before the Green Revolution was initiated as afterwards.

But even Evenson believes that "we have yet to see a really first rate agricultural research center (comparable to the best U.S. Agricultural Experiment Stations) emerge in a developing country." According to a recent article in *National Journal Reports* by Richard Critchfield, Indian farmers attribute the lower wheat yields harvested this May to bad seed. The Mexican wheats developed by CIMMYT "were the only productive seeds they have received. Seeds introduced in recent years from research institutes in India, they said, were prone to rust or other diseases, vulnerable to insects, or simply low yielding."

The Green Revolution stretches beyond agriculture to touch almost every sphere of life of the countries where it is adopted. Not surprisingly, there are few simple answers to many of the issues it raises. It is in some ways more remarkable as a social than a scientific phenomenon. Miracle crops have swept the world before—for example, sugar cane in the 1920's—but, until the Rockefeller Foundation did so, no one had cared enough to see what modern plant breeding could do for staple food crops. The Green Revolution, in other words, would not have occurred if conditions had not been ripe for it. How far conditions favor its continuance is open to doubt. Some economists believe that the HYV's will never occupy more than half to two-thirds of the wheat and rice areas of less developed countries. The Green Revolution may lose even the momentum it has unless plant breeders can adapt it to other crops, to unirrigated lands, and to the maybe permanent constraints of the energy crisis. These obstacles are probably more likely to be overcome if the Green Revolution can be continued as a native growth, rather than as a Western implant.

—NICHOLAS WADE

Ethiopia: Did Aid Speed an Inevitable Upheaval?

Ethiopia abounds with paradox. A visitor to the capital city of Addis Ababa might encounter cattle skulls lying in the dust of bare unlandscaped parks, and shepherds with their flocks wandering heedless of traffic across wide thoroughfares. Modern, monumental government office buildings are interspersed with ramshackle beer houses. For all its pretensions to modernity—as exemplified by the fabulous Addis Ababa Hilton, financed by the Export-Import Bank, which adorns the road from the airport—Ethiopia has remained firmly entrenched in the 12th century, an African feudal kingdom that has stood as an island of calm while most other sub-Saharan nations have undergone the spasms of post-colonial adjustment.

It has also stood as an island of Coptic Christianity in a Muslim sea. Its mountainous terrain has isolated it geographically from its neighbors, and the unique identity of the ruling Amhara elite, who trace their origins to King Solomon, has helped prevent the formation of culturally or ethnically based foreign alliances. Sitting atop this relatively stagnant society has been Haile Selassie, emperor since 1930, who in the decades since World War II has been free, because of his posture of nonalignment and success at maintaining domestic stability, to travel around the world in the role of Africa's senior statesman. The chief exception to the picture of domestic tranquillity has been the agitations of the Eritrean Liberation Front (ELF). Eritrea, formerly an Italian colony, was federated semiautonomously with Ethiopia after World War II. In 1962 the Ethiopian government dissolved the federal ties and incorporated Eritrea, whose allegiance has always been more with the Italian government than the emperor, as a province. The ensuing rebellions have been simmering ever since and Eritrea's desire for independence has become a central issue in current political developments.

The eventual downfall of the imperial regime has been a foregone conclusion among foreigners and educated Ethiopians for years. The only questions were how it would happen, and when. Most observers thought it would not happen until the emperor's death, but the disastrous 3-year-old drought in the northern provinces of Wollo and Tigre, combined with inflation from rising fuel prices and accompanying social disorders, appears to have hastened the day of reckoning. What began as a fairly subtle takeover, with the military setting itself up as watchdog over a civilian government, turned into a bloody coup on 23 November with the abrupt executions of 59 high government and military officials. The 83-year-old emperor is now a hostage, and what will happen next no one dares guess.

It is worth wondering, though, how American aid has influenced the course of events in what has become an increasingly fragile feudal regime.

In many ways Ethiopia has been an American client state in the sub-Sahara for the past two decades, the most populous (26 million) among the world's 25 poorest nations and the beneficiary of a steady stream of assistance from the U.S. Aid for International Development (AID) programs. Americans have also trained an abundance of Ethiopian military officers and provided an average of $22 million a year of planes, tanks, and other military goods. (Strategically, Ethiopia's prime importance to the United States has been the communications and satellite tracking facility at Kagnew near Asmara. The center is now being phased out, however, its functions having been replaced by communications satellites.) Americans helped launch Ethiopia's Haile Selassie I University in 1952 and have provided quantities of civilian aid, including agricultural assistance to drought-stricken areas. AID funds have remained relatively constant over recent years, averaging $20 million per annum, and, while it may be fruitless to speculate on the extent to which U.S. assistance has contributed to the fall of the government, it seems fair to say that it has helped shape the foundation for the events now being played out.

Because it has never been colonialized, Ethiopia is far less developed

(Continued on page 1225)

(Continued from page 1192)

than its neighbors when it comes to education, health, transportation, communications, and administrative structures. (The only exception was the Italian occupation of 1936–1941 whose chief legacy was a rudimentary road system.) AID started with a scattershot approach, but during the 1960's priorities were narrowed down to primary emphasis on agricultural development and education, followed by public health (namely, malaria eradication) and road building. Perhaps because the level of assistance has been so fundamental—for example, a serious effort at a controversial program such as family planning is unfeasible at present —Americans and other foreigners involved in development in Ethiopia have enjoyed good relations with the authorities. The results are as yet inconspicuous except for isolated examples such as a gleaming fleet of American-made Ethiopian air force jets shooting across the clear blue skies above Addis Ababa, but Americans seem to feel that the groundwork is slowly being laid to enable society to gradually emerge from grinding peasantdom to a prosperous, albeit predominantly agricultural, nation.

Ethiopia is a land of extremes, with rocky impenetrable mountains, temperate highlands, tropical malaria-infested lowlands, and desert. Although the capital abounds with glistening high-rise government buildings constructed by Yugoslav and Italian contractors, most of the countryside looks much as it did in the 12th century. Ninety percent of the population is engaged in farming or livestock tending. The literacy rate is estimated at 5 percent, and no more than 20 percent of Ethiopians have had any schooling. The country's main export is coffee—which got its name from the province of Kaffa. Lesser exports are hides, oilseeds, and pulses. More than half the farmers are tenants of large, often absentee, landholders. The rest till tiny scattered plots of land that become even smaller as they are divided and redivided among families. The population growth rate is a high 2.6 percent per annum. The annual per capita income is estimated by AID at $83.

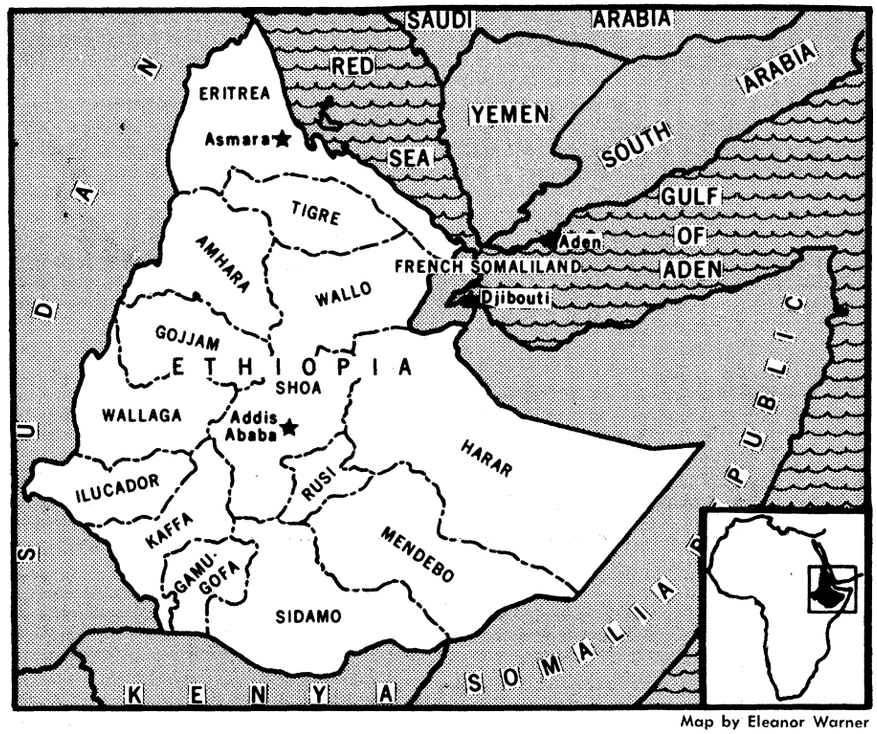
The emperor of this proud but backward nation has, somewhat ironically, devoted most of his attention to foreign affairs, particularly in the past decade. During the 1960's he was titular head of the Organization of African Unity. He built a huge hall in Addis Ababa where that now almost-nonexistent coalition meets annually. The emperor has welcomed aid from any and all foreigners. At the same time he has sought to prevent them from becoming too influential. By the mid-1960's he was seeking to bring to an end a long tradition of foreign advisers within the Ethiopian government. The last of that breed, the American legal adviser to the Prime Minister, left in 1968. Most of the 2500 Americans remaining in the country are U.S. government employees.

The exit of foreign advisers is part of the process of "Ethiopianization" that both the government and foreign contributors have encouraged. The foreign hand is still very much behind the scenes. Ethiopian Airlines, for example, the country's pride and joy, is run under a management contract with Trans World Airlines, but more and more natives are holding positions once held by foreigners. The science faculty at the university is now manned by foreign-educated Ethiopians, and the law school, which was founded and largely staffed by Americans, had only two American faculty members at the time the university was closed last winter.

The growth of an educated elite and the swelling ranks of technocrats in the civil service was bound to undermine the imperial influence as the old order died off. But it was the government's delayed and totally inadequate response to famine combined with rocketing inflation that apparently triggered the military takeover.

What the Dergue (as the military junta is called) did, in effect, was to lop off the top layer of conservative aristocratic officialdom that was responsible for the continuing political stability of the country, but was also a heavy drag on efforts at stepping up social and economic progress. An American who formerly taught at the university says that even his Ethiopian contacts were surprised at how events developed, and that no one is sure who the leading figures have been behind the scenes. As various factions in the Dergue wrestled among themselves, two prime ministers were installed and then ousted; finally General Aman Michael Andom, a popular figure known for generally moderate views, became the head of the government. The final stage is said to have been precipitated by more radical chauvinist members of the Dergue who wanted to send troops to quell the ELF rather than seek a political solution. This group shot Aman and carried out the executions that he had opposed.

What has surprised some observers is that the revolt was headed by relatively junior military men including noncommissioned officers (the top brass were



Map by Eleanor Warner

among those executed). Mengistu Haile Mariam, the man who seems to be running the show now, is only 32 years old and was an ordnance officer who had received training at the command general staff college at Fort Leavenworth.

It is particularly dangerous to make generalizations about political factions in Ethiopia, because there politics are carried on at a very personal level, are fraught with intrigue, and allegiances can change overnight. A State Department official characterizes the Dergue as a "nationalist" bunch whose actions were propelled not so much by self-interest as by genuine desire to improve the lot of the Ethiopian people. It appears that there are Marxist and Maoist elements in the cadre now in control. There is talk of nationalizing land, and the group has kept the university closed with the idea of sending faculty and students out into the countryside in order to educate the masses.

According to British journalist Colin Legum, longtime African specialist, the most immediate dangers now are either civil war between a combine of Tigrean and Eritrean provinces and the rest of the country, intensification of war with Eritrea, or outside intervention which would magnify existing conflicts. There is also the possibility that Ethiopia, whose main unifying concept has been allegiance to the emperor, could degenerate into a mass of feuding tribes.

At this point it appears that the United States intends to continue its various programs of military and economic assistance wherever possible, although this may be made difficult by the fact the United States doesn't know who it's supposed to be dealing with.

If a stable and reasonably unreactionary government could be established, there appears to be considerable hope for Ethiopia. Unlike a nation such as Bangladesh, whose only resources are jute and teeming humanity, Ethiopia has an abundance of good agricultural land—the red volcanic soil of East Africa, much of which is in Ethiopia's southwestern lowlands and can be brought under cultivation as the anti-malaria campaign permits more people to move in. It is a major wheat producer in East Africa, and is hospitable to two strains of sorghum that researchers at Purdue University (see *Science,* 12 October 1973) have found to be rich in lysine, necessary to build protein. There are plans (now up in the air) for a major internationally supported agriculture research center devoted to livestock research. The nation has abundant potential for hydroelectric power, and geothermal potential is also likely. The mining of potash (for fertilizer) is on the increase, and Eritrea, with the help of the Japanese, is looking into some promising copper deposits. In addition, Tenneco thinks it has found natural gas and possibly petroleum deposits in southern Harrar province (it is, unfortunately, on terrain disputed by the Somalis). Thus, there appears to be potential for some modest attempts at industrialization.

Last spring no one seemed overly worried by a coup considered inevitable and necessary if the country was to proceed beyond the limited reforms permitted by the emperor. Now it is generally believed that the hotheads have the upper hand. It is hoped that the international protest against the executions will forestall further bloodbaths.

The extent to which U.S. participation in Ethiopian affairs shaped the current situation is impossible to determine. Certainly the United States has had an effect both on the muscle and the thinking of the military. And in large part through the Peace Corps, which in its heyday had some 900 volunteers in Ethiopia, the availability of secondary education has been significantly expanded. Aid from the United States, along with that of other nations, particularly the British (who formed the model for the Harrar Military Academy), the French, and the Swedes, has undoubtedly hastened the day when confrontation between the old and the new came about.

Knowledgeable observers have been surprised at how little the general population has reacted to the deposing of the emperor, although speculation is that they are too demoralized to care. The emperor became a figure on the world stage in 1936 with his famous plea to the League of Nations for help in liberating the country from the Mussolini government. He has remained an international figure ever since, although in recent years he probably more closely resembled those ancient monarchs who were mummified and wheeled through the streets to show the people that the ruler still survived. Now his power is gone, and it is his country that after decades of obscurity has wrestled its way to the world's attention.—CONSTANCE HOLDEN

The author has lived and worked in Ethiopia.