



Butterfly Farming in Papua New Guinea

By pinoyfarmer | July 31, 2007

"Butterflies may seem unusual farm animals, but to villagers in the Papua New Guinea jungle it is cattle that are exotic. The villagers live in close contact with their local insects; invariably they know much about butterfly locations, behavior, habits, life cycle, and the food eaten by the caterpillars."

Butterfly farming is a growing new industry in Papua New Guinea, and by turning birdwings, mauve swallowtails, and other insects into a cash crop villagers are both earning money and practicing sound wildlife conservation. In this unique program butterfly farming is being used to complement the preservation of species and of habitats. In balancing the utilization of common butterflies with the protection of the most threatened species, Papua New Guinea is providing a model for other countries, particularly those in the tropics. The program demonstrates how village development can become an integral part of conservation.

The panel that produced this report convened in Papua New Guinea in May 1981. Its purpose was to investigate the concepts underlying this project and to assess their potential for application elsewhere. Panel members met with staff of the government's Division of Wildlife in Port Moresby and later visited butterfly farms in Popondetta and the insect trading agency in Bulolo. The panel is grateful to Karol Kisokau, Navu Kwapena, and Miro Laufa of the Division of Wildlife for arranging the itinerary in Papua New Guinea and to Peter Clark and Michael Parsons for hosting the Bulolo and Popondetta visits. This report is one of the National Research Council series, Managing Tropical Animal Resources. Current titles in the series are:*

- Water Buffalo: New Prospects for an Underutilized Animal (1981)
- Little-Known Asian Animals with a Promising Economic Future (1983)
- Crocodiles as a Resource for the Tropics (1983)
- Butterfly Farming in Papua New Guinea (1983)

These activities have been conducted under the auspices of the Advisory Committee on Technology Innovation (ACTI) of the Board on Science and Technology for International Development, National Research Council (see page 29). The purpose of ACTI is the assessment of unconventional scientific advances that might prove especially applicable to problems of developing countries. Since its founding in 1971, it has produced about 30 reports covering subjects as diverse as ferrocement construction materials, the winged bean (a high-protein tropical food crop), and techniques to provide more water for arid lands. This study adds the dimension of conservation and ecosystem protection to ACTI'S principal concerns of promising but neglected resources.

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Introduction and Summary

The international demand for tropical butterflies is much greater than is generally recognized. Each year millions of them are caught and sold throughout the world. Many buyers are scientists engaged in research on aspects of systematics, ecology, ethology, evolution, and conservation. Others are individuals who like expensive curios that incorporate butterflies, such as display cases, coffee tables, wall hangings, or other objects. But increasingly, the fragile, iridescent creatures, mounted in plastic or glass, are used to decorate less-expensive items such as purses, trays, platters, screens, and other common objects in Europe, North America, and Japan. In addition, amateur butterfly collecting, which reached a peak in Victorian times, is again becoming popular.

All this has produced a strong and active market. The current trade is estimated to be between US \$10 and \$20 million annually, and the demand is rising.

Butterfly Farming in Papua New Guinea

Remote regions of Papua New Guinea are benefiting from this burgeoning interest in tropical insects, and several hundred villagers are rearing or collecting butterflies, beetles, and other insects for export. The Papua New Guinea government now considers insects a national resource, and it has made butterfly farming part of the nation's village economic development. At Bulolo it has established an Insect Farming and Trading Agency (IFTA) to handle the business details of a growing international trade. And Papua New Guinea is the only country so far to specify insect conservation as a national objective in its constitution. Botanical research is the key to Papua New Guinea's butterfly farming program. Local botanists and ecologists have identified the plants that the various butterfly species use during their life cycle. The butterfly farmers then build up their "livestock" by clearing small areas of ground and planting leafy food plants for larvae, together with the nectar-producing flowering plants that adult butterflies feed on. The combination of flowering and leafy plants provides a complete habitat where butterflies find everything they need to grow and reproduce. Therefore, most remain, and the farmer retains his livestock without fences or walls.*

"They are among the most unusual farms in the world. Around their edges are hibiscus and bougainvillea that attract the adult butterflies, whose mouthparts are adapted for drinking nectar from flowers. And inside are leafy plants, such as the strange Dutchman's pipe vine (Aristolochia tagala), on which the caterpillars of several birdwing butterflies feed."

The enriched butterfly habitat in the villager's garden attracts and holds a breeding population that becomes a self-renewing resource. By varying the plant species the farmer can even maintain colonies of different butterfly species. And because insects are so prolific, some butterfly farmers are beginning to have problems with overstocking and have had to shift larvae from plant to plant—rather like moving cattle from one field to the next as the grazing runs out.

Economic Development

The IFTA program started in 1974 with fewer than 30 Papua New Guineans from villages in two provinces. By 1978, more than 500 villagers in 10 provinces had been introduced to farming or collecting butterflies for export. Since then, business has been increasing about 40 percent a year.

Gram for gram, exotic butterflies are far more valuable than cattle. Prices paid by dealers in Europe, North America, and Japan range from 30 cents for individuals of common species to around \$10 for the two birdwing species whose export is allowed. A specimen of a rarer species (for example, a female of the mauve swallowtail *Graphium weiskei*) may bring as much as \$50.

The project is still an embryonic activity; it is not large, as development programs go. IFTA has only one professional staff person and two local technicians to handle the distribution of specimens. The agency's

goal is to export between 5,000 and 10,000 specimens a month, from which the villages can expect a return of \$10,000 or more.

The agency purchases butterflies from villagers and uses them to fill orders from overseas buyers. Colorful beetles, strange-looking stick and leaf insects, and some moths and cicadas are also caught in the wild and sent to Bulolo. The profits, less 25 percent, are returned to the villagers. At the time of the panel's visit, IFTA had received about 4,000 shipments of butterflies and other insects from the rural people and had paid out about US \$180,000 to purchase them. In 1979, the average farmer or collector received about \$37 per box of specimens. By 1980, this had risen to about \$50 per box. In 1981 it was estimated that a diligent butterfly farmer could earn an annual income of about \$1,200.

Even so small an annual income is substantial in rural areas where the mean annual per capita income may be only \$50. In many remote areas it is difficult to create income-producing opportunities because of illiteracy, dispersed population, and, in some cases, resistance to foreign ways.

Through butterfly farming many rural Papua New Guineans are for the first time participating in a cash economy. The product is a highvalue, low-volume crop. It brings needed or supplementary income to the people of the predominantly rural areas. Compared with farming coffee, another possible industry in Papua New Guinea's rural regions, it requires far less effort or land, and it involves minimal costs to the producer. And where a few expatriate opportunists once made small fortunes exploiting Papua New Guinea's butterflies, the profits now go to the villagers.

Conservation

Habitat loss is by far the most critical issue in butterfly conservation. If habitat changes, the animals must change, leave, or die. Usually they die, since alternative habitats are already occupied or too distant. Nearly all the world's butterfly species have suffered diminished ranges, and an estimated half of the world's butterfly populations face threats from human development. From Britain to Bhutan, the insects' habitats have come under siege. In Europe, perhaps one-third of all butterfly species are threatened, owing chiefly to the reductions in their various habitats. In California, half-a-dozen coastal butterflies have been lost since the 1860s, and an equal number are now endangered. In Madagascar and Rwanda, swallowtails and some species that occur nowhere else are being sacrificed to the clearing of forests. The losses are much more than aesthetic, for many butterflies benefit people. They pollinate crops, are a major link in the food chain, and serve as sensitive indicators of ecological health.

"A striking feature of the Papua New Guinea butterfly farming program is that it is designed to conserve and increase the species being traded. It is a pioneering conservation effort that has been endorsed by the Lepidoptera Specialist Group of the International Union for Conservation of Nature and Natural Resources. The program helps relieve pressure on endangered populations, because for successful butterfly farms the villagers must retain – and even foster – a healthy wild population on or near their land."

Insect farming also helps preserve habitats because it leaves the bulk of the land intact and it helps landowners earn money without requiring them to cut down the rain forest as they would for timber or for cocoa, coffee, or oil palm plantations. Similarly, villagers can retain their traditional hunting grounds while cropping the insects that rely on these grounds for survival.

The existence of the butterfly farming project has served to focus attention on the status of all butterfly species. In 1968 this led to a law banning the taking of even a single specimen of the seven birdwing species threatened with extinction in Papua New Guinea. These large, brilliantly colored creatures can

bring as much as \$1,000 each in international trade, but there is a stiff fine in Papua New Guinea for even possessing one.

Enriching habitats with butterfly food plants (notably the Dutchman's pipe vine, *Aristolochia tagala*) has greatly increased the numbers of Papua New Guinea's two common birdwing species, *Ornithoptera priamus* and *Troides oblongomaculatus*. Now the country is taking on the challenge of increasing the seven endangered birdwing species that are protected and banned from trade. Already the IFTA staff has found that at least one of these rare species (*Ornithoptera victoriae*) is easily reared on the Dutchman's pipe vine. Farms are now being designed and sited with a view to building up the populations of this giant endangered species.

Conclusions

At this stage, the importance of this pioneering activity lies not in its size, but in the new vistas it opens up for the use of tropical resources.

Village Development

In farming butterflies, Papua New Guinea is showing that indigenous wildlife resources (especially those being depleted because of their commercial value) can contribute to economic development and that the farming of indigenous animals can be fitted smoothly into traditional village life.

Providing employment in rural areas is a major problem of developing countries. And in a sense, butterflies are an "appropriate" livestock, particularly for remote areas of the tropics where other income-producing activities are difficult to establish or are harmful to traditional lifestyles and fragile environments.

Butterflies may seem unusual farm animals, but to villagers in the Papua New Guinea jungle it is cattle that are exotic. The villagers live in close contact with their local insects; invariably they know much about butterfly locations, behavior, habits, life cycle, and the food eaten by the caterpillars.

Farming butterflies is proving a business to which villagers quickly adapt. Butterflies do not require the equipment or financing of a conventional farm; no capital is required, except for postage on the first shipment of specimens. Insect farming allows people to participate in the cash economy without causing disruptive changes in traditional village life. The villagers can work long and hard if they wish or they can put in only enough time to produce a little cash for necessities, leaving plenty of time for raising crops and other village activities.

Habitat Conservation

"It is often claimed that economic development is necessarily destructive to the environment and detrimental to conservation – that as rural societies develop, their natural surroundings must suffer. The Papua New Guinea butterfly farming project is an innovative program that demonstrates this need not be true."

The program also shows that where human needs are given attention, conservation can be successful. Elsewhere in the tropics, attempts to conserve habitat without considering the needs of the people who live nearby have often failed.

In sum, the butterfly farming program demonstrates that certain natural resources can be used profitably in a way that protects the environment. The program offers a culturally appropriate use of the land; on a broad scale, it could become a force in preventing clear-felling of the forest for timber exports or the wholesale conversion of rain forest to cash-crop monocultures such as coconut, coffee, or oil palm. Most of Papua New Guinea is still covered by primary rain forest; exploiting the economic value of the insects that

live there is helping safeguard this increasingly rare habitat, which is fast disappearing in most parts of the tropics.

Species Conservation

"The knowledge gained from farming Papua New Guinea's butterflies has already contributed to relieving the threat of extinction from seven endangered species of birdwings. This experience could be replicated in other places where there are endangered butterfly species. Indeed, the program provides a model for nations that could profitably farm butterflies while protecting their threatened butterfly species."

Extension to Other Organisms

This project has a strategy and organizational structure that could well be applied to plants, such as rare orchids, and animals, such as crocodiles, that are endangered because of their commercial value. Indeed, using similar concepts of combining village income and conservation, the Papua New Guinea Division of Wildlife is farming crocodiles,* ruse deer, wallabies, and two native birds, the megapode and cassowary. Through such husbandry practices, many species elsewhere might be saved from extinction, while providing income to the local people who traditionally have used the resource. Other countries should look with interest at the way Papua New Guinea is handling its wildlife enterprises.

Butterfly Status and Conservation

About 100,000-150,000 species of butterflies have been described; perhaps half that number remain to be discovered. Although there are important concentrations in the Arctic and temperate regions, most species are found in the tropics. There, the diversity of colors and forms is dazzling; every imaginable combination of hue and color is displayed. And many tropical butterflies are enriched with "structural" colors, which cause the wings to flash iridescently in the sun as they bend the light they reflect. Although butterflies have long been admired and often depicted in art, they have been seriously studied only since the end of the seventeenth century. Linnaeus, in his *Systema Naturae*, placed the small number of butterflies then known in the single genus *Papilio*. Today that genus is restricted to the true swallowtails, and more than 700 genera of butterflies are recognized.

The Butterfly Trade

Last century, as knowledge of butterflies grew and methods of preserving them improved, they become popular collectors' items. Wealthy naturalists such as Rothschild and LeMoult dispatched collectors to all parts of the world for specimens. Today the trade in butterflies is even more extensive.

There are three major kinds of butterfly and insect trade. In one, large numbers of common species are collected in the wild and processed for use in ornamental objects such as coasters, mats, and lampshades. This is a low-value, high-volume industry that is both labor- and capital-intensive. It frequently uses "chipped" or slightly damaged butterflies. It often sells butterflies with paper bodies and only the wings of actual insects, which seem to be acceptable to a large part of the buying public.

The Taiwanese butterfly trade is an example. It operates on a large scale. At least a dozen Taiwanese factories employ scores of workers to capture and process butterflies. Estimates of annual sales vary from 15 million to 500 million butterflies. Taiwanese butterfly wings pasted onto paper bodies with pig-bristle antennae are used in ornaments and household objects from wall hangings to clear-plastic toilet seats. The bodies are recycled as pig feed. Despite this massive trade, Taiwan's wild butterfly populations seem to be remaining steady.

Similar, though smaller, industries trafficking in common butterflies are found in Korea, Malaysia, Hong Kong, Brazil, Honduras, and several African nations. The famous blue morpho butterflies of the American tropics enter the trade at the rate of some 50 million per year. Nearly all of these are the brilliant

iridescent males, and biologists believe the number sold could be doubled without harming the overall population.

The second type of trade involves higher value and lower volume. This produces a vastly different product from the paper-bodied butterflies bound for novelty stores. It is exemplified by the operation in Papua New Guinea where sales are to collectors, museums, and students, and the specimens are high-quality insects in good to perfect condition, usually bearing scientific data. Because of the relatively high value per specimen, this trade can be carried on by fewer individuals in a nonfactory setting, and it is well suited to village industry, provided there is supervision and a quality-control checkpoint.

The third type of butterfly trade is for high-quality, expensive ornamental items, such as glass cases, domes, wall mounts, or jewelry containing beautiful insects. Brazil, for example, has a thriving jewelry trade based on the iridescent blue morpho butterfly. This type of trade can also furnish high-paying outlets for village-farmed insects.

In all three divisions of the butterfly trade, dealers fulfill an essential role. Few collectors and scientists can travel the world collecting their own specimens. Some dealers have established reputations for honesty, some have not. Exploitation of suppliers and customers alike has been rife. Few dealers are careful to attach accurate locality data to their specimens; some make serious mistakes in identifying them. (To combat this problem, British insect dealers have formed an association to monitor conservation-related activities and improve professional practice.)

Generally, dealers supply specimens bred from the caterpillar or chrysalis and described as "ex pupa." Unless butterflies are caught immediately after emerging from the pupa the fragile wings tear and the scales detach to produce "worn" specimens.

Butterfly Taxonomy

Classifying butterflies is difficult. Their most obvious features, the color and pattern of the wings, vary greatly; individuals and populations of the same species often look quite different. This has led to the dubious naming of many species and subspecies. And the uncertainties it causes have led some biologists, especially those working in ecology and genetics, to name populations rather than species or subspecies. However, populations frequently evolve, and this introduces a further uncertainty. Much additional work on basic butterfly systematics is needed. The knowledge gained should contribute particularly to the conservation of endangered species.

Butterfly Conservation

Butterfly conservation is still in an early state of development, bedeviled by scarce or incomplete information. The conservation status of even the most thoroughly studied butterfly species is known in only a few areas. The distribution and status of most species is essentially unknown, and proposals for conservation measures are largely based on guesswork. Nevertheless, some conservation programs have been enacted. Most have concentrated on designating endangered species and banning their collection.

"The greatest threat to butterflies and other insects, however, is habitat alteration. On several continents some species have already become extinct or endangered when humans altered the special environment they require. The importance of protecting butterfly habitats should not be underrated."

Many species are restricted to very small areas, particularly to individual islands (Corsica, Sardinia, Jamaica, Madagascar, Sumba, the Comoros, Fiji, the Solomon Islands, Manus, and the Duke of York Islands, for instance). Such species are vulnerable to extinction because nearly all island habitats are fragile and are changing rapidly.

Although it is uncommon for insect species to be dangerously reduced merely by the capture of specimens, renewed commercial interest in butterflies gives rise to concern for their conservation. Most insects reproduce rapidly, and their high fecundity enables them to replace such losses in a generation or two – provided the basic environment has not been altered.

But there are certain species of butterfly that reproduce slowly and are therefore more threatened by collection. The unusual birdwing butterflies of New Guinea, for example, produce only small broods. Moreover, these rare species command higher prices. Because this makes them particularly vulnerable, legislation to protect birdwing butterflies has been instituted in both parts of New Guinea – Papua New Guinea and Irian Jaya.

Accordingly, to save Queen Alexandra's birdwing (the largest and most threatened of the birdwings) from extinction, several wildlife management areas have been set up in Popondetta on Papua New Guinea's north coast. The government is also setting up refuges, administered by village councils, to preserve and protect other birdwing butterflies and wildlife resources. This habitat conservation is an important adjunct to the butterfly farming program.