GUEST EDITORIAL

Amazonia's Rich Storehouse of Genes Vital for Improving Food and Cash Crops

Amazonia contains the largest stretch of tropical rain-forest, spanning some 5,000 kilometres from the Andes to the Atlantic, and some 4,000 kilometres from the Guianas and the Upper Orinoco to the scrub cerrado of the Brazilian shield and the seasonally-flooded grasslands of the Pantanal. This vast mosaic of forest communities, secondary growth, natural and Man-induced grasslands and swamps, contains the richest array of plant and animal species in the world, as well as a rich storehouse of genes for crop improvement.

Wild populations of our crop plants and their near relatives often contain the only known sources of resistance to diseases and pests — an important asset considering present-day global concern about the indiscriminate use of pesticides. American Oil-palm (*Elaeis oleifera*), a wild palm that grows in low-lying, periodically-flooded situations from southern Honduras to the Amazon, resists Spear-rot, a serious disease of African Oil-palm (*E. guineensis*) plantations in tropical America. Spear-rot, possibly caused by a viroid, and similar in some respects to lethal yellowing disease of Coconut (*Cocos nucifera*), is thought to be transmitted by insects. Pesticides would not help, as they would kill Oil-palm's pollinators, which are principally beetles. Current control measures are restricted to removing trees at the first sign of symptoms of Spear-rot.

Fortunately, the diminutive American Oil-palm is a near relative of African Oil-palm and can be crossed with it, so that disease resistance can be transferred to the domesticated species. Hybrids between American Oil-palm and African Oil-palm are already restoring palm-oil production along the Pacific coast of Colombia. Caiaué, as the American Oil-palm is known in the Brazilian Amazon, is also short — a trait that is being used to reduce the height of African Oil-palm, so that harvesting of its fruits is made easier. In a parallel development, Malayan dwarf Coconuts are replacing taller Coconut trees that have been wiped out by lethal yellowing disease in the Caribbean, particularly in Mexico.

Home of Numerous Food-crops

Amazonia is home to a vast array of crops that are grown for food, resins, latex, nuts, and many other useful products. Wild populations of rubber (*Hevea brasiliensis*) and wild or spontaneous populations of Cacao (*Theobroma cacao*), for example, are still found in Amazonia's vast, but rapidly shrinking, forests. Rampant deforestation, fuelled by development schemes and pioneer farmers, now threatens to destroy genetic resources of many economic plants and potential crops before they can be tapped for the benefit of people throughout the world. Also, loss of tribal cultures is resulting in the disappearance of unique varieties and local strains of many of these crops and of vital knowledge about the natural history of their wild populations and near relatives.

Ironically, forest clearing to establish farms and plantations can eliminate genes that could be used to improve the crops which are being planted. The shrinking of wild populations of nearly 50 perennial crop species that are useful for a wide range of products is currently under way in Amazonia. Perennial crops are important to the livelihoods of most small farmers in the tropics, as well as to operators of large plantations. Many Amazonian crops are now grown throughout the tropics, and the future health of the economies of such countries as Malaysia, Indonesia, and Ivory Coast, may well depend on the fate of Amazonia's forests.

Natural Rubber and Cacao Important

More than ninety per cent of the world's natural rubber is produced on plantations and smallholdings in southeastern Asia. Demand for natural rubber is brisk — for the manufacture of radial tyres, now standard for most cars, and for the booming airline industry. Synthetic rubber has dominated the car tyre industry for most of this century; but radial tyres, which contain varying amounts of natural rubber, perform better than synthetic ones, and are therefore increasingly preferred by discriminating buyers. Furthermore, several new uses for natural rubber, such as foundation padding for buildings in earthquake zones, is increasing demand for this product.

One reason why rubber plantations have prospered in southeastern Asia is that they are free from South American Leaf-blight, caused by *microcyclus ulei*; should that fungal pathogen ever reach the shores of Malaysia or Indonesia, productivity of rubber plantings would plummet. Several near-relatives of *Hevea brasiliensis* in Amazonia resist South American Leaf-blight, but much work remains to be done to succeed in transferring their resistance genes to high-yielding clones of the Rubber-tree.

Cacao is an important cash-crop in many countries of tropical Asia, Africa, and America. In tropical America, Witches'-broom, caused by several strains of a Fungus (*Crinipellis perniciosa*), is a serious disease which undercuts cacao production and reduces the income of many growers. Recently, Witches'-broom reached Bahia, Brazil's most important cacao-producing state. If Witches'-broom reached Ivory Coast, Ghana, or Malaysia, the economies of those developing nations would suffer severely, and the price of chocolate would soar world-wide. Earlier sources of resistance to Witches'-broom, located in wild Cacao from western Amazonia, no longer prevail, so new sources will have to be found.

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A Cornucopia of Other Amazonian Crops

A host of other crop plants of regional or local importance trace their origins to the varied forests of Amazonia. Peach-palm (*Bactris gasipaes*), widely appreciated in lowland tropical America for its starchy fruits, is now being grown commercially for palmito production in Central America, particularly Costa Rica. Annatto (*Bixa orellana*), which produces a natural red dye, is increasingly in demand now that red dye no. 3 has been banned in the United States because of its carcinogenic properties. Urucú and Achiote, as Annatto is known in Brazil and Spanish-speaking countries, respectively, is probably native to southwestern Amazonia, and wild or spontaneous populations occur in various parts of the Amazon basin.

Brazil-nut (*Bertholleria excelsa*) plantations are now being established in Amazonia and Malaysia, and genetic resources will be needed to confront future disease, pest, and soil, problems associated with the transition from a wild-collected food to a cultivated plant in a more ecologically homogeneous setting.

Many locally-appreciated fruits may become more widely grown in the future, provided that enough of the traditional varieties and wild populations survive. For example, Cupuaçu (*Theobroma grandiflorum*), a relative of Cacao, is cultivated mostly in back-yards for its refreshing pulp, which is used to flavour ice-cream, drinks, puddings, and cakes. A host of other local fruits with unique flavours may one day delight the palates of consumers in other parts of the world.

Living Laboratories of Evolution

Amazonian forests are living laboratories of evolution, and they need to be so preserved that breeders, and eventually biotechnologists, can constantly tap fresh sources of genes for crop improvement. To help to secure the widely-dispersed gene-pools, sizeable portions of forest in various parts of the Amazon Basin will *have* to be safeguarded for future generations. Efforts to create and protect parks, biological preserves, national forests, Indian reserves, and extractive reserves, need to be redoubled. Every dry season, more potentially-valuable genes for crop improvement go up in smoke — often literally.

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