

text Faces of Papua New Guinea

INTRODUCTION

Brief historical overview

This land is one of the most ancient known locations of plant domestication and the beginnings of agriculture. Evidence for the presence of human beings in the interior dates back at least 40,000 years.

New Guinean peoples first saw Europeans when Spanish, Portuguese and Dutch explorers reached the New Guinea coast during the 16th and 17th centuries.

A European colony was established in 1884, when Germany annexed the north coast as a protectorate and Britain did the same on the south coast. The western half of New Guinea was part of the Netherlands East Indies.

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Indigenous peoples

The country of Papua New Guinea is a rugged land with a great diversity of cultures and languages.

Although the great central basins of highland New Guinea were densely settled by a million or more people practising a sophisticated agriculture, the people were not known to the outside world until the 1930s when Australian gold prospectors and explorers began to penetrate their world. The broad, forested mountain fringes around the highlands remained inaccessible to outsiders for even longer, so that some indigenous groups were not contacted until well into the 1960s. Hence, they retained many of their traditional ways of life.

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After Western contact

In 1975 Papua New Guinea became an independent nation with a rapidly growing population. It began seeking economic development through its rich mineral resources and by cultivation of export crops such as coffee, coconuts, cacao, and tea. As a result, the diversity of native agricultural systems became threatened.

Export crops replaced subsistence gardens and high-yield crops such as the tuber-bearing manioc, which came originally from tropical America, were substituted for the original variety of other native, starchy staples.

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Children learned Western ways in school rather than learning the indigenous ways of their parents.

In towns the people's diet changed for the worse from native greens, nuts, fruits, and complex starchy root crops to refined sugar, tea, flour, cheap fat, and soft drinks.

As a consequence, new patterns of disease, like those found in the West, spread.

On the hopeful side, there are local and national programs to encourage home gardens and to protect the remaining natural areas of the forest and the coast, which still supply many important foods.

About the research

In 1964 and 1965 when these photographs were made, the Bomagai-Angoiang people had been contacted for the first time by an administrative patrol only six years before.

Because the influence of modern civilization on their agriculture and material culture remained minimal for several years after that initial contact, the Bomagai-Angoiang people provided a rare opportunity to learn much about how a real Stone Age people lived.

The emphasis of this project is on the Bomagai-Angoiang's indigenous agricultural methods and on what we can learn from people whose lives were so closely interwoven with their natural environment.

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The researcher/photographer

William C. Clarke made these photographs and carried out the research described here. He is best defined as a cultural ecologist, which means that he is a combination of anthropologist and geographer.

He first studied anthropology as an undergraduate student at the University of California in Berkeley and later received a Ph.D. in geography for his work with the Bomagai-Angoiang people, who are described and pictured in this volume. Since then Dr. Clarke has continued to work on issues of tropical agriculture and environmental conservation in the Pacific Islands.

Dr. Clarke has taught at the University of Papua New Guinea and the University of the South Pacific in Fiji.

He is presently writing reports on environmental issues for various international agencies.

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The project director

Josepha Haveman, who designed this product, can best be defined as a media artist and cultural anthropologist. Her special interest is in the relationship of media to culture from pre-historic times into the future.

She first studied art in Amsterdam, then art and anthropology as an undergraduate student in San Francisco and subsequently did graduate work in anthropology at the University of California at Berkeley while working as a staff member at the (then) UC Museum of Anthropology.

Since then Ms. Haveman has also received an MA. in art and taught photography as fine art at colleges and universities in California, Oregon, Israel, and Europe.

She has been exploring the potentials of digital media in art, design, and education using personal computers, since 1981. Ms. Haveman is presently producing CD ROMs for art and environmental education.

The programmer/ editor

Dee Elling scripted this project, digitized the sound, and edited the texts. She is an artist and writer who has been involved with digital media since 1985. Since receiving a BFA from the Academy of Art College in 1983 she has worked as a graphic designer, typographer, and technical writer.

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The digital rescue mission: the restoration of these unique photographs

Recent advances in computer graphics technologies have been a critical factor enabling us to produce this volume of unique photographs. As is common with all field work materials, original notes and color transparencies are only used once, for publication, reports, or research papers, and then allowed to languish in file cases, shoe boxes, or worse. If the research is done in the tropics, and the scientist continues to live in such a humid climate, the slides *f*more than anything else *f*undergo an accelerated aging process and become discolored, faded, moldy, and dirty.

Our challenge was to restore these images to their former brilliance by using the latest digital technologies available for our personal computers. We scanned each slide, regardless of condition, onto digital media. From there we used graphics applications, primarily Adobe's PhotoShopr versions 2.1/2.5, to extract all remaining information from each image. In most cases this allowed us to restore the original color information or substitute acceptable approximations, and more.

This task would have been impossible only a few years ago!

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Uses and applications of this project

Education: This project can be used as educational material in the fields of anthropology, environmental studies, ethnic studies, geography, related sciences, and humanities.

Reference: Since these pictures and accompanying texts are from published academic research materials, they may be referred to accordingly. The sole author of both the research texts and pictures is Dr. William C. Clarke.

Illustration: The images on this CD ROM may be used to illustrate any appropriate subjects in school projects and research papers. Permission to publish these pictures is granted to registered purchasers of this volume.

Print production and publication: Permission to use the pictures on this disc as "clip-art" is granted to registered purchasers. Please credit the author when using the pictures and/or quoting from any of the texts.

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How we put this together

Browser design

Most people like to browse through a project like this, enjoying the pictures and reading only a bit of text here and there. For them we've

made it as easy as possible, allowing many people to simply enjoy this disc. From the main menu, click on a topic you wish to read about. You can click the red arrow/dot on the lower corners of each page to browse forward and backward through the pages of the topic sections. You can return to the main menu from the first page of each topic section.

The text has been broken down into small coherent segments and enhanced with pictures that illustrate the points being made. The images used to illustrate the texts are either miniature versions of the whole pictures or poignant fragments, whichever best illustrates the points made in the texts.

Where the complete picture slide shows are located
All the pictures available on this CD ROM can be viewed in the slide shows. Choose a the topic in the main menu and then click on the slide show button on the first page of each topic section. The slide show will play all available pictures that are filed under that subject heading and then stop.

The text files

The complete text is also available in standard word processor file formats from which they can be printed out to hard copy.

GEOGRAPHY

The island of New Guinea

The great island of New Guinea lies just north of Australia and south of the equator on the eastern side of Indonesia.

It is the second largest island in the world after Greenland, with a total area of about 315,700 square miles (817,700 square kilometers). It is roughly divided between the Indonesian province of Irian Jaya on the west and the independent parliamentary nation of Papua New Guinea to the east.

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Papua New Guinea includes the islands of Manus, New Britain, New Ireland, and Bougainville. With 14 active and 22 dormant volcanoes, Papua New Guinea has a mountainous terrain. Thick forests cover most of the central area of the country, with swamps along the coasts. The southwest is crossed by two large rivers, the Sepik and the Fly.

With over 85 percent of the country under forest cover and still largely unexplored, Papua New Guinea has a wealth of flora and fauna. It has the world's largest and smallest parrots, as well as the largest lizards, doves, and butterflies, and over 11,000 plant species. Destruction of the forests by logging interests is a problem yet to be faced by the government.

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Vital statistics 1993-94

Ethnicity: Papuans, Melanesian, Pygmies, minorities of Chinese, Australians, Polynesians

Languages: English (official), Melanesian & Papuan languages

Religion: Protestant (63%), Roman Catholic (31%), local religions

Geography: The eastern half of the island of New Guinea, Papua New Guinea consists of thickly forested mountains in the center of the country with lowlands along the coasts.

Government: Parliamentary democracy Area: 178,260 square miles
Gross National Product: US\$2.700 billion; GNP per capita: US\$725
Literacy: 52% Birth Rate per thousand: 34.0
Infant Mortality per thousand: 66.0

ENVIRONMENT

Rugged high mountain country

The photographs of the Bomagai-Angoiang environment show that their country was wet, forested, and rugged; a humid, tropical, mountain land. Rains fell frequently and heavily, streams abounded, and clouds covered the mountain tops and ridges much of the time. Agriculture was impossible at the higher elevations, which were covered with a mossy forest. Although such wet tropical environments support a rich natural forest, the underlying soils were generally poor unless derived from young volcanic material or recent alluvial deposits. However, as outlined in the discussion on agriculture, the Bomagai-Angoiang method of shifting gardens (land rotation instead of crop rotation) maintained a level of soil fertility sufficient to produce good yields from crop plants.

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Habitat

Aside from a habitat and sites for gardens, their environment provided the Bomagai-Angoiang with materials for building houses and making artifacts, food from wild plants and animals, and firewood.

From plants the people obtained a variety of medicines, as well as perfumes and oils to adorn their bodies. Further adornment came from the dramatic feathers of birds-of-paradise, colorful leaves, and even a species of iridescent green beetle which people wove into headdresses.

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Houses and shelters

The traditional houses were low to the ground and smoky inside from the hearth fires. The smoke had the advantage of keeping out mosquitoes and preserving the grass and leaf roofs from decay and insect infestation. Houses were often partitioned into separate compartments, one at the back for the man of the house and older boys, another for women, girls, and younger children, and still another for the household pigs.

There were also men's houses, which were solely for men and boys, and women's houses, which were used by women and children but could be visited by men. Usually, several houses were grouped together into hamlets.

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Outdoor living

Between and among the houses were a mixture of household plantings, areas of swept, packed earth for socializing and dancing, and earth ovens under flimsy shelters of poles and leaves.

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Cooking was done in an earth oven, a hole in the ground where rocks heated in an open fire were placed amongst packages of food wrapped in leaves. The top of the hole was sealed with banana leaves and covered with soil until the steamed food was ready. The evening meal was a social time in the hamlets, with food jointly prepared and cooked while people sat about talking and appreciating the fragrant smells coming from the earth oven.

Their agriculture, hunting, and gathering provided the Bomagai-Angoiang with generally good nutrition. They ate a lot of fiber, carbohydrates, and leafy greens. However, there is evidence that some people may have suffered from protein deficiency.

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PEOPLE

Stone Age people

The words "Stone Age" makes many people think of those human beings who lived thousands of years ago, before the use of metal had been developed anywhere on Earth.

However, there are several places on the planet where the Stone Age reached well into the twentieth century. In these areas, people had no metal until quite recently. They made all their tools and containers from wood, stone, shell, bone, bamboo, woven plant fibers, or other naturally occurring, more easily worked materials.

These recent stone age peoples lived in tropical South America, in a few isolated parts of Southeast Asia, and north of Australia, on the giant, rugged island of New Guinea.

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Many of the photographs on this disc show a twentieth-century stone age people. They can be called the Bomagai-Angoiang, a name made by joining the names of two clans.

The Bomagai-Angoiang were a "clan cluster"; that is, two separate small clans, each with their own territory. Their territories were contiguous, and the people in the two clans recognized each other as friends and to some extent shared land and operated as a unit.

The significant groupings in Papua New Guinea were the clans. Most clans were patrilineal, related via the father's clan.

The men held the territory and always married women from outside the clan who usually moved to their husband's territory thus residence was patrilocal. Traditionally all the clans had allies and enemies among the other clans, the enemies usually being neighbors on one side and the allies often being the neighbors on the other side.

What connected these clan groupings is their common language, Maring. These clans, friends and enemies, spoke this language and are referred to in this project as "the Maring."

The Bomagai-Angoiang clans lived closely together in an isolated, rugged valley in that part of Papua New Guinea known as the "highland fringe." The highland fringe occupies the mountainous slopes to the north and south of the broad, open valleys and basins of the highlands proper.

They had no metal of any sort until they began to acquire some steel axes along local trade routes in the 1950s, shortly before these photographs were taken in the mid-1960s. Papua New Guinea was then still a colony of Australia. It became an independent country in 1975.

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Bride payment

In this photograph men are sitting around a small display of wealth (on the leaf) and a young pig, all of which are being paid as part of a bride price.

The clans were exogamous; an Angoiang woman could not marry an Angoiang man and had to marry a man from another clan. Formal payments were made by the men of one clan to the men of another when one clan received a bride from another clan.

Payments for a bride extended over the life of the woman. There was an initial payment before the marriage, another at the time of the birth of a child, and other payments later.

Pigs were an important part of these payments. Some of the other forms of traditional wealth, such as shell valuables and feathers, were increasingly replaced by money.

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Delousing

Head lice were common among the Bomagai-Angoiang. Picking lice off another person's head provided a valuable way of socializing, as the photograph shows. The women's headdresses of brightly colored cloth were a relatively recent addition to the dress of the Bomagai-Angoiang. Previously, they would have worn string nets colored with plant dyes.

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Medical treatment

Like most peoples with intimate knowledge of a forest environment, the Bomagai-Angoiang used many plant substances for medicine. For example, they chewed various leaves for a variety of ailments, and they squeezed the juices of leaves and fruits on sores.

The photo illustrates the use of the leaves of a stinging nettle. Rubbed on the skin to the accompaniment of a chant, this was said to relieve a variety of pains. Undoubtedly the nettle acted as a counter-irritant and may have released antihistamines that provided relief.

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Women making string

Women socialized while making string by rolling plant fibers together on their thighs. A woman skilled in this task could make a string of great strength and of any desired length. From the string, they wove net bags for

carrying produce and public aprons for both men and women to wear.

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Women walking

In this photograph women were on their way to their gardens in the morning.

Note the digging stick, or dibble, held by the woman on the left; such a stick was her major garden tool. The dibble was used for planting and harvesting as well as for loosening weeds.

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Carrying sugar cane

In a society whose food supply depended on daily harvesting of bulky, starchy crops from gardens scattered in rough terrain, strong, flexible containers like net bags were of great significance. Net bags, such as the one shown on this woman's back, could easily hold sixty pounds of sweet potatoes and taro.

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Men preparing Pandanus fruit

Men cored Pandanus fruit after harvesting it in an orchard.

Making Pandanus sauce

Men prepared the sauce after cooking the Pandanus fruit in an earth oven. The sauce, which the Bomagai-Angoiang call komba, was usually mixed with the leafy greens to make a nutritious as well as tasty food.

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Man with a camera

Kabang, a lively, humorous Bomagai-Angoiang man, seized one of the researcher's cameras and made a joke about the researcher's constant observations and questions about people's lives and activities.

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CEREMONIAL

Ceremony and ritual

Ceremonies and rituals played a very significant role in the lives of the Bomagai-Angoiang and all other New Guinean groups (as do ceremonies and rituals in the lives of all peoples, whether or not they believe themselves to be particular ceremonial or ritualistic). The beliefs behind Bomagai-Angoiang ceremonies and rituals and their ideas about the function and purpose of magic cannot be described here in any detail.

The best source of information on these topics is the widely known book by anthropologist Roy Rappaport, Pigs for the Ancestors: Ritual in the

Ecology of a New Guinean People .

Rappaport described the ritual life of the Tsembaga, who lived only a few miles from the Bomagai-Angoiang and spoke the same Maring language. Rappaport argued in his book that Tsembaga ritual, rather than being wholly concerned with immaterial aspects of life, played an important role in the people's relation with their environment. Among other functions, Tsembaga ritual may have helped to regulate relationships between people, pigs, and gardens and may have acted to conserve marsupial fauna.

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For more pictures of ceremonial decoration in Papua New Guinea see the book by Strathern, A. and Strathern, M. titled Self-decoration in Mt. Hagen, which contains beautiful photographs of people's self-decoration in the Mt Hagen area, which is in the Central Highlands, not far from the mountains where the Maring live.

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Everywhere in the highlands and highland fringe of New Guinea, pigs were extremely significant in ceremonies. The animals embodied wealth that could be accumulated and then distributed widely, as pork, to meet obligations and enhance status. Thus men made gardens in an attempt to increase the size of their pig herds. An important reason for marriage was to have at least one wife who would harvest sweet potatoes every day to feed the pigs.

When a community's pigs became sufficiently abundant for overly abundant, in that every extra pig meant more work in the gardens and a greater threat of depredation by pigs breaking down the garden fences elaborate pig-killing ceremonies were held. The pigs were butchered and cooked in earth ovens. The pork was distributed in formal presentations within the community and, usually, to other nearby communities as well. Dramatic dancing and rhetorical speeches were always a part of these ceremonies, and all the people carefully adorned themselves with paint, feathers, leaves, fur, and other finery.

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Magic and ritual

Magic, known as kunda , and a belief in different kinds of spirits who inhabit different parts of the people's environment, pervaded daily life as well as more formal ceremonies. Spells were uttered relating to good weather, healthy pigs, productive crops, success in hunting, and so forth. Ritually important plants, most notably the cordyline shrub, were widely planted.

This photograph shows cordyline planted at a magic gateway along a path. Such gateways prevented the advance of bad spirits and ensured that any person passing through them would not fall sick.

AGRICULTURE

Indigenous scientific methods

Papua New Guinea offers a particularly good laboratory for discovering

indigenous knowledge about agriculture because there were so many small groups of people, mostly isolated from each other, each practicing their own style of agriculture.

Because of the size and mountainous topography of the country, each group faced its own unique natural constraints on the growth of crop plants, ranging from drought to flooding to frost to plant diseases.

The indigenous scientists, through their own experimentation and trial and error, managed to solve all these problems.

By generations of careful observation and planting, they also developed many different varieties of many of their crops *fa* situation very different from the dangerous modern restriction to a few high-yielding varieties.

This great agricultural reservoir of genetic characteristics can be of immense value to the modern world. For example, Papua New Guinean strains of sugar cane have been used by experimenters in Hawaii to improve the sugar cane cultivated there.

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Choosing a site in a mature forest where they believed the soil would be good, men cut down large trees to clear a garden plot.

The photographs titled man cutting tree and man felling a tree show the first step in preparing a Bomagai- Angoiang garden.

Steel axes made this a much easier task than it was when the Bomagai- Angoiang had only stone axes earlier this century.

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In the photograph titled man with stone axe a man called Ngirapo, who grew up using stone axes, demonstrates how grass was cleared with a stone axe. He cut the grass slowly along a piece of wood held beneath the axe. A bush knife, or machete, made this job much faster and easier.

The biggest trees would have been very difficult to cut down with stone axes (see the photo- graph on the right titled cutting with stone axe). Large trees were usually girdled so that the leaves above would die and admit sunlight down to the crop plants.

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After the debris from felling the trees and clearing the undergrowth dried, the gardeners burned at least some of the waste to make planting easier and to provide an ashy fertilizer for the crops.

The photographs titled making hill garden and woman burning debris show people clearing a garden plot.

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Both men and woman worked at establishing gardens. Women planted most of the crops while men did the heavier work of building fences to keep out marauding pigs.

The photographs manioc planting, digging woman, and woman planting crops show women planting a garden.

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Because the gardens contained so many different crops mixed together, they look messy to eyes accustomed to modern monoculture with its large single-crop fields.

However, polycultural shifting gardens were very productive and provided a valuable variety of foods for two years or more.

Planting began with cucumbers and leafy greens, followed by maize, then sweet potatoes, taro, then yams, manioc, sugar cane, and bananas. The gardens included a host of supplementary foods as well. The photographs titled young garden and planted garden show this type of agriculture.

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Shifting cultivation

The kind of agriculture practiced by the Bomagai-Angoiang is best described as shifting cultivation but is also known as swidden cultivation or slash-and-burn agriculture.

Many anthropologists believe that shifting cultivation is one of the earliest kinds of agriculture developed in the humid tropics, where it is still very common in regions with small populations and extensive forests.

To carry out shifting cultivation, men cleared a plot in the forest by felling many of the trees and burning at least some of the debris. Then the men or the women or both together planted a variety of crops (often as many as 30 or more species of crop plants) in the cleared forest soil. After a year or two of using the plot, the gardeners allowed it to be taken over by weeds and the seedlings of forest trees, which gradually grew to dominate the lower weeds until the plot was again covered by young forest.

After a number of years (it could be 10 or 20 or more) the plot was cleared again for gardening. By that time, all the weeds had been suppressed and the soil under the forest had regained fertility and would again produce good crops.

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The Bomagai-Angoiang's particular system of shifting cultivation included over 50 species of cultivated plants.

The major foods from the gardens were sweet potatoes, five species of yams, the American taro as well as the Southeast Asian species, manioc (also known as cassava), and bananas.

There were also many plants that produce greens to enrich the staple diet of starchy root crops and bananas.

Detailed information on Bomagai-Angoiang gardens, crops, and food is available in the book *Place and People: An Ecology of a New Guinean Community* by William Clarke.

(See the reading list in the References section.)

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Sustainable agriculture

Shifting cultivation is a sustainable kind of agriculture. There is a low labor input so long as the population density of the cultivators remains low.

When population starts to rise within the territory of a group of shifting cultivators, then the forest-fallow period must be shortened. As a result, grasses and other weeds begin to replace the forest, the soils become less fertile, and the people must change their style of agriculture and work harder to produce each unit of food.

They also lose the many materials, medicines, wild plant foods (such as the very important leaves from tree ferns), and animals that can be taken from the forest.

The growth of human population brings some benefits to such a human society but it also brings some kinds of impoverishment and most certainly lessens natural biodiversity.

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Agricultural intensification

Although the Bomagai-Angoiang system of shifting cultivation was well adapted to the forested habitat in which the people lived, the system's health was dependent on the continued presence of the forest. In such a situation, if the human population grows and needs an increased food supply, more gardens are cultivated and the fallow period is shortened. The forest, which no longer has enough time to regenerate fully, turns to scrub and grassland.

In consequence, weeds become more of a problem to the gardener, and soil fertility begins to decline. Faced with a need for greater production of food but a declining productive capacity, the gardeners have the choice of migrating to new lands (if any are available), going hungry where they are, or intensifying their agricultural practices.

Evidence from all across the world shows that the third choice of agricultural intensification has been and continues to be widely applied.

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The purpose of intensification is to produce more food from a unit of land than was produced before.

Almost always the increase in production is achieved by increasing the inputs into the agricultural system.

In the modern industrial world, the increased input takes the form of artificial fertilizer, machinery, fuel, pesticides, irrigation pumps, and other products of industry.

Among pre-industrial peoples, intensification means a greater input of labor. That is, people have to work harder to produce their food, which is why they seldom take up agricultural intensification until they are forced into it by a growing need for more production.

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Several of the photographs illustrate the process of agricultural intensification among pre-industrial peoples.

Starting with a low density of population, the forest covers most land and acts to keep the soil fertile and the weeds suppressed.

The diverse, polycultural gardens require little labor and provide a varied diet. As population grows and fallow periods shorten, the forest is gradually replaced by grassland.

The photograph on the top left shows Imperata grass, one of the best known weedy grasses that take over gardens and require a great deal of labor to eradicate or control. Heavy grass infestation requires that the soil be turned and tilled in preparation for gardening. Although this is possible without machinery, it requires hard work with simple tools.

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These photographs show some of the varying forms of agricultural intensification practiced in different places in Papua New Guinea. Mounds were built, some little, some big, and various kinds of plots were made, with the soil turned and worked.

As intensification advances there is a shift toward monoculture, with a concentration on the few crops that produce the highest yields. In Papua New Guinea, effort focused particularly on the sweet potato, which produced more food in poorer soils than either taro or yams. As intensification advances more and more of the land is taken up with gardening, as shown in the aerial photograph of the densely populated Papua New Guinean highlands.

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Women carried on the steady day-to-day work in the gardens, weeding and bringing the daily supply of food home to the hamlets for cooking. Men also worked in the gardens, helping with weeding and harvesting.

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Domestic animals

The domestic animals of the Bomagai-Angoiang included pigs and chickens, both of which were eaten. Dogs, which were pets and were very useful in hunting, were not eaten. Some of the pigs went feral and were then hunted. The meat belonged to anyone who could bring down the pig.

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Tamed animals

The giant flightless cassowary, a wild bird of the forest, was hunted. The cassowary chicks were often tamed and kept in the hamlets to mature and eventually be eaten at a feast.

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Hunted animals

All sorts of other birds as well as marsupials, rodents, eels, reptiles, and insects were hunted or collected and eaten.

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Orchards

Another important and productive part of their agriculture was the establishment of orchards.

While gardens were used for crop plants, many men also planted seedlings or cuttings of four kinds of trees. One was breadfruit; another was a species of fig that produced edible leaves. A tree with the scientific name of *Gnetum gnemon* produced edible leaves and nuts as well as provided good fiber for making string bags. Most importantly, they planted a species of *Pandanus* that produced a giant red fruit. The cooked pulp provided a delicious red sauce rich in vegetable oil and pro-vitamin A.

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These photographs show the agriculture of the Baliem Valley in Irian Jaya in western New Guinea (now part of Indonesia).

This system was close to being the most intensive agricultural system practiced on the island of New Guinea. A whole valley floor has been drained and turned into large sweet-potato gardens.

The photograph fertilizing fields shows how spoil from the ditches was tossed onto the surface of the plots to enrich the soil.

Slopes were terraced with stone walls to slow erosion, and the soil worked to keep it productive. These terraces were not as widely known as those in Indonesia or the island of Luzon in the Philippines, but they are equally impressive modifications of the landscape.

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Population density

When these photographs were taken in 1964-65, the Bomagai-Angoiang had a low population density of about 68 persons per square mile (about 26 persons per square kilometer) of cultivable land.

Most scholars believe this density is well below the figure where serious land degradation would begin under a system of shifting cultivation. As the photos show, the territory of the Bomagai-Angoiang was mostly covered with well-developed forests, which were very useful to the people as a source of many valuable products.

REFERENCES

Among the many books and papers now published on the peoples of Papua New Guinea, there are four major works on the Maring, the language group that includes the Bomagai-Angoiang clan-cluster, who are featured in the photographs on this disc.

These four books on the Maring are listed here as well as another four related books on Papua New Guinea, chosen for their wide general interest or particular relevance to the photographs and topics discussed in this project.

Books on Maring-speaking clans:

Clarke, W. C. 1971. *Place and People: An Ecology of a New Guinean Community*. University of California Press, Berkeley.

Healey, C. 1990. *Maring Hunters and Traders: Production and Exchange in the Papua New Guinea Highlands*. University of California Press, Berkeley.

LiPuma, E. 1988. *The Gift of Kinship: Structure and Practices in Maring Social Organization*. Cambridge University Press, Cambridge.

Rappaport, R. 1984. *Pigs for the Ancestors: Ritual in the Ecology of a New Guinea People*. (A new, enlarged edition of the 1964 publication.) Yale University Press, New Haven.

Other books of particular interest:

Morauta, L., Pernetta, J., and Heaney, W. (editors) 1982. Traditional Conservation in Papua New Guinea: Implications for Today. Monograph 16. Institute of Applied Social and Economic Research, Boroko, Papua New Guinea.

Read, K. E. 1986. Return to High Valley: Coming Full Circle. University of California Press, Berkeley.

Steensberg, A. 1980. New Guinea Gardens: A Study of Husbandry with Parallels in Prehistoric Europe. Academic Press, London.

Strathern, A. and Strathern, M. 1971. Self-decoration in Mt. Hagen. Backworth, London.

General references on Melanesia

Brookfield, H. C. 1971. Melanesia: A Geographical Interpretation of an Island World. Methuen, London.

Chowning, M. A. 1977. An Introduction to the Peoples and Cultures of Melanesia. Cummings Publishing Co., Menlo Park, CA.

Traditional music of the neighboring Enga people

The Enga are the largest ethno-linguistic group in Papua New Guinea. Numbering more than 160,000 people, they live in the Enga Province, which lies 50 miles or so to the south and west of the territory of the Bomagai-Angoiang.

We wish to thank the National Research Institute, Papua New Guinea for generously allowing us to use some of the music from recordings they made during the production of the film *Tighten the Drums*, produced by the Institute of Papua New Guinea Studies.

From them we learn that: "The most common instruments of the Enga are the jew's harp, the pan pipe, the musical mouth bow and a single membrane, open, hour-glass shaped drum."

"Most of the recordings are of vocal music, because vocal music is the most common... As examples of instrumental music we have included the musical bow and the pan pipe."

Maps: Line drawing provided by William C. Clarke

NOAA Global Shaded Relief map, Small Blue Planet CD ROM, 12 October 92

This image was generated from a digital data base of land and sea floor elevations on a 5-minute latitude/longitude grid. Assumed illumination is from the west; shading is computed as a function of the east-west slope of the surface with a nonlinear exaggeration favoring low-relief areas. A Mercator projection was used for the world image. The resolution of the gridded data varies from true 5-minute for the ocean floors, the U.S.A., Europe, Japan, and Australia to 1 degree in data-deficient parts of Asia, South America, northern Canada, and Africa. Data sources are as follows: Ocean Areas: U.S. Naval Oceanographic Office; U.S.A., W. Europe, Japan & Korea: U.S. Defense Mapping Agency; Australia: Bureau of Mineral Resources, Australia; New Zealand: Department of Industrial and Scientific Research, New Zealand; Balance of world land masses: U.S. Navy Fleet Numerical Oceanographic Center. Computerized Digital Image and

associated data base are available from the National Geophysical Data Center, National Oceanic and Atmospheric Administration, U.S. Department of commerce, Code E/GC3, Boulder, Colorado 80303.
Digital image by Dr. Peter W. Sloss, NOAA/NGDC.