,094	777,094	158,931	20.5	20.5
1965	866,164	866,164	181,541	21.0	21.0
1970	1,310,968	1,310,968	262,184	20.0	20.0
1975	3,113,089	3,113,089	594,828	19.1	19.1
1980	4,626,964	4,530,631	746,078	16.1	16.5
1985	8,034,976	7,467,789	889,239	11.1	11.9
1986	7,596,136	7,349,344	708,908	9.3	9.6
1987	7,583,677	7,257,516	716,235	9.4	9.9
1988	7,579,769	n.a.	730,411	9.6	n.a.
1989	8,124,224	n.a.	925,349	11.4	n.a.

Note: In the 1980-89 period, Cuba re-exported Soviet crude petroleum and exported refined petroleum and nafta produced in Cuba, the latter, largely produced from Cuban crude production. Since the Statistical Yearbook only provides data on total petroleum and petroleum product exports, and on nafta exports, the calculation of Cuban petroleum re-exports includes the value of exports of petroleum refined in Cuba and thus slightly overstates the value of imports net of petroleum re-exports. Data on petroleum exports for 1987 and 1988 is not reported in the 1989 Statistical Yearbook.

Sources: for 1920s and 1930s, Bianchi (1964:70); for 1955-57, Seers (1964: Table 6); for 1958 and subsequent years, Comité Estatal de Estadísticas, Anuario Estadístico de Cuba, 1989, Tables XI.10 and XI.9.

Table 2: Cuban Food Import Dependence (000s tons)

Product	1970	1975	1980	1985	1986-88	1989
CORN						
Imports	170.4	365.1	711.3	408.9	523.9	722.3
Production	15.3	20.5	23.5	32.4	37.4	47.1
Apparent Consumption	185.7	385.6	734.8	441.3	561.3	769.4
Import Dependence	91.8%	94.7%	96.8%	92.7%	93.3%	93.9%
BEANS						
Imports	86.7	76.5	104.2	127.8	112.7	127.3
Production	4.4	4.0	9.4	11.0	13.5	14.1
Apparent Consumption	91.1	80.5	113.6	138.8	126.2	141.4
Import Dependence	95.2%	95.0%	91.7%	92.1%	89.3%	90.0%
LARD & OILS[1]						
Imports	152.3	172.8	187.3	215.8	209.5	204.7
Production	51.9	74.6	80.6	111.2	115.4	97.3
Apparent Consumption	204.2	247.4	267.9	327.0	324.9	302.0
Import Dependence	74.6%	69.8%	69.9%	66.0%	64.5%	67.8%
BUTTER						
Imports	16.9	18.3	21.0	17.0	16.6	15.3
Production	0.2	7.8	9.5	10.9	10.0	8.8
Apparent Consumption	17.1	26.1	30.5	27.9	26.6	24.1
Import	98.8%	70.1%	68.9%	60.9%	62.4%	63.5%
RICE[2]						
Imports	199.0	199.8	229.6	242.4	203.6	242.2
Production	182.8	222.8	225.6	241.6	234.2	248.9
Apparent Consumption	381.8	422.6	455.2	484.0	437.8	491.1
Import Dependence	52.1%	47.3%	50.4%	50.1%	46.5%	49.3%
CANNED MEAT						
Imports	22.3	33.0	34.8	41.0	33.4	43.2
Production	14.6	26.3	34.9	64.3	64.7	68.0
Apparent Consumption	36.9	59.3	69.7	105.3	98.1	111.2
Import Dependence	60.4%	55.6%	49.9%	38.9%	34.0%	38.8%
WHEAT FLOUR						
Imports	277.1	320.4	298.6	160.7	177.3	179.7
Production	159.7	176.1	269.3	441.6	446.5	398.0
Apparent Consumption	436.8	496.5	567.9	602.3	623.8	577.7
Import Dependence	63.4%	64.5%	52.6%	26.7%	28.4%	31.1%

	1970	1975	1980	1985	1986-88	1989
POULTRY[3]						
Imports	--	30.9	20.0	24.9	21.1	38.2
Production	--	13.5	34.6	60.3	68.7	76.2
Apparent Consumption		44.4	54.6	85.2	89.8	114.4
Import Dependence		69.6%	36.6%	29.2%	23.5%	33.4%
CHEESE						
Imports	3.4	4.2	4.8	6.4	6.8	7.5
Production	1.2	6.7	11.3	14.5	15.7	16.2
Apparent Consumption	4.6	10.9	16.1	20.9	22.5	23.7
Import Dependence	73.9%	38.5%	29.8%	30.6%	30.2%	31.7%
ANIMAL FEED[4]						
Imports	89.4	146.7	261.4	283.3	325.4	398.7
Production	596.0	1,002.1	1,386.4	1,630.8	1,795.4	1,904.6
Apparent Consumption	685.4	1,148.8	1,647.8	1,914.1	2,120.8	2,303.3
Import Dependence	13.0%	12.8%	15.9%	14.8%	15.3%	17.3

Sources: Comité Estatal de Estadísticas, Anuario Estadístico Cubano, 1989, Tables VI.21, VIII.20, and XI.10.

Notes:

1. Imports include those of lard, edible sebo and crude vegetable oils; domestic production includes lard, edible industrial lard, and crude and refined vegetable oils.

2. Both rice imports and production refer to milled rice, ready for human consumption.

3. Production figures refer to dressed chickens processed by the Ministry of Food Processing and are, thus, lower than production figures for poultry "live weight" reported by the Ministry of Agriculture in Table 3.

4. Imports of animal feed include only vegetable and animal flour destined for feed. Domestic production includes the category of "mixed" animal feed produced by the Ministry of Light Industry and fish meal produced by the Ministry of Fisheries. The estimate of domestic production may, thus, exclude all of the animal feed produced by the Ministry of Sugar, but I have not been able to confirm this. The estimate also excludes fodder and other crops grown for animal feed by the Ministry of Agriculture.

Table 3: Cuban Food Production and Targets of the National Food Program
(000s tons)

Product	1970	1975	1980	1985	1986	1987	1988	1989	1990[1]	Target
Tubers	122.8	302.5	736.8	679.9	675.2	633.0	653.2	681.2	na	na
Plantain[2]	73.5	182.8	233.4	344.6	324.1	284.4	345.1	291.4	na	na
Viandas	196.3	485.3	970.2	1024.5	999.3	917.4	998.3	972.6	na	1032.0 (1995)
Vegetables	130.4	401.7	445.8	594.2	550.9	549.7	675.6	610.2	na	910.0 (1995)
Viandas and Vegetables:	326.7	887.0	1416.0	1618.7	1550.2	1467.1	1673.9	1582.8	1300.0	1942.0 (1995)
Rice	374.5	446.7	447.8	524.3	570.5	466.0	488.9	536.4	540.0	1070.0 (1995)
Corn	15.3	20.5	23.5	32.4	34.5	42.2	35.5	47.1	na	na
Beans	4.4	4.0	9.4	11.0	13.2	12.5	14.8	14.1	na	na
Milk[3]	379.5	591.2	889.0	928.8	926.3	939.9	918.7	924.1	na	1987.7 (1995)
Beef[4]	381.5	240.1	293.0	298.9	302.3	290.1	291.7	289.1	na	477.0 (1995)
Pork[5]	15.9	43.4	57.6	94.8	100.2	106.0	104.6	110.4	94.3	187.0 (1994)
Poultry	20.4	56.7	90.9	113.0	113.3	109.4	114.5	117.8	110.4	172.5 (1993)
Eggs[6]	1.5	1.9	2.3	2.5	2.5	2.5	2.5	2.5	2.6	3.3 (1993)
Fish[7]	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	na	0.6 (1995)
Citrus	163.9	172.5	443.9	744.5	779.7	885.5	981.0	825.7	na	2000.0 (1993)
Other Fruits	77.9	138.0	199.2	236.3	201.1	223.3	269.4	218.9	na	na

Sources: Comité Estatal de Estadísticas, Anuario Estadístico Cubano 1989, Tables VIII.20, VIII.32, VIII.37, VIII.41, VIII.42, VIII.47. Estimates for 1990 drawn from Poder Popular (1991). Targets for 1995 drawn from presentation on the National Food Program by Adolfo Díaz, Minister of Agriculture, on behalf of the Executive Committee of the Council of Ministers, to the National Assembly of Poder Popular, in Granma 27 December 1990; other targets drawn from Poder Popular (1991).

Notes:

1. Preliminary estimates.

2. Includes both plantains (platano vianda and burro) and bananas (platano fruta).

3. Fresh milk, state sector only, in millions of liters.

4. Based on deliveries to slaughter houses, live weight, by both the state and private sectors.

5. Deliveries to slaughter houses, live weight, by state sector only.

6. Million units; state sector only.

7. State aquaculture only.

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