# Fiber Plants of Africa and their Usage

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# Preface

The mention of the word "fibers" may bring immediately to mind cotton fabrics and jute bags. However, these represent only a small portion of the group of plant fiber resources that are processed for variety of useful articles such as bags, coops, baskets, and strings for domestic use. Other useful plants that belong to the “fiber” group include bamboo, abaca, rattan among others that play important roles in our livelihoods. These plant resources have been developed in various parts of the world using different techniques, based on the immediate needs of that society, and the society plays a leading role in the product development. The products that are derived are also used in diverse ways in various parts of the world.

This study is intended to find the sources for increasing income and livelihood improvements, and its approach is based on the knowledge of plants and the utilization techniques that have been developed in various areas. Most of these products are rural based and can be developed into big business that can increase the income and livelihood of the rural folks. However, there is a big gap in the information flow with regards to opportunities for product development. Most of the rural dwellers are poor and could improve their livelihood from the plant fiber industry. Unfortunately, the raw material base is fast disappearing from the natural forests and the sustainability of the industry should be addressed immediately. There is the need to find ways of increasing the raw material base and develop new products to increase the income of the rural poverty.

During this study, various professionals such as research scientists in forestry and agriculture, arts and culture, rural development, and agricultural distribution, cultural anthropologists, interior designers, craftsmen, fabric designers, kente weavers, and tradesmen, made various contributions. The report therefore represents a synthesis of information from processors, designers and marketers of fiber and fiber products from various societies and how these products affect their livelihood.

This English version was prepared by the Association by summarizing the Japanese report.

It is our hope that this report will be useful to the general public and various government agencies especially in the developing countries, who are interested in improving the livelihood of rural folks.

The field survey conducted in Ghana would not have been successful without the cooperation of the following persons and institutions in Ghana, who provided us with invaluable information. Consequently, we wish to express our sincere gratitude to Dr. A. B. Salifu, Director General, Council for Scientific and Industrial Research (CSIR), Dr. S. K. Dery, Deputy Director, Oil Palm Research Institute, Kusi, Dr. Victor Kwame Agyeman, Director, Forest Research Institute, Kumasi and Dr. Oteng Amoako, also of Forest Research Institute of Ghana, CSIR, Dr. Stephen Nutsugah, Acting Director, Savanna Agricultural

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Finally, this report was prepared under the guidance of this Association and does not necessarily represent the position of the Ministry of Agriculture, Forestry and Fisheries of Japan or the Japanese Government.

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# Contents

# Chapter 1　Background of the Research

## 1)　Preface - What is high profitability?

The purpose of this project is to examine the policies for securing profitability and improvements and the future prospects for fiber plants and processed products in Africa, including the sustainable utilization of natural resources.　The theme of this research project is "high profitability."　To achieve this objective, this research project examines how the improvement of profitability can be realized in a series of steps from the acquisition of raw materials, processing, and sale of products, as well as production and harvesting.　This research project has also been implemented for the purpose of increasing profits in daily economic activities of regional residents and resident organizations, thereby improving their livelihoods.　Therefore, the examination commenced by focusing on the plants and the products for which the environment and technology already exist within the region, rather than introducing new techniques from outside of the region.

Fiber products in Africa represent materials and designs specific to Africa and they are used in everyday life.　Using such traditional materials and designs as the starting point, there is a possibility for fiber plant products to contribute to improving the income level of rural communities by devising suitable processes and sales.

The quality and sales methods vary depending on the local market, urban market, or overseas market. By organizing these methods and taking an approach suitable for each market, values at a new level can be created, thereby improving the profits.

Production methods with minimal environmental impact have been in the worldwide focus for some length of time now.　At the same time, local identities and cultural diversity have been more appreciated and customers who value such features are gradually increasing.　What should be done to respond to such expectations?　How can a sustainable livelihood improvement of developing countries be achieved?　In this report, "high profit" refers to the entity that enables a sustainable livelihood including the relationship between fiber plants and people as well as profit.

## 2)　Fiber plants as local resources

This research project targets the full spectrum of fiber "plants" including useful plants that are collected and used from nature, as well as fiber "crops" that are cultivated.　All over the world, various fiber "plants" including fiber "crops" that are represented by cotton and its industry have been used for various purposes.　In Africa also, wide varieties of fiber plants are used for binding tools such as ropes and strings, materials for baskets and bags, furniture and farm tools.

Most of these fiber plants grow naturally in forests and the savannah or are cultivated, and have been closely related to the lifestyle of the people since ancient times.　Items that function in the same way can be seen in each area such as dyed textile products and baskets; however, the plants that are used differ slightly and plants that grow naturally in each local environment are used.　That is, people obtain various plant resources from the environment of their inhabited areas and have utilized these resources. Such an attempt to evaluate the economic values of non-timber resources is being practiced in each region.

### 3) Significance of targeting fiber plants

In this project, fiber plants were selected as the research target because as regional resources, their utilization has the potential to improve the livelihood of the people of developing countries and their overall economic development. The possibility can be realized at three different levels.

The first level is income improvement and livelihood stability at the micro level such as the cottage industry. Recently, in developing countries, many residents have shifted their main livelihood activities from agriculture to non-agricultural economic activities due to the scale of the risks related to agricultural production. This trend is particularly prominent in the rural communities in Africa. Under such circumstances, utilization, processing, and sales of fiber plants contribute to the improvement of the income levels of individual families as well as the establishment of a stable livelihood through diversification of income sources. That is, these trends lead to an overall reduction of the risks of earning a livelihood by providing an alternative income source to agricultural production that may experience sluggish periods due to bad weather, as well as providing a simple increase of cash income through the sales of fiber plant products.

The second level is the development of local industries that have evolved under certain conditions of geographical expansion. In developing countries, in many cases, the latent demand for indigenous products specific to the area cannot be uncovered even though such a demand exists, as the information on the products or the producing region has not sufficiently reached the demand side. In particular, there is potential for expanding the sales channel of the fiber plant products that have been developed and inherited under the specific natural environments or traditional culture of the regions domestically and in the overseas markets. Unlike high-return crops such as fresh vegetables and fruits whose freshness is the decisive factor, fiber plant products have fewer handicaps at the distribution stage even in the rural areas where transport infrastructure has not been developed. By expanding the production and sales that promote the features of these fiber plant products, the lead for economic vitalization of the entire region can be captured.

The third level is the promotion of industry diversification at the national level. Many African governments try to promote diversification of domestic industries in order to break away from the economic structure that relies on a small number of cash crops that have been retained from the colonial era. In reality, however, progress in the diversification of domestic industries is very slow in the poor countries that have no underground mineral resources and thus do not have many choices. Under these circumstances, the utilization of fiber plant products as local resources deserves examination as a measure for the diversification of domestic industries for the poor countries that have only limited choices.

### 4) Structure of this report

In this report, this Chapter (Chapter 1) clearly indicates the background and purposes and Chapter 2 historically reviews the actual state of use of fibers in Africa. Chapter 3 clarifies the actual state of use of fiber products in the modern age based on the result of the field survey that was conducted in Ghana. Actual improvements necessary for individual products are suggested as well as an examination of various aspects of fiber products such as raw material procurement, manufacturing, and sales. Chapter 4 discusses the various aspects that are required for the promotion of the use and sales of fiber products, such as the organizations, systems, and markets. To develop the use and sales of fiber products in a

sustainable manner, the production and collection of fiber plants, which are the raw materials, must be continued without affecting the environment. To achieve this, the environment for growing fiber plants as raw materials and the cultivation are discussed in Chapter 5.

# Chapter 2　Use of Fibers in Africa

## Preface

This report provides a historical summary of the use of fibers in Africa by adding and supplementing the description of the fibers that are used for "fold plaiting" based on the "Fabrics of Africa" [Iseki 2000] that was written by the author based on the theme of the textiles of West Africa.

As is well known, the African continent is geographically classified into the North, East, West, Central, and South regions.　However, as the characteristics of the region North of the Sahara desert differ from those of other African regions in terms of the history, society, and culture, in this report, Africa refers to the countries south of the Sahara desert.

In Africa, bark, raffia, cotton, wool, and silk are used as the materials for textiles (fabrics).　(Table 2-1, p.16)

Among these textile fiber raw materials, the production areas of bark, raffia, wool and silk are restrictive because of the environmental condition of their growing, and use of these materials are decreasing year by year.　On the contrary, cotton has become an important cash crop due to the unrestricted production areas of traditional textile fabrics and the policies of African Governments for continuing raw cotton plantations of the colonial era, and large cotton farms are dotted over the savannah regions.　Currently, cotton spinning and fabric production are mechanized locally and the use of imported synthetic fabrics is also increasing.

## 2-1. Bark fabrics

Bark fibers tend to be hard, so they require processing such as beating, boiling with lixivium, and rinsing with water.　Raffia fibers seem to have spread over a wide forest area of West Africa due to its easy fiber extraction.　However, in many areas, barks are still used as fabrics without weaving technology.

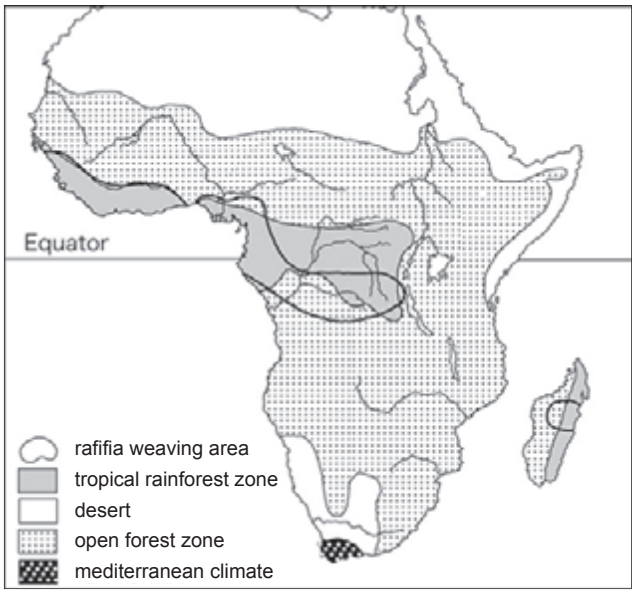
It is assumed that the use of bark fabrics started from the prehistoric era in Africa.　The habitat of trees that are used for bark fabrics is concentrated in the tropical zone of Africa at the North-South latitude of 15 degrees on either side of the Equator.　The natural ecosystem of equatorial Africa encompasses two types, tropical rainforest that is hot and humid all year round, and savannah where a rainy season and dry season alternate every year.

Bark fabric trees in the savannah regions grow on the land adjacent to rivers and swamps.　(Most of the trees that were observed by the author belong to the fig family of Moraceae.)

The geographic distribution of bark fabric production extends from the Madagascar Island to the Republic of Rwanda, the Republic of Uganda, and the Republic of Malawi, to the Republic of Zambia in East Africa, and the Congo of the Congo River basin, the Republic of Angola, the Republic of Gabon, the Republic of Central Africa, and the Republic of Cameroon in Central Africa.　In these areas, bark fabrics are used in the same way as animal skins.　In the South East region of Nigeria located on the coast of the Gulf of Guinea and the Republic of Togo, bark fabrics are used for funerals and in the Ashanti Empire (Ghana), such fabrics are used for the "King's rebirth ceremony" and the "New King's inauguration

← Photograph 2-1 (left) and ↑ 2-2 (above) show bark fabrics of Ganda, Uganda
Photograph 2-1) After collecting the bark from a fig tree, the bark is regenerated by wrapping the trunk with banana leaves.
Photograph 2-2) The bark that was removed from the trunk is placed on a wooden platform and is expanded to the shape of the fabric by hitting it with a mallet. (Photographed by Jun Mori, 1968)

ceremony" only, and other dyed fabrics (Adinkra cloth) are used for funerals. Bark fabrics are also produced in the countries on the coast of the Atlantic Ocean such as the Republic of Liberia. As cotton fabrics spread among the general West African population from the middle of the 20th Century, the use of bark fabrics, which are some of the original fabrics, has shifted from clothing material to "burial - fabrics for wrapping ancestors' spirits." The ritual of using bark fabrics as the costumes for presenting the actualized images of ancestors' spirits to the people is carried out as a tradition in various areas. The bark fabric production areas often overlap with the production areas of raffia fabrics that are described below. (Map 2-1)




Map 2-1)
Tropical zones of Africa and distribution of raffia weaving areas (created by the author)

## 2-2. Raffia Fibers

Raffia fabrics refer to the fabrics that are woven by a primitive vertical loom or oblique loom using leaf fibers of raffia palms as the material. In the modern era in which manufactured cotton fabrics are widely used, raffia fabrics are used for everyday garments or "ceremonial costumes" among some ethnic groups of Central Africa from the coast of the Gulf of Guinea. Recently, even in the areas that produce cotton fabrics, some ethnic groups weave raffia for the adulthood ceremony and raffia fabrics exist as the "original fabrics" prior to cotton fabrics as well as bark fabrics.

### 2-2-2. Geographic distribution of raffia fabric production and fiber collection

Raffia is a plant that belongs to a palm genus that originated from Madagascar and grows in tropical rainforests, along river banks of the savannah, marshes, and swamps in the areas stretching from Madagascar, where it originated, to the Congo and Gabon of Central Africa, Cameroon, Nigeria, and Liberia alongside of the Gulf of Guinea. The distribution area presents a raffia belt spread. There are many different varieties of raffia and six types of raffia are used for their fibers including *Raphia vinifera* and *Raphia ruffia*. (Map 2-1).

Raffia fibers are still widely used and are sold in various places from the savannah region at the South end of the Sahara, in which raffia does not grow, to the coastal region of Guinea. Raffia is processed as strings or used unprocessed for tying raffia shanks or sticks. The flesh of the fruit is used for poisoning fishes, the ash of the bunchy sepals is used for seasoning, and raffia wine is produced from the root. The leaf stems and rachises are used as building materials for houses and furniture, and the skins of leaf stems are used for baskets after being torn into thin pieces. Fibers used for woven fabrics are collected from the back of the young leaves that have just emerged and are still closed in a spear shape.

Figure 2-1 Raffia palm (*Raphia* sp.)

Raffia fibers are used for woven fabrics without twisting. (Photograph 2-3). The fibers are also used as strings by twisting them into a two-fold yarn with the palms and thighs. After collecting the fibers, the skins are dried and used as the core materials of basket weaving. (Photograph 2-4)

Photograph 2-3) Weaving with raffia (Photographed by the author in 1986 in Kuba, Congo)

Photograph 2-4) Making raffia baskets: Costume baskets that are made by women with raffia fibers using the skins of raffia leaves as the core material based on the coiling technique (Photographed by the author in 1986 in Tikar, Cameroon)

## 2-3. Silk

In the African region south of the Sahara, silk is rarely used and its limited use can be witnessed only in a part of the Sahel strip[1] and the Madagascar Island. In Africa, several types of silkworms of the line caterpillar species are used for silk. Of those types, *Anaphe infracta* (photograph 2-7) that forms a large cocoon of about 15 cm and *Anaphe venata* (photographs 2-5 and 2-6) [ISEKI 1985: 5-8] that form a group of small cocoons are well known. Normally, these silkworms form cocoons by leeching off evergreen high-tree Tamarind (*Tamarindus indica* L.) of the pea species and Parkia (*Parkia biglobosa*) of the same species.

Most of these types of silks are used for embroideries on the chest, collar, and back of the male costumes in Islamic ceremonies. Weavers of Yoruba, Nigeria also use silks for fabrics. Pastor Kanuri provides silk fibers to the weavers in Yoruba. They collect silk while moving through the savannah and forests, make embroideries, and sell the products at the "markets" in Hausa and Yoruba[2]. The supply and demand network from the collection of cocoons in the savannah to the production of finished textiles in the coastal region has been established in Nigeria.

[1] The Sahel Strip refers to the strip from the East to the West of the Sahara from Mauritania to Sudan.

[2] Confirmed by the author at Garoua, Cameroon; Kano, Nigeria; and Sikasso, Mali.

↑ Top left　Photograph 2-5) Cocoon of *Anaphe venata* that is produced by a group of young worms
↑ Top right　Photograph 2-6) Spinning of *Anaphe venata* (Photographed by the author in 1983, Housa, Nigeria)
← Photograph 2-7) Cocoon of *Anaphe infracta* (provided by Juraku Co., Ltd.)

The inhabitants in the South of Burkina Faso and the Ashanti of Ghana have been using silk threads for textiles.　However, most of the silk threads were obtained by unbinding silk textiles obtained from Europeans who advanced to the coast of the Gulf of Guinea. The technique for weaving gorgeous traditional ceremonial fabrics by unbound threads started in the 17th Century and its central region was the imperial court craft center of Kumasi [BODWICH 1819: 331] [RATTRAY 1927: 220].

From the 19th Century, red-violet silk fabrics and silk threads that were produced in France and Italy were brought into the West African region by caravans on the Sahara and became important trade products.　The use of silks has spread among the weavers of many ethnic groups as well as the Ashanti. However, in the 20th Century, imported threads produced in Britain replaced silks and since then synthetic fibers have completely taken over its position.

## 2-4. Wool

In the African region South of the Sahara, wool was used only in limited areas as were silk fibers. These areas include some areas at the South end of the Sahara and the Niger Delta area where sheep can be reared and the groups that weave wool are also limited to the ethnic groups of Housa, Fulbe, Sobga, and Tuareg.　Of the wool fabrics produced by these groups, blankets called Kass "have been highly appreciated by the people in the southern forestry regions for many centuries" [PICTON/MACK 1979: 107].　In particular, the blankets were in high demand among courtiers of the Ashanti in Ghana.

## 2-5. Cotton

### 2-5-1. About cotton

There are two sources of cotton, one is the annual plant, Malvaceae, and the other is the perennial cotton plant. One type is a cotton fabric piece discovered in the Archaeological Ruins at Moenjo-Daro of Indus around 2500 to 2300 BC. This type of cotton was produced by cultivating the wild cotton that grew in Africa as *Gossypium herbaceum* and *Gossypium arboreum*. It is normally referred to as Asian cotton. The other type originated from Peru and Bolivia and is referred to as American cotton. American cotton is further classified into land cotton based in Mexico and Guatemala and sea land cotton (Peru cotton) based in Peru and Bolivia in the Andes.

(These two types of cotton were supposed to have co-existed over 300 million years ago when the African continent and American continent were connected.)

### 2-5-2. Types of cotton and the distribution

The most important fiber material in the South of the Sahara is cotton. The research conducted by Hutchinson for tracing the origin of cotton worldwide revealed that six types of wild cotton (belonging to *Gossypium* of the Malvaceae genus) grow in Africa and three types of cotton grow in the dry regions of East Africa, Sahara, and Kalahari, which are *anomalum*, *herbaecum*, and *stocksii* respectively. The *anomalum* type spreads in the Sahel region of West Africa [HUTCHINSON 1954: 226]. (However, these types of cotton produce short fibers and it is doubtful whether they were used as fiber materials.) Currently, most of the cotton that is woven manually in African regions is a hybrid of the types that have been brought from Asia and America over the past several hundred years.

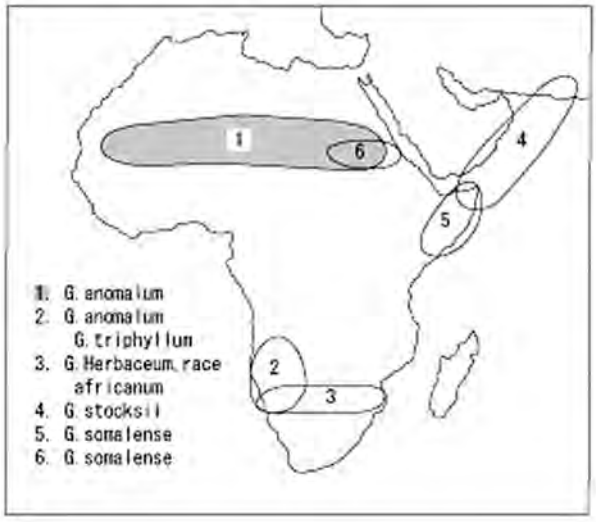
Photograph 2-8) Shrub type cotton

Photograph 2-9) Shrub type cotton

(Photograph taken by the author in 1986 in Kinshasa, Congo)

Among the types of cotton observed in the many regions researched by the author including Togo and Ghana in West Africa, the cotton referred to by the local people is the American type grass cotton and the shrub type cotton of the *hirsutum* species (photographs 2-8 and 2-9) referred to as "old cotton."

## 2-5-3. Historical data on cotton




Map 2-2) Cotton of Africa
(Created by the author: sourced by HUTCHINSON J.B. "*New Evidence on the Origin of the Old World Cottons heredity*")

A great deal of information is available on the topic of cotton in West Africa from around the 11th Century. For cotton textiles, a large amount of cotton and wool fabrics that are assumed to be from the 11th Century were discovered in the caves of the Cliffs of Bandiagra, which is East of the Niger Delta, an area inhabited by the Dogon tribe in the Republic of Mali. The threads that were spun in various thicknesses and the designs of the hoods, ponchos, and torn fabrics represent the advanced spinning and weaving techniques of the ethnic groups that produced the fabrics.

After arriving in 1460 at the island chain of the Verde Cape of Dakar in the current Republic of Senegal, the Portuguese started cotton cultivation and a plantation plan with irrigation facilities and commenced the export of cotton to Europe by the end of the 15th Century. Portuguese merchants exchanged fabrics produced in Morocco and cheap glass beads and brass products produced in Europe with local cotton fabrics from the coast of West Africa, thus using the cotton for trade with other regions that did not produce complete textiles.

Valentim Fernandes who visited the coast of West Africa at the beginning of the 16th Century reported that in the Wolof Empire, cotton garments that had been available only to rich people only 50 years previously were already widely used among the common people. For the people of Toucouleur in the middle stream region of the Senegal River, he recorded the cotton cultivation in this region, spinning by men and women, and jackets produced by stitching fabrics of the width of a palm to make a jacket of the width of both arms stretched out. He also described that in the current Republic of Gambia, the King of Malinke wore a cotton garment, cotton brought from the Verde island chain and red fabrics and blankets brought by the Portuguese from their country were sold to the inhabitants in Malinke, and Portuguese purchased cotton fabrics that were woven by the people in Malinke and sold to other regions [FERNANDES 1951: 13, 21].

This report by Fernandes indicates that one of the important reasons for spreading cotton fabrics over the coastal region of West Africa is that the Portuguese, who used cotton of the Verde island line as one of the trade products of West Africa, supplied raw materials to the coastal regions, collected cotton fabrics brought from the regions of advanced weaving techniques, and took them to the coastal regions that did not have the advanced techniques.

Many garments from the 18th Century are reported in the description of [ROMER 1769: 172] in the textile craft center in the court of Kumasi of the Ashanti Empire, the current Republic of Ghana, which has developed rapidly in the forest area and in the portrayal of customs and manners of the emerging Empire. Based on these facts, dramatic development can be assumed in the cultivation of cotton as the raw material in West Africa during the 18th Century. With the infiltration of the Islamic religion, the use of "fabrics for burial," "spread of garments," and "narrow cotton fabrics" as a method of payment

have spread in the inland regions. As the regions were far from the regions where European trade products were exchanged, such use is assumed to be based on the spread of weaving techniques by the people of West Africa.

The trading power with Europe in the coastal regions shifted from Portugal to France and England and from around 1725, the fabrics that had previously been brought from India and Asia began to be replaced with cheaper fabrics produced in Europe. Such a shift had an impact on the production of fabrics woven by the people of the coastal regions and they were to face a crisis [MONTEL 1927: 37]. However, the production of simple daily garments and ceremonial fabrics has continued up to the current date.

In the latter half of the 19th Century, the advance into Africa by powerful European countries accelerated, and starting with the coastal trade by the Portuguese in the middle of the 15th Century, Holland, England, and France made inroads to the coastal region of West Africa. With the sudden rise of the textile industry caused by the industrial revolution, the securing of the cotton demand regions as the material and cotton product supply regions became the objective. Therefore, of the colonial development projects of Europe in the 19th and 20th Centuries, cotton cultivation was selected as the first main focus project of the plantation crops. Infiltration of Islam and Christianity resulted in the spread of garments to the general public, thereby developing, in Africa, the unique ethnic costumes of Africa made from cotton fabrics produced in Asia and Europe. In particular, a set of women's costume that requires fabric of at least 8 m for the hood, waistcloth, and blouse was completed.

In parallel to such cotton cultivation, cotton fabric production in West Africa, where cotton cultivation using the old method had been inherited by individual farmers, seems to have become rather more active from the end of the 19th Century to the beginning of the 20th Century and up to this date.

Various traditional costumes that were collected during material culture research conducted in various areas of West Africa that occurred concurrently with the introduction of manufactured cotton fabrics from the coastal region to the inland regions are stored in the museums and art museums of the colonial countries. Most of the costumes were not ordinary garments used at the time of the research and were used as costumes of royalty and aristocrats and ceremonial costumes, particularly "burial fabrics" and "funeral fabrics." It is considered that most of the "African fabrics" prior to the spread of cotton fabrics are used as the devices to indicate "authority" or to "wrap death."

## 2-3. Use of fibers for fold plaiting

As described at the beginning of this article, the author has been engaged in research based on dyeing and textiles in Africa. In addition to the dyed textile products, the author frequently observed that, in these countries, garments and various everyday tools were produced using simple techniques such as "bundle," "tie," and "plait" of specific plant fibers, vines, and tree barks and such products are used for various ceremonies. The author also observed a simple "tying" action that is used as a unit of material distribution.

However, research on the daily fiber use based on the simple technique and the existing knowledge such as "knotting" that has been used as the measuring rule of the regional societies has not been in the focus of the research on Africa. The author has not paid any special attention to baskets that are made by the techniques of simple coiling or twist-plaiting and mats by the fold plaiting technique using the leaf stems of palms, wisteria, and pramineae plants as the materials.

The author had an opportunity to observe a process of making a mat by a Fanti female using the leaves of the screw pine genus (*Pandanus* sp.) as the materials. The technique was neither plaiting nor weaving, and rather is a transitional technique between "plaiting and weaving."

### 2-3-1. "Plait weaving" as a transition to the handloom

As far as the author knows, no report has been presented for the <plait weaving> that is assumed to be the shift from plaiting to fabric weaving in research on Africa. However, one of the three photographs of Fulbe girls plaiting grass mats by stretching strings in the page of ‘Plaiting grass’ in "Living in Savannah" written by Junzo Kawada [KAWADA 1995: 118] (Photograph 2-10) shows the transitional stage to the weaving technology.

Photograph 2-10) Fold plaiting technique that is generally seen in Africa
Top, left and right: Fold plaiting technique that is generally seen in Africa - Sourced from [Junzo Kawada 1995: 118]
Bottom left: Method of return weaving by the Fulbe tribe by stretching a twisted string as the vertical string, placing a stem of the gamineae plant on the fixed vertical thin string at a right angle - Source from [Junzo Kawada 1995: 118]
Bottom, right: Fold plaiting technique that is generally seen in Africa - Sourced from [ETINNE-NUGUE 1987: 83]

Such technical consideration will be discussed separately. However, while noting the fiber crafts produced using the fold plaiting technique in Africa during the research in Gabon, the author found that animal skins, fibers of gramineae, banana fibers, and long thin supple branches of shrubs are commonly

used everywhere. The author frequently witnessed the basic technique common for production using fibers. For instance, when making strings from hard animal skins or barks, the skin or bark is torn into thin pieces, then softened by chewing before using and also the young leaves of palm trees are used for making soft bags and hats. Most of the plants are dried after collecting and moistened while in use.

In general, baskets and mats that are produced using the fold plaiting technique are classified by region, ethnic group, technique, and material by the researchers. However, as found in the research on textile fabrics, different production techniques and materials are often used even if the products appear to be identical.

### 2-3-2. Sieve produced in Ethiopia as an example of fold plaiting

One of the research countries visited by the author, Ethiopia in East Africa, is well known for its variety of grain cultivation and cultivation of teff graminae (*Eragrositis tef* (Zucc.) Trotter) and ensete musa spp. (*Ensete ventrieosum* (Welw.) Cheesman) and sieves are used for refinement of these crops. When

Photograph 2-11) Making a sieve using young palm leaves (*Elaesis guineensis* JACQ) (Photographed by the author in 2009 in Ali, Ethiopia)

Photograph 2-12) Making a sieve using (*Scirpus grossus* L.)
(Photographed by the author in 2009 in Ali, Ethiopia)

conducting research on "sieves," the author observed that each of the seven ethnic groups of Ethiopia used different graminae plants and Arecacae plants and also used different techniques for producing the net section, which is the base. However, the differences in the configuration and fiber materials used in the sieves are not noticeable unless they are observed in detail.

## 2-4. Summary

This report introduced the historical data regarding barks, raffia, silk, wool, and cotton that have been used as fibers, in particular, for the textile fabrics in Africa. The report also mentions that these textile fabrics were used as "burial fabrics," "funeral fabrics," devices for presenting authority, and "wrapping death - ancestor's spirits" and at the same time how the cotton production history of Africa from the 16th Century had played a role associated with the economic history of Europe and Asia.

However, systematization of the use of plants for fold plaiting craft products has not yet been clarified. The author noticed some items during summarization of this report. For instance, sieves used in

Ethiopia that were studied by the author can be associated with the slag strainers used for "brewage" such as sorghum (*Sorghum vulgare* PERS.) that spreads over the entire Sahel area. Instead of limiting the use within farming tools, the use of gamineae plants is connected from dots to a line through this association and consequently, the author can have a glimpse of a "local wine belt" up to the far West Africa.

The author wishes to end the summary of this report by expecting, in the near future, schematization of fold plaiting craft products of African regions that are currently in dot form.

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(Table 2-1) Use of plant fibers of Africa confirmed by the author

| Fiber category | Fiber type | Material type | Scientific name | Features/applications |
|---|---|---|---|---|
| Plant fiber | Seed floss | Gossypium | *Gossypim anomalum/G. triphyllum*<br>*G. herbaceum/G. stocksii*<br>*G. somalense* | There is a wide variety of fibers and the uses vary according to the length and thickness. Used for textile fabrics. |
| | | Bombay ceiba | *Ceiba pentandra* | Yellowish tan, very light, and strong gloss. Used for filling cotton of beds. |
| | Bast fiber | Baobab | *Adansonia* | (Used for filling cotton). The bark is used for strings. |
| | | Ficus varieagta | *Ficus varieagta* | Used for bark fabrics |
| | | Antiaris toxicaria | *Antiaris toxicaria* LESCH | Used for bark fabrics and baskets |
| | | Ficus natalensis | *Ficus natalensis* | Used for bark fabrics |
| | | Parkia | *Parkia Biglobasa* | Used for binding by tearing barks |
| | | Silver birch | *Wikstroemia* sp. | Used for strings |
| | | Girardinia | *Girardinia* sp. | Highly durable and glossy. Used for nets. |
| | | Kenaf Hibiscus | Kenaf, *Hibiscus cannabinus* L. | The fibers are rougher and harder than yellow jute. Used for strings. |
| | | Pueraria | *Pueraria lobata* | Glossy and transparent fiber. Used for knitting. |
| | Leaf veins and leaf stems | Plantain Banana | *Musa sapientum* L. | Glossy and transparent fiber. Used for strings. |
| | | Ensete | *Ensete ventricosum* (Welw.) Cheesman | Soft white fiber. Used for strings and mats. |
| | | Raffia palm | *Raphia ruffia/Raphia vinifera* | Back skin of young leaf is used. Rough, hard, and very strong.<br>Used for textile fabrics and baskets |
| | | Date palm | *Phoenix dactylifera* L. | Back skin of young leaf is used for weaving and plaiting. Leaf stems are used for baskets, mats, and furniture. |
| | | Agave | *Agave americana var. marginata* | High moisture absorption and used for ropes and nets. |
| | | Oil palm | *Elaeis guineensis* JACQ | Leaf stems are used for baskets. |
| | | Wisteria | *Calameae Kunth ex Lecoq & Juillet* | The rough and hard fibers are used for baskets and furniture. |
| | | Pandanaceae | *Pandanus sp.* | Fibers collected from leaves and aerial roots of a variety of pandanaceae are used for mats. |
| | Stems | Cyperaceous | *Scirpus grossus* L. | The stems are used for baskets, mats, and sieves. |
| | | Setaria | *Setaria sp.* | The woven spikes are used for baskets and sieves. |
| | | Pennisetum | *Pennisetum sp.* | Used for roofs and fences. |
| | | Bamboo | *Thamnocalamus sp.* etc | Used for tools and furniture. |
| | | Reed | *Phragmites karka/Vetiveria nigritana* | The first joint from the spikes is woven. Used for baskets and sieves. |
| | Fruit | Coconut palm | *Cocos nucifeta* L. | Highly durable for friction. Used for scrub brushes. |
| Fiber | Sheep wool | Sheep | Unavailable | Glossy bristly hair |
| | Camel wool | Camel | *Camelus dromedarius* L. | Used for strings |
| | Other animal wool | Horse | *Equus cabalus* | The manes and tails are used for strings. |
| | Silk | Anaphe | *Anaphe infracta/A. venata* | Brownish red. Used for textile fabrics and embroidery threads. |

# Chapter III Use of Fiber Plants in Ghana and Commercial Possibilities

In this research project, field survey was conducted in the Republic of Ghana in August and September, 2009. This chapter summarizes the report of the field survey such as the likely usage and the distribution status for each material.

Improvements by utilizing the material characteristics are also proposed in terms of design and technical aspects. As an example, "Cool Africa" is proposed.

## 3-1 Current State of the Use of Fiber Plants

### 3-1-1 Materials for baskets, mats, and textiles

This section describes the three types of everyday household items, namely, textiles, baskets, and mats, among those that use natural materials in Ghana based on the data obtained in the field survey. However, in this example, baskets refer only to those that are made from stems.

#### 1) Natural fibers such as gramineae that are used for baskets

In the savannah region in the north of Ghana, basket weaving using grass is popular. The climate of the savannah region is not suitable for stable farming due to the harsh dry season. In the southern region of Ghana which has a tropical rainforest climate, palm plants are produced in abundant quantities, such as rattan, raffia, and oil palm. In the northern region that has a severe dry season, it is difficult to produce baskets by collecting such plants. Production of baskets using the grass stems of gramineae means utilization of natural fibers suitable for the climate and natural environment of the savannah.

Basket-making is suitable for such a natural environment and they have been produced and used as a means for self-sufficient livelihood. Baskets are mainly made by women, although, men are also engaged in this activity.

Recently, baskets that are produced using the traditional basket-making techniques are popular as export items. Such baskets are referred to as "Bolga baskets" and are mainly exported to Europe and America.

Bolga baskets are made of *Vetiveria nigritana* and *Panicum maximum*, the grasses called ‘kinkase’ in local that grow in the outskirts of Bolgatanga and Kumasi. Some researchers say that *Phragmites karka* is also used for the basket making. The stem is torn in two pieces and is used for weaving by either twisting or not twisting the strings.

Photograph 3-1-1: Bolga baskets

Research was also conducted on the traditional baskets produced in the outskirts of Bolgatanga, and these types are "pio", "tapo", and "zehen". Stems of sorghum and kenaf are used for pio. Stems of sorghum are used for the body or core material of a basket and kenaf is used as a string for fastening the stems. Kenaf is used for tapo and ‘kinkase’ is used for zehen.

Research on basket production was conducted in Bolgatanga in the Upper East Region and its fringe rural village, Nyariga. The author collected some gramineae grasses from the area along the side of the road while traveling to the North from the outskirts of Kumasi. The Plant Laboratory, University of Ghana was requested to do an analysis of the plant types. The plants whose analysis was requested include ① grass that was collected in Nyariga for basket production, ② some types of grasses that were collected from the outskirts of Kumasi and ③ grasses that were collected from outskirts of Bolgatanga. In Japan, analysis of the same grasses was done again by The Weed Science, Agronomy and Horticultural Science, Graduate School of Agriculture, Kyoto University for confirmation.

In Nyariga, a survey was conducted on the techniques and materials in the Nyariga Craft Society. In the Sirigu Women Organization for Pottery and Art also, a survey was conducted on the basket production that is associated with tourism. For the history and current situation of the commercialization of baskets, interviews were conducted in the Zonal Office of the Ghana Export Promotion Council. For basket distribution, a survey was conducted on the basket market that is opened twice a week in Bolgatanga City.

Photograph 3-1-2: 'Kinkase', collected in Nyariga. photograph taken by the author

Photograph 3-1-3: Making the base of a basket. Photograph taken by the author in Nyariga.

Photograph 3-1-4: Tool for draining off water from the seeds of zehen and parkia after they are washed. A soft basket with attractive mesh is created by weaving straws of *Phragmites karka* without being twisted. This type of basket, however, cannot withstand weight as a container. Market of Zebira (Bokwa district)

Photograph 3-1-5: Pio and sorghum, photograph taken by the author in Nyariga.

Photograph 3-1-6: Bag woven of kenaf strings (tapo). In the Upper East district, a bag woven of kenaf strings is called a tapo and is used as a shoulder bag for males. Photograph taken by the author in Nyariga.

Photograph 3-1-7: Kenaf strings. In West African countries like Ghana, fibers that are extracted from the strong bark of kenaf are made into strings and usually used as binders. Photograph taken by the author at the market of Zebira (Bokwa district).

## 2) Natural fibers used for the production of mats

In Ghana, some mats are produced using natural fibers and are used for various purposes in daily life. As hardly any research has previously been conducted on mats, the survwey was difficult. The field survey was initially commenced by carefully observing the markets and houses and some types could be identified by the University of Ghana. A survey on mats was conducted entirely within the schedule for Ghana survey.

Photograph 3-1-8: Blinds hanging from the opening. Photograph taken by the author at the craft village of Accra.

On the outskirts of the capital, Accra, and the outskirts of Takoradi, the coastal region of Southern Ghana, the author frequently saw hung mats (photograph 3-1-8) from openings as blinds. At the market of Takoradi, mats produced in the Volta region were sold. On the outskirts of Tarkwa of the Western Region, mats are made of leaf rachises from the raffia palm, which are used for drying farm crops such as cacao, and used as bedding by spreading out on the floor (photograph 3-1-9) and blinds by spreading out on the roof.

Photograph 3-1-9: Mat used for bedding. Photograph taken by the author at the Esaman village on the outskirts of Tarkwa, Southern region of Ghana.

In the Faowanye village near Beposo in the Western Region, the author could observe mat production (photograph 3-1-10). As the material for mats, the grass stems called Mbew in Fante language and achacha in Ewe language is used, and for binding the stems, fibers of *Agave sisalana* of Agavacae are used.[1] The type of Mbew could not be identified.

Photograph 3-1-10: Making a mat. Photograph taken by T. Takahata at the Faowanye village on the outskirts of Beposo.

The yam grass used as blinds in the Brong-Ahafo Region and the grass that is used for making fences on the outskirts of Tamale in the Northern district were a type of Andropogon of gramineae. In the Volta Region, a survey was conducted on the mats made from the Cyperaceae and Typhaceae plants.

[1] In Kenya, baskets are produced using sisal, which were not seen in Ghana.

In the field survey, mats made from a variety of natural fibers could be observed. However, only raffia palm, grass of Andropogon gramineae grass, Cyperaceae plants, and Typhaceae plants could be identified. For the others, although the local names could be identified, their types could not be confirmed by the University of Ghana. Although some types could not be identified, it was clarified that a variety of natural fibers are used as the materials for tools in daily life such as mats.

Photograph 3-1-11: Making a mat. Photograph taken by T. Takahata in the Volta Region

### 3) Textiles

The natural fibers that were assumed in the prior research and for which field research was conducted as textile materials are cotton, raffia, kyenkyen, and kapok. According to Kawada, the function of garments in Western Africa was until recently more of a symbol of prestige connected to royal authority than it was for the purpose of protecting bodies from the external environment [Kawada 1997]. In the Kumasi region of Ghana, a symbolic structure has been formed that is connected with the Ashanti Empire that was established at the end of the 17th Century. The garments include cotton garments and those of bark fabrics.

For textiles, research was conducted on the fabrics called Kente in Bonwire on the outskirts of Kumasi in the center of Ghana, dyed fabrics called Andikra in Ntonso, and the fabrics used for a smock-type garment called "Fugu" on the outskirts of Tamale in the North East region of Ghana. Information on cotton cultivation was collected at SARI (Savannah Agriculture Research Institute) of Tamale. Cotton is cultivated in Ghana and yarns are produced in the spinning factories on the outskirts of Accra. The interviews conducted in the cotton fabric production region revealed that raw cotton and cotton threads produced in foreign countries such as Burkina Faso and Nigeria are used in addition to the cotton and cotton threads produced in Ghana.

Photograph 3-1-12: Loom for weaving Kente. Photographed by the author in Bonwire.

Photograph 3-1-13: Male weaver wearing a Kente. Generally, no shirts are worn under Kente. Photographed by the author in Bonure.

Kente refers to a "congratulatory ceremonial fabric" and is produced by two ethnic groups called Ashanti and Ewe. [Iseki 2000: 156]. Conventionally, silk threads were used, but, mainly rayon threads made in China are used currently. One fabric is created by stitching together narrow fabrics of a little more than 10 centimeters in width. The sizes differ between the fabric for men and the fabric for women. A foot treadle loom is used for weaving Kente and a reed of plain weave and a reed of pattern weave are used (photograph 3-1-12). Its

Photograph 3-1-14: Male wearing an Adinkra. Photograph taken by the author at the market in Kumasi.

feature is the geometric patterns designed by combining plain weave and pattern weave in many colors such as orange, green, and blue (photograph 3-1-13) or in two-tone colors based on white and navy blue. By stitching narrow fabrics together, more prismatic combinations of geometric patterns are created, presenting a more attractive design. The fabric is worn by wrapping it around the body as a robe.

Adinkra is fabric produced by pressing patterns on a cotton fabric and is used for funerals and mourning ceremonies. Like Kente, this is a symbolic fabric associated with the royal authority of the Ashanti Empire. In this research, production of Adinkra in the Ntonso village was observed. Adinkra is produced by printing patterns using a pattern block created by a gourd with black liquid extracted from the tree bark called 'badie' (*Bridelia ferruginea*). This block printing method is still used (photograph 3-1-15), however, mostly screen printing is applied.

Photograph 3-1-15: Block printing in Adinkra. Photograph taken by the author in Ntonso.

On the outskirts of Tamale in the northern region of Ghana, there is a kind of men's garment called either a smock or a "fugu" (photograph 3-1-16). A smock is made by stitching thick narrow hand-woven cotton fabrics (some use hand spun threads) and this garment is popular as its dignified appearance shows the social prestige. In this research, the author observed weaving in the Shishev village on the outskirts of Tamale. Fabrics are woven using a foot treadle loom. At the market in Tamale, smocks are sewn and sold and the author observed the actual demonstration. For the cotton threads as the raw material, industrial yarns in the southern region of Ghana are mainly used; however, some use hand-spun yarns also. On the outskirts of Tamale, the author observed a female spinning yarns from cotton. Hand-spun yarns are not sold at markets and are used for personal consumption.

Photograph 3-1-16: Male wearing a smock. Photograph taken by the author in Techiman.

Garments produced by using fabrics were originally worn only by the people of high ranks connected with royal authority; however, currently, such garments have become popular among the economically well-off middle-class people and the domestic demand within Ghana is increasing.

Photograph 3-1-17: Kyenkyen in the Borivi forest. Photograph taken by the author.

The bark fabric called 'kyenkyen' in the Ashanti language could not be verified in this survey. 'Kyenkyen' is produced by stretching the bark of a tree (photograph 3-1-17) called *Antiaris toxicaria (A. welwitschii, A. africana)* by pounding. Since production of bark fabrics used for

ceremonies has been discontinued, the fabrics are now used as souvenirs. During this study, however, the fabrics could not be seen in the shops either.

Kapok, whose scientific name is *Ceiba pentandra*, is a tree that produces cottons in fiber form. The author observed people who carried kapok cotton that was collected in the North, made cotton filled pillows, and were selling them on the spot (photograph 3-1-18). Interviews conducted by the author revealed that this type of cotton is used for fabrics since the fibers cannot be spun to create yarns as they are straight.

In the Democratic Republic of Congo (Former Zaire), raffia was famous for its fabric material. However, in Ghana, the author could not witness weaving using raffia fibers. The author witnessed that raffia trunks are used for buildings, leaf stems are used for baskets, and fibers collected from leaves are used for binding. However, in Ghana, yarns are not made by spinning fabrics and producing fabrics using the yarns.

Photograph 3-1-18: Selling Kapok cotton alongside the road. Photograph by the author in

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### 3-1-2 Materials for baskets and furniture - with palm and bamboo as the core

This section mainly describes the fiber plants that are used for baskets and furniture based on the varieties of palm and bamboo that were examined locally.

#### 1) Type of cyperaceae Scientific name: *Cyperus articulatus*

Baskets woven with the flattened cylinder-shaped stem of this plant are very delicate and demonstrate the craftsman's skill. Although only one design is available, the originality is unique.

The material can be easily obtained from the swamps of the area. In the Keta area of the Volta Region where this survey was conducted, basket weaving is practiced by farmers as a side job and baskets are produced in family units. In the area where the research was conducted, no particular producer integrates the products within the village and since products are sold to the buyers who visit the producers individually, the efficiency is low. Prices are dropping due to stagnant sales.

Based on this situation, it may be possible to increase the price and productivity of the local products by increasing new design variations and establishing an organization that integrates products in village units instead of family units.

Photograph 3-1-19: Vegetation site

Photograph 3-1-20: Basket of 30 cm to 42 cm in diameter and 30 cm in height. Price: 3 Cedis.
Mainly the elderly females are in charge of basket making while children learn.

Photograph 3-1-21: Basket of 8 cm in diameter and 10 cm in height. Price: 30 Pesowas.
Six baskets can be made per day.
Only purple and green are used as combinations of other colors were not popular although they have been produced.
The mesh size can be specified. The horizontal yarn was made of three layers and the vertical yarn was one layer.

2) Oil Palm Scientific name: *Elaeis guineensis*

Stems are used by tearing. Oil palm can be easily obtained from the areas that cultivate oil palm. As utility articles, the baskets made of oil palm are used for storing and carrying farm goods to the markets. The current basket size is determined based on the strength, however the marketability of the local products may be increased by producing baskets of finer and better finish. Due to its strength, oil palm can also be used as a material for making furniture.

Photograph 3-1-22: Products sold in the Akatsi market.
The prices are as follows:
Basket size;
65 cm in diameter at a height of 35 cm: 3.0 Cedis
45 cm in diameter at a height of 26 cm: 0.7 Cedis
20 cm in diameter at a height of 17 cm: 0.5 Cedis
Thirty or more buyers visit the market and sell the baskets to other markets in Accra City.

Photograph 3-1-23: Atsieve-Sogakophe district. Sieve for cassava flowers made from the same material

3) Wisteria or Rattan Scientific name: *Calamus rotang, Eremospatha spp., accosperma spp.* etc.

Currently, rattan is difficult to obtain due to excessive harvesting and so production is decreasing. The extinction of rattan has become a serious problem and there is an urgent need for artificial cultivation.

The house furnishing products observed in Accra Special City and Takoradi City apply almost identical designs as those often seen in Asia. However, the quality is inferior. The quality variation is caused mainly by the irregular material conditions and not using "patterns" for manufacturing products. The major problem is that most workshops are located outdoors and so completed products and semi-completed products are exposed to the rain.

Photograph 3-1-24: Basket woven in the Anyreshi district. Highest quality. 4 Cedis. Two to three baskets can be produced per person per day.

Photograph 3-1-25: Typical outdoor workshop (Dwoulu district of Accra Special City)

Photograph 3-1-26: Wild rattan (Forest on the outskirts of Tarkwa City)

Photograph 3-1-27: State of rattan cultivation experiment Global Bamboo Company (Enyreshi district)

4) African Wild Date Palm Scientific name: *Phoenix reticulata*

The string made by drying and twisting the leaves of this plant is used mainly for tying up goods in the markets. The strings are also used as the material for the baskets for onions or as tying strings for fixing a beam to a post employing the traditional building method. The use of the material for a seating surface of furniture and decoration is also possible. This material can be comparatively easily applied to other products with much ease.

Strings are commercially produced in the area of the research field and the strings are widely distributed to other areas as well. The strings are also used for weaving mats that use *Cyperus articulatus* (*Andropogon gayanus*) as the main material.

Photograph 3-1-28: Bundle of woven strings. 50 Pesowa per bundle (20 yards).
The material is collected, dried, and stored, and it is once dipped in water, before being made into a string by twisting. (Atravenu district)

Photograph 3-1-29: Example of application to the seating surface of furniture, Global Bamboo Company (Enyresi district)

5) African Fan Palm Scientific name: *Borassus aethiopum*

In the coastal area of the Volta region, dried leaves of this plant are used for a variety of weaving products such as fans, mats, and baskets. The trunks, which are very hard and strong, are used for poles and the beams of buildings. In particular, fans are also sold in other regions as useful tools for starting coal fires. Its rough large mesh is attractive.

Photograph 3-1-30: Trunks used for poles and beams of buildings

Photograph 3-1-31: Basket: 50 cm in diameter, 45 cm in height. 3 Cedis. Six baskets can be produced per day

Photograph 3-1-32: Mat used for drying chili peppers. 220 cm x 140 cm. 7 Cedis. Two mats can be produced per day.

6) Raffia Scientific name: *Raffia ruffia, R. vinifera*, etc.

Raffia cultivation was observed mainly in the South of Ghana.

In Ghana, raffia is more widely used as the material for baskets by tearing leave rachises rather than textile fibers. Raffia is also used for trap baskets (fish traps), cacao bean drying sheets, bedding mats, and building materials.

In Ghana, raffia is also well recognized as the plant for collecting the raw material solution for palm wine and distilled spirits.

Due to its superior strength, rachis can also be used as a material for making furniture. (Simple benches are also made.)

Photograph 3-1-33: Basket (container for corn and palm kernels)

Photograph 3-1-34: Bedding mat. 2 to 3 Cedis per sheet. Raffia leaves are used as horizontal threads while raffia leaf rachises are used as vertical materials.

Photograph 3-1-35: Wardrobe made using raffia leave rachises as the surface material. Global Bamboo Company (Enyresi district)

7) Bamboo Scientific name: *Oxythenanthera* spp., *Bambusa vulgaris*

Bamboo grows extensively in the south of Ghana. Like rattan, bamboo is mainly used as furniture material in outdoor workshops. Many new products are also being made.

Five years ago company A started production of laminated bamboo timber and is experimentally selling the products in the domestic market. There seems to be many difficulties in making the business commercially viable. Initially, its price competitiveness was low as electricity and water are more expensive than in other countries (for instance, China) and in addition, the adhesive needs to be imported. As bamboos that naturally grow in Ghana are very hard and the knot bending flexibility is high, the yield is low when processed into lumber. Therefore, cultivation of bamboo that originated from China is being introduced due to its excellent processing adaptability.

Company B has commenced planting Chinese bamboo. In the system that is being developed, nursery plants are cultivated in fields. Plants that became grow successfully are replanted in the fields of contract farmers, and bamboo materials are re-purchased after three years. The author observed the mats woven using the Chinese bamboo and recognized its high product value.

Company C in Accra Special City also attempted production of boards. However, the company switched to Kebab sticks as board production is not commercially viable.

In Ghana, production of boards that require large scale mechanical process using bamboo as the material is considered to be unsuitable for its large facility investment risk. Kebab sticks, toothpicks, and more high-value added household goods seem to have more potential.

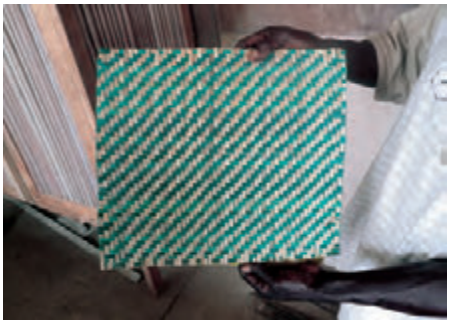
Photograph 3-1-36: Chinese bamboo nursery beds

Photograph 3-1-37: Roughly cracked bamboo. Substantially bent.

Photograph 3-1-38: Packet flooring (parquet flooring material)

Photograph 3-1-39: Bicycle with bamboo frame (Abonpe district of the Eastern district).

Photograph 3-1-40: Kebab sticks (Adinkrahene Concept Company)



Photograph 3-1-41: Place mat made of Chinese bamboo.

The quality equivalent to this product is desirable.

## 3-2 Improvement on the best use of raw materials

### 3-2-1 Design and technical recommendations for baskets, mats, and dyed fabrics

#### 1) Recommendations for baskets

Stems of vetiver grass and others that are used for Bolga baskets have excellent properties such as the strength and ability to restore to the original form (plasticity). When copies of Bolga baskets were produced in Vietnam, the baskets produced in Ghana were stronger, winning the competition over the copied products. Acquisition of superior materials is advantageous in the basket market.

Reversibility is also useful for product development. Stems of vetiver grass and others can be woven into complex shapes due to its high flexibility. For instance, the three-dimensional samples such as shapes of animals and dolls that are shown in photograph 3-2-1 were produced by the Ghana Export Promotion Council using the same material as the Bolga basket (photograph 3-2-1). The material can be restored to the original shape by wetting it with water even if it is deformed. This characteristic is useful for exporting the products to remote areas as the products can be restored to the original condition easily even if they are deformed during a long period of transportation.

Photograph 3-2-1: Samples presented by the Ghana Export Promotion Council - Photographed by the author.

The major feature of the basket is that it stands by itself due to the material strength. It has been recommended that this feature be taken advantage of by using it as a material for producing interior goods and storage vessels for harvested crops. The most conventional Bolga baskets are a large round shape of 40 cm in diameter and are not suitable to the compact houses in Japan. A basket having a flat base and oval shape is suitable for houses in Japan. A combination of brown material that is dyed with natural dye and the natural stem color also matches the taste of sundry goods made of natural materials. For instance, the products that are shown in photograph 3-2-2 were made by the Nyarega Craft Society and the author finds them easy to use at home in terms of the color and shape. Thus, it is necessary to produce baskets of the design and shape suitable for the market and due to its strength and reversibility, the material can be comparatively easily handled so as to meet a variety of design requirements.

Photograph 3-2-2: The oval shape and flat base are suitable for Japanese houses - photographed by the author.

For shoulder bags, creative design is required as its tough material may damage the shoulder section of the fabric of the garment when it is worn over the shoulder. Some of the handles made of goatskin have an odor or become moldy due to inadequate tanning. It is therefore necessary to improve the tanning technique.

A sustainable acquisition method of basket materials must also be examined. When expanding goods for production, the producer must examine a method for ensuring material acquisition more stably and cheaply.

There is a substantial merit for producers who are engaged in basket production to belong to the producer association. Many producers are women who engage in such work as a side job during the agricultural off-season. For producers to gain adequate profits through basket production, it is necessary to recognize the design of the baskets to be made, which means that products must comply with the market demand. However, it is difficult for producers living in rural villages to handle marketing. If producers sell their products directly to traders at the basket market held in Bolgatanga, the traders drive hard bargains to get the price down. Placement of orders of products through the producers' association organized under the leadership of local volunteers such as the Nyarega Craft Society is not only useful for producers to obtain an appropriate income but is also useful for the sustainable industry development of rural areas.

### 2) Recommendations for mats

Throughout all of Ghana, mats produced using natural fibers have been used for various purposes such as blinds and rugs. In Ghana which is situated in the tropical rainforest climate and tropical savannah climate, mats made of natural materials are household items suitable for the climate. Therefore, the potential of mat production can be driven by domestic demand.

On the outskirts of Accra, mats are used as blinds, which are made of thick fibers and woven tightly, blocking the airflow. The author recommends a structure that allows for some airflow. The mats made of the Typhaceae plants and Cyperaceae plants that are produced in the Volta area are woven using the technique where warps are set up using a wooden frame and the stems are threaded weft-wise. A pattern is created by dying some stems that are used as woofs. Products of a variety of designs can be developed by elaborating on the patterns.

### 3) Recommendations for textiles

The demand for the fabrics for all of Kente, Adinkra, and smocks, which are textile products, is accelerating in Ghana.

Fabrics for Kente and smocks can be used as the materials for increasing design variations of basket products. Fabrics for Kente and smocks, both of which are narrow textiles of a little more than 10 cm, can be used by stitching together to a required size (photograph 3-2-3). The opening of the basket is so large that it exposes the inside contents. For hiding the contents and for crime prevention purposes, the author recommends a fabric be stitched at the opening of the basket. The fabrics contribute to the products specific to Ghana and printed fabrics are also produced. It is also possible to combine a printed fabric with a basket.

Photograph 3-2-3: Fabric for smocks. Narrow fabrics are rolled and are sold in the market. Photographed by the author at the Tamale market.

### 4) Others

It is possible to create a tourism industry in rural areas by combining handicraft production and tourism. Such attempts have already been made and one of the attempts is Sirigu Women Organization for Pottery and Art that was established by the local women in Sirigu, in the northeast area of Ghana. This women's association was established as a place for women to learn handicrafts and the traditions of the region and is provided with a gallery, accommodation facilities, and a restaurant. In the gallery, it is possible to observe the actual production of pottery, baskets, and paintings by the women. The same attempt can be made for Rattan baskets and Rattan vegetated areas. Rattan vegetation is rapidly decreasing and the necessity for cultivation is becoming urgent in Ghana also. The author recommends the development of a combination of eco-tourism for learning cultivation and vegetation of Rattan and hands-on experience of basket production using Rattan.

In this research project, handicraft products were also examined by visiting the Craft Village and souvenir shops in Accra and Bolgatanga. The research revealed that many Kenyan products are also sold in the shops as well as Ghanian products. Substantial improvements are necessary for Ghanian products in terms of both quality and design.

### 3-2-2 Design and technical recommendations for handicrafts

#### 1) Products using raffia palm

##### (1) Effective use of rachises for furniture

Photograph 3-2-4

The rachises of raffia, which are extremely strong, are used for outdoor benches and wall materials. Raffia can be comparatively obtained with ease near residential areas. While acquisition of rattan is now becoming difficult, raffia can be used as a natural material for furniture. Designs utilizing the cross sectional shape of a rachis was proposed by Global Bamboo Industries (photograph 3-2-4). The suggestion of the design that has been made by taking advantage of the thickness of the material and the proportion are shown in the following figure (Figure 3-2-1).

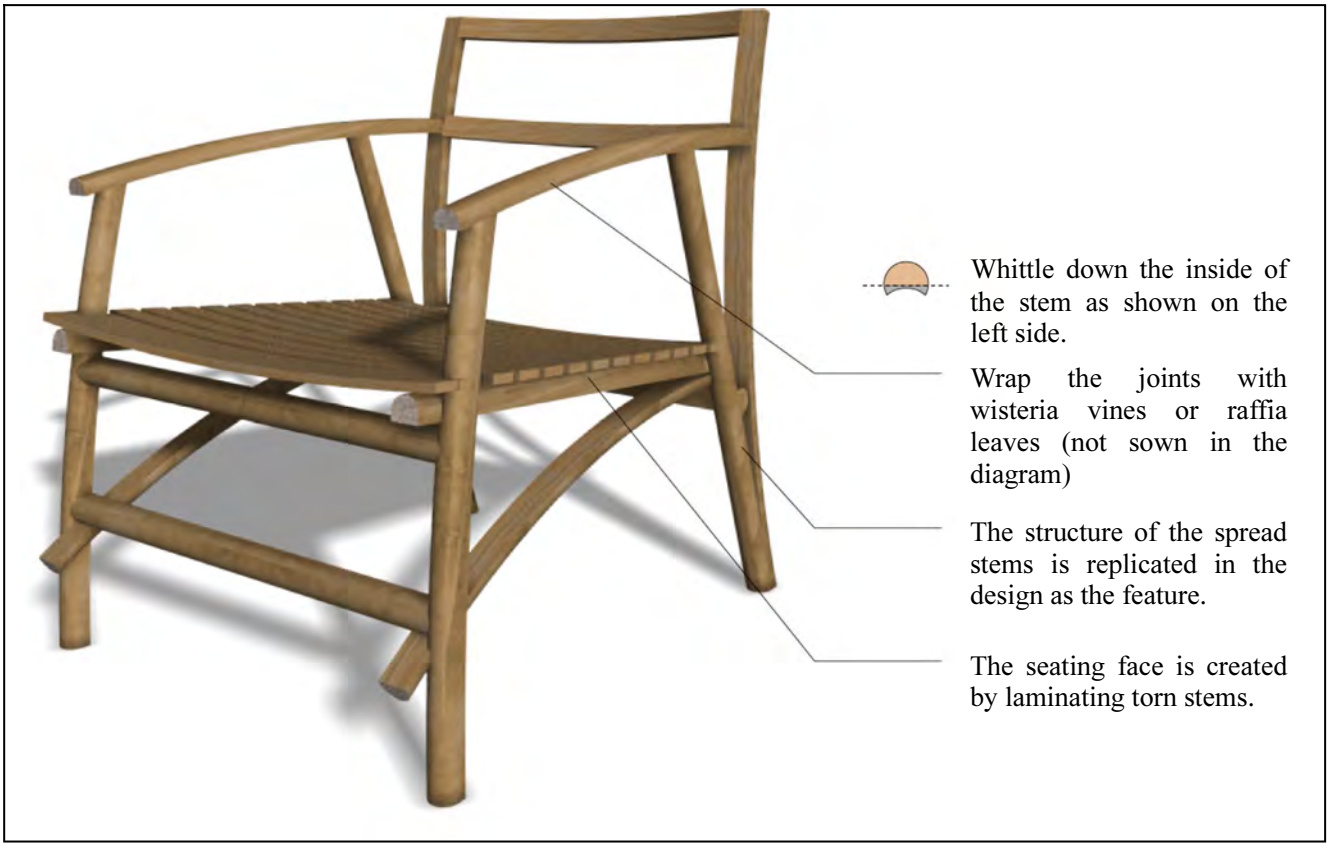



Figure 3-2-1 Small lounge chair, Shinichi Ito W560 D615 H700

(2) Application to blinds

Rachises that are torn into pieces are locally processed to produce line fishing gear and mats. In South Africa, one company is manufacturing blinds. Originally, torn raffia rachises were found to be suitable for blinds due to their excellent strength and straightness. Reference website http://www.aluvert.co.za/raffia.htm

2) Products made of jointed flatsedge

(1) Application to souvenirs made using the traditional weaving method

Baskets that are produced in the Volta Region have attractive fine meshes. The woven products include baskets whose upper diameter is slightly smaller than the lower diameter and also flag-shaped fans.

This basket is functionally useful (used for carrying foods and money) as an everyday living tool in Ghana; however, the vertical to horizontal ratio and the shapes of the top and bottom are an obstacle to indoor use in Japan, Europe, and America. The author recommends a "box with a lid," a "fruit basket," and a "lamp shade." These products can be produced by changing the proportion without any special new technique.

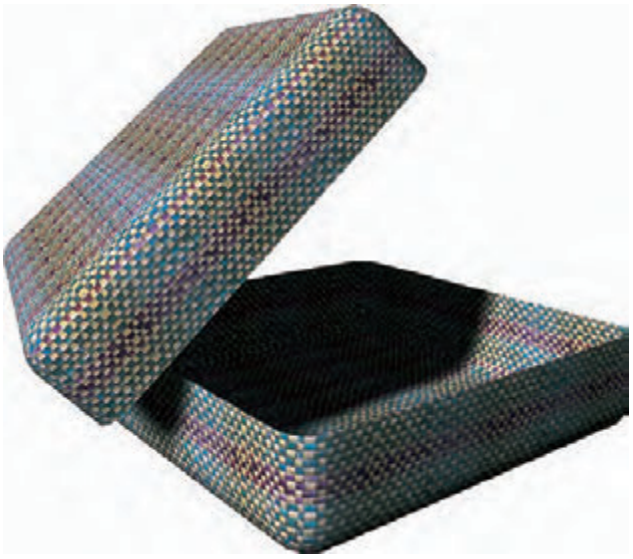


Figure 3-2-2 Box with a lid made of bulrush, Shinichi Ito

3) Products made of oil palm

(1) Application to products similar to bamboo weaving

Rachises of oil palm are extremely strong and durable as demonstrated by baskets that are seen in the markets. The author recommends the production of seating sections of chairs and lamp shapes using these features in the same way as bamboo weaving. Although the strongest part is the surface skin extracted by tearing a rachis, the surface is often dirty as it is exposed to the weather. To transform the item to a high-value added product, treatment such as selection, coloring, and dying are necessary after tearing the rachis.

4) Products made of rattan

Figure 3-2-5 On-the-road workshop in Takoradi

(1) Quality control

South East Asian countries hold a large share of the market for this material and also lead the world markets in terms of designs. In Ghana also, products of a universal design as shown in the photograph on the left side are produced as a "no-name design." This indicates that sales targets of this product include export markets, hotels, and restaurants. Although the market covers a wide range, there is a substantial difference from the products manufactured by South East Asian countries in terms of quality.

By combining with textiles, a feature specific to Ghana can be demonstrated and the product can be linked with the tourism industry. Therefore, it is important to produce high-quality products of a universal design. To achieve this objective, the following three improvements are urgently required. At the same time, examples of Yamakawa Rattan International, an Indonesian manufacturer that produces designer products for Japan, Denmark, and America, are introduced.

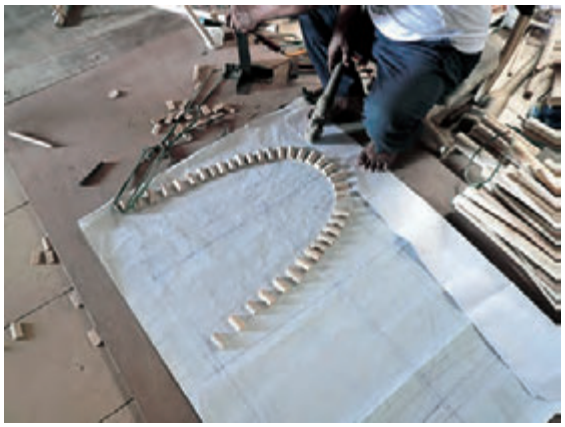
① Raw material management: Most importantly, raw materials must be stored in a place protected from the rain. At the same time, it is important to store materials by classifying them by thickness and quality. A machine for sorting by thickness is desirable.

Photograph 3-2-6 Stockyard

Photograph 3-2-7 Sander

② Use of a formwork: To bend rattan with an identical curvature as a component of furniture, a formwork comprising plywood and wooden pieces is necessary as shown below. Rattan is bent along with the formwork and the curvature is fixed using steam.

Photograph 3-2-8 Formwork



Photograph 3-2-9 Formwork production process

③ Correction of flexure after setting up rattan: Although some errors may be unavoidable due to the nature of the natural material, it is important to manufacture products in accurate sizes and angles according to the drawings as required for export products.

Photograph 3-2-10 Adjustment process

### 5) Products made of bamboo

#### (1) Using bamboo originating from Ghana

As bamboos that originated from Ghana are bent at every joint, it is difficult to use them as seen in Japan and Asia where a long stem is torn into thin pieces or woven and is used as molded plywood. Designs that take advantage of the joint curvature or products that are produced by laminating short pieces are recommended.

Photograph 3-2-11 Railing of Green School in Bali. Such a design as this that utilizes the cross section (torn vertically) brings out the feature of curved bamboo.

### (2) Use of bamboo originating from China

If a plantation that is currently under experimental operation in Ghana turns out to be successful, various commercial possibilities will arise including delicate bamboo crafts to furniture using laminated plywood. In this case, as products intended for the export industry rather than for the domestic market can be considered, it is recommended to design furniture with a knockdown structure (assembling/disassembling).

Photograph 3-2-12 Bamboo Knockdown Table

### 6) Products made of African date palms

The small leaves are used to produce various products. In this section, the use of the palms as the furniture material for seating sections of chairs is recommended.

As the material varies in thickness, the material tends to end up with a rough finish if it is combined with an uneven frame such as bamboo or rattan. To take advantage of the softness and roughness of the material, it is advisable to use timber or metal for the frame.

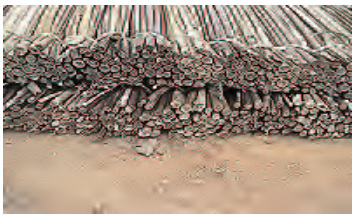
## 3-3 Living in Africa in a cool environment using everyday natural materials - Cool Africa

Akachi District, Volta Region

Global warming is having an impact upon Africa as well as the rest of the world, and many cases of flooding in dry lands and a dramatic reduction in corn harvest due to drought have been reported. In this environment of an accelerated global warming phenomenon, the author believes that the conventional knowledge of cooling effects that have been passed down through generations in the tropical rainforest regions in Africa should be introduced into the regions that are affected by the accelerating global warming trends to widely promote the lifestyle indigenous to Africa, rather than pursuing a high energy-consumption oriented lifestyle. Sales of household instruments that are produced in the regions by the people who have the knowledge and resources for creating a cool environment bring economical merits to the producers and also provide a method for coping with a hot climate comfortably to the purchasers of the products. The author recommends the production and promotion of the products of "cool Africa" that are produced taking advantage of the "knowledge and resources of Africa."

Single-layer mat made of the stems of cattail and giant bulrush

This section introduces the devices used by the people in the coastal region of Ghana to spend their daily lives staying as cool as possible as witnessed by the author.



Thick mat made of giant bulrush

Firstly, mats are often used. A mat that is made by weaving the stems of cattail or jointed bulrush in a single layer can be easily rolled up and carried to a shaded location under a tree to perform handiwork or to rest. The mat is far more comfortable than a vinyl mat due to its excellent elasticity and water absorbability. A thick mat of 2 m in length or more can also be made by tying about 10 bulrush pieces with strings. This type of mat is used for bedding. Unlike sponge mats, the mat, which has excellent porosity, does not accumulate heat as it is, insulates against the heat from the ground, and enables the user to spend hot nights more comfortably. By promoting the use of these mats, the living environment can be improved in terms of sanitation also.

Although mats made of natural materials are less durable than vinyl mats, they are environmentally friendly as they decompose into the soil after disposal. The author observed several types of mats that are made effectively using locally available materials.

Let us consider the reed screen, which is one of the traditional general products. A reed screen is produced by weaving stems of reeds that grow on the waterfront. The author witnessed a fish-weir (device for catching fish) in the swamp colony of the Volta Region. By weaving more densely, a product similar to the Japanese reed screen can be created. As the technique is already available, the

application is not difficult. The tools can also be produced by anyone easily and cheaply. The making of such a product can be easily introduced as a side job during the agricultural off-season or as a means to earn small income for old people.

As a reed screen is placed at an angle under the eaves, the shade that is created by the reed screen creates a small upward current, thereby creating a slight breeze. The screen is also useful for preventing the accumulation of heat on a wall or floor by covering the entire wall or floor.

Iseki advocates the "Cool Africa" movement that enables African people to live in a cool environment using readily available plants including reed and cattail. In Africa where propagation of information is still undeveloped, good products are not effectively introduced to other areas. By improving materials and production methods through effective communication, incomes can be increased by expanding the scope of use from personal use as well as by producing products that contribute to the improvement of the people's livelihood.

<Measures for promoting Cool Africa>

* Collect materials and products that contribute to a cool environment, exchange opinions among the producers, and improve the quality and designs.
* Explain the merits of such products and hold sales promotion meetings in high-class shopping malls in major cities.
* Advertise the merits of the products on TV and radio commercial spots and posters.
* Promote the use of the products at schools and government offices.
* Establish a Cool Africa accreditation mark.

# Chapter 4 Sale of Fiber Plant Products for Increased Income

This chapter examines the potential of the sale of fiber plant products for improving the lifestyles and income of the African people from the perspectives of organization, system, and market.

First, the experience of a young volunteer dispatched by JICA is introduced. She struggled to assist in the production and sale of Bolga baskets in a community in the northern part of Ghana. The issues to be addressed by the basket producers are identified from the viewpoint of this JICA volunteer's experience, and the activities that were effective in solving such issues are summarized. Furthermore, the issues involved in organizing the producers and selling the products are examined based on the trials and errors actually made in the local community, including the suggestions that were offered to improve income, organizing the producers and adopting a new distribution system that is beneficial for both sellers and buyers. In the sale of fiber plant products, the trends in consumer needs and the market play an extremely important role as well as the matters to be addressed by the producers, such as quality improvement and upgrading of production systems. Therefore, by focusing on the local and international markets, the trend in consumer needs for fiber plant products and the potential of the market are also examined.

Finally, an instructive case of fiber plant product development in Laos is introduced, together with a summary of the desirable roles of public support organizations and the perspectives required in developing fiber plant products.

## 4-1 The Case of Bolga Basket Production

### 4-1-1 Outline of the place of assignment

Nyariga Village, where the author was dispatched, is a thirty minute car ride from Bolgatanga, the capital city of the Upper East Region, which is located about 830 km to the north of Accra, the capital city of the Republic of Ghana. Nyariga has a population of about 3,000, and most of the inhabitants support themselves by engaging in agriculture in the rainy season. As the Region falls within the savannah climate zone with the temperature ranging between 30 and 45 degrees centigrade, the dry season is long, and the farming season short. Tomatoes, peanuts, gumbos, millets, corn and beans are the main crops of the village. The handicraft of weaving baskets of straw has been handed down from one generation to another, and the so-called "Bolga baskets" constitute a precious source of earning cash income. Most of the inhabitants can weave baskets.

The village has no industry to employ the villagers, and they can only earn income in the short farming season. As a result, an increasing number of villagers have migrated to urban areas for work. As the villagers can only earn money on an irregular basis, they keep little cash savings on hand, and most of them cannot visit the hospital or buy drugs when they get sick or injured.

### 4-1-2 Nyariga Handicraft Association

#### 1) History of Nyariga Handicraft Association

The Nyariga Handicraft Association was founded in 1999. At the beginning, it produced traditional types of baskets like other handicraft organizations, and sold them to the merchants at neighboring markets.

In 2003, overseas traders showed an interest in the products of the Association, and it was decided that the Association would try to produce new types of baskets having higher added values required for export-bound products. Having been provided with the necessary techniques and designs, it succeeded in advancing into the overseas markets. However, it was impossible for the Association to maintain the same level of quality and sustain production, so it requested the author, who was the first Japan Overseas Cooperation Volunteer (JOCV) member dispatched to Nyariga Village in 2007, to provide assistance.

### 2) Recent circumstances and sales results

Representative: one person

Number of staff: three people

Number of members: approximately 400 (350 to weave baskets, and approximately 50 to work on such processes as hand sewing, sewing by machine, and leather processing. 80% of the members are women, and the activities of the Association have extended from Nyariga to surrounding communities and inland villages.)

Annual domestic sales: approximately US $6,000

Annual overseas sales: approximately US $30,000

Annual quantity exported: approximately 5,000 pieces

Traders: Two traders, one French and one Japanese

Photograph 4-1-1: Traditional Bolga baskets

Photograph 4-1-2: Nyariga baskets for export

### 4-1-3 Assistance activities and current situation

#### 1) What was required of the JOCV

The author was requested to work as staff to implement quality control, establish the quality level necessary for export-bound products, improve techniques, strengthen product inspection, review cost and price and expand sales channels to the markets both at home and abroad. Furthermore, the author was also expected to make necessary organizational changes, improve the management of the organization, and implement inventory control.

#### 2) Understanding of the status quo and the problems faced

As Japan was the main market of the products of the Association, what was required most was improvement and maintenance of quality, and strict observance of delivery time. The following are four of the many problems the author faced during the assistance activities.

① When the author arrived at the village, there was no staff in the office, and the representative performed the necessary operations by himself. It was apparently impossible for one person alone to process orders for thousands of baskets and make job arrangements for nearly 400 members.

② Due to the limited production capacity of the small African village, delays in delivery and shortages and returns caused an increase in the cost and inventory of defective merchandise, putting a severe strain on the management of the Association.

③ The basket production work consists of a seven-stage process, and each stage of the process is performed by a different person. However, no well-defined procedure was established for each step, the responsibility of each worker was not clarified, and the instructions were conveyed only orally without any established means of communication. These and other factors contributed to the occurrence of mistakes while at work and delays in delivery, leading to the decreased profits of the Association as well as the villagers.

④ The most important thing for local workers is to feed themselves and their families. "One cannot work with an empty stomach," as the Japanese saying goes, and they were paid in advance for the amount of work they promised to achieve. This wage system of basket weaving was very complicated, and it was necessary to keep records of the amount of work promised and advance payment for each of more than 200 weavers. In addition, they were supplied with the straw by the Association, the cost of which was deducted from their wages as material cost, and the amount of straw supplied was different from worker to worker. When the promised amount of work was completed, the advance payment, material cost and loan, if any, were deducted from the wages for the achieved work to settle the balance. However, the records were not consistently kept and there were inaccuracies due to ambiguous memory, and there were also mistakes in calculation. Among other difficulties, the record-keeping required an enormous amount of time. Furthermore, there were some cases where workers, who had been paid in advance decided to quit the job.

Basket Production Processes

1. Selection of straw → 2. Dyeing → 3. Basket weaving → 4. Attachment of handles → 5. Attachment of leather on handles, etc. → 6. Lining → 7. Manual sewing → 8. Inspection of finished products

Photograph 4-1-3: Straw dyed in various colors
(For export, baskets of the same type need to have the same color, but it is extremely difficult to dye the straw uniformly in the same tone.)

### 3) Efforts to solve the problems

① Investing in personnel and education: Because of the fact that there were both busy and slow seasons and the Association had no regular income, it was financially difficult to employ full-time staff. The necessity of investing in personnel and employee education was explained to the representative to bring about improvement.

As an improvement measure, two assistants, one for the office work and the other for technical support, and a manager were employed on a full-time basis.

To take the lead of nearly 350 basket weavers, they were divided into groups, and a leader was appointed for each group. The leaders were provided with training and lectures on a regular basis so that they could evaluate the production efficiency and quality in their respective groups.

② Holding of educational meetings: With the cooperation of a senior and a short-term member of JOCV, who were specialized in production control and data systems, respectively, the author studied, together with the representative, about the flow of products from receiving the order to production, and the knowhow of operating an organization. A workshop on defective inventory was also held with the participation of the leaders.

Photograph 4-1-4: The leaders burnt the defective inventory, feeling acutely aware of the money and time wasted on the baskets.

③ Clear understanding of the status quo: The author decided to make an all-out effort to have the representative understand the status quo clearly. When an order is received, he should calculate the quantity of materials required to fill the order, and check the existing stock of the materials before placing an order for additional materials. Purchasing unnecessarily large quantities of materials will waste warehouse space, and result in lost and damaged materials. By understanding the production process, the sequence thereof, and the working hours required to complete each step of the process, it is possible to allot the work and plan the working schedule appropriately, thus leveling out the production of the baskets. The understanding of the sequence of the production process will also make it possible to calculate when each material will be needed, and the timely order placement will reduce the unnecessary stock of materials.

When the representative asked the workers the details required to understand the status quo, they had already had the answers to his questions and even the specific numeric data. All he needed to do was to assemble those answers and data in order to describe the whole picture of the status quo. Then, he could predict the problems that might arise, and take necessary measures to prevent them. This was because the workers had realized what was needed to make improvements, but they had never had any opportunity to implement it.

While being engaged in this process, the representative learned a lot about operating an organization, as he saw with his own eyes the cases of unequal wages, existence of busy and slow hours, and the waste of expenses.

④ Registration as members and record-keeping: The author thought it necessary to abolish the advance payment system if possible. However, it had been a long-standing practice, and the workers had taken it for granted. Abolishing the system would mean that there would be no one to work for the Association. Besides, the Association received 20 to 50% of the amount to be paid for the export-bound products (3,000 pieces in average) in advance from the traders.

As substitute measures, the members were registered group by group, and the detailed data of each member was recorded accurately. When the balance between the wages actually earned and the advance payment was settled, the members were ranked according to the level of quality of their work and the time required to finish it. The rate of advance payment, wages, the number of pieces assigned to each member, which had been equal among all members before, were decided according

to the newly introduced ranking. This was intended to ensure fairness in the workplace by treating those who worked hard and those who did not differently.

For the people who had not worked under strict discipline or rules, it was not easy to get accustomed to the merit reward system instead of the equal pay system. In the future, however, it may be possible to introduce a system in which the workers are not paid in advance, and those who have finished the assigned work as instructed are rewarded with a bonus.

### 4) Changes in awareness

In recent years, Nyariga baskets have been exported to overseas markets through the mediation of foreign traders. In the beginning, the local workers thought it burdensome to produce export-bound products using new designs and techniques instead of traditional baskets they were familiar with.

Being excited about the fact that the baskets produced in a small village in Ghana were sold in the faraway Japanese market, the author enthusiastically provided assistance and guidance to the villagers, but could not attain good results for some time after arrival at the village. It is considered that, after being instructed and sometimes scolded about the work by the traders and the author, the villagers acquired a passive attitude toward their jobs, thinking that they were only made to weave the baskets, or doing it for the benefit of the outside people. It took a period of time until they realized that the basket production was an important means for them to feed themselves, and that was why they had to take responsibility and do their jobs perfectly until the products were shipped, regardless of the fact that the baskets were ordered by outside people.

On the other hand, as the consumers in developed countries desire to know about the producer of the product to ensure its reliability, it was necessary for the villagers to know about the users who chose to buy their baskets. They could not understand why the design and size of the baskets they produced had to be as per order, and what was wrong with the delay in delivery. However, their awareness toward basket production gradually changed when they realized that failure to meet the requirement of the consumers (customers) would disappoint both the traders and the consumers so that they would lose their

interest in the baskets, which meant that they would no longer receive orders and thus lose their jobs. The villagers are kind and friendly by nature, and like to entertain visitors. They will be more willing to work if they know how happy the users are to have their baskets.

### 5) Workshop activities

Two workshops are introduced here as examples of the activities that contributed to the change in awareness of the villagers. Both of them were held in collaboration with the Craft Subcommittee of JOCV, which consisted of the members conducting activities related to craftwork among all those dispatched throughout Ghana.

The members of the Craft Subcommittee visited Nyariga Village and held the first workshop extending over four days. At that time, Nyariga Handicraft Association was planning to organize tours for visitors where they could get a hands-on experience of weaving baskets, a specialty of the village. The staff members of the Association were eager to know how they could address the diverse needs of the tourists as well as how to teach them the skill of weaving baskets.

The members of the Craft Subcommittee played the role of the tourists, and learned the history of basket weaving, production processes, dyeing, etc. from the villagers, besides weaving the baskets by themselves. The villagers were obviously perplexed by the situation in which they had to teach basket weaving to foreigners who knew nothing about that handicraft. In particular, they were keenly aware of the language problem.

Based on the simulated interaction with the tourists (consumers), experienced at the hands-on type workshop, the villagers and the author worked together to seek solutions to the problems that might arise in the actual tours. Such efforts were continued in the daily activities of the author.

After that, role-playing was performed to experience the important elements involved in the production and sale of the products. The representative of the Association played the role of an overseas buyer in order to drive home the importance of producing products strictly as per order, observing the quality requirements and delivery time, and establishing a reliable relationship with the traders (consumers). The other villagers participated in the session as producers.

Through those activities, the villagers seem to have obtained a higher sense of purpose and become more motivated, as they discussed with each other more actively about the basket production for the betterment of their own lives.

The second workshop took the form of an event in which demonstration, exhibition and sale of the baskets were conducted. It was held in the latest large shopping mall in Accra, the capital of the Republic of Ghana. The purposes of this event were ① to make the Nyariga baskets much better known in the capital city, ② to cultivate new sales channels to activate the entire craftwork industry in Ghana, and ③ to collect information on the market trends so as to enhance the quality and marketability of the baskets. Five of the basket producers in Nyariga Village participated in the event, and were engaged in such activities as a questionnaire survey, panel exhibition, showing of video movies, and demonstration of basket weaving as well as exhibition of baskets. It was also expected that the participants could directly watch the latest trends in fashion and consumers' needs at the latest large shopping mall where

there are also a lot of foreigners.

While in Nyariga Village, all they did was receive orders from overseas, produce products, and ship them. During the event, they interacted with the consumers, and saw how they chose products and finally bought them. Among other things, the happy faces of the customers when they bought the baskets seem to have given the villagers a high degree of confidence in their products.

### 6) Future expectations

The Bolga baskets seldom discolor, possess sufficient strength, and return to their original shape by moistening them with water if they become deformed. Currently, traditional types of baskets are the main exports, which are shipped to Japan, the United States, and many countries in Europe.

The Nyariga Handicraft Association is exporting new types of baskets with higher added value to the Japanese market. They are available in various colors, and are produced more skillfully. Despite not being well-known in Japan, they are purchased at relatively high prices. Unfortunately, they are still little known elsewhere in Ghana and other African countries. It is hoped that the name and the quality of the Nyariga baskets will be disseminated throughout the country so that they can be exported on a global scale.

As a measure to vitalize Nyariga Village, the Nyariga Basket Association is considering promoting tourism in the village by organizing tours to provide the hands-on experience of weaving baskets. The author earnestly wishes them the best of luck and success in the future.

## 4-2 Role of Producers Associations and Distribution Reform

Based on the case of Nyariga Village mentioned above, this section examines the role of the producers association while looking at the cases of Japanese cooperative associations in their early days. Suggestions are made using examples as to the key points to be noted in organizing the producers, and an efficient method of starting the joint sale and purchase, which are made possible by establishing an association.

### 4-2-1 Necessary perspectives in organizing producers

#### 1) Respect for the rules of the community

It is important to devise a method that can increase the cash income of the producers while, at the same time, preserving and developing the Ghanaian traditional folk art and handicraft (with baskets taken as an example here), together with a system that can be applied to other products such as vegetables, fruits, and livestock products.

The systems of production and distribution currently in effect in Ghana have been elaborated over many years, and they should not be evaluated from the viewpoint of developed countries but should be respected as such.

Since Ghana's independence in 1957, its villages have their own rules which have constituted the basis of the life of the inhabitants for more than fifty years. It is essential that adaptation to the current "market economy" should be planned on the basis of those rules. What the villagers need most is cash. It is important to make them realize that while the efforts of a single individual can not compete successfully against big business, by putting their heads together and cooperating with one another, they can earn greater income.

As the first step, make the villagers aware of the difference between the articles they make for their own use and the "commercial products" that can be sold in retail markets in the villages and cities, and even in overseas countries.

#### 2) Production of "commercial products" and sale thereof

Let the villagers understand that producing "marketable commercial products" by a group of villagers, assigning a specific task to each of them, is more profitable than making products individually in his/her own way using the materials collected from the woods and selling them to a broker.

It is also necessary for the villagers to understand that the method of sale is an important factor to make their products more profitable. In the circumstance where the products are sold to brokers at the buyer's price, the producers cannot know how the prices of their products are determined, and what margin of profit the brokers add to them. It is not until the producers experience for themselves such cases as where products having a similar appearance are priced differently, being usable does not mean being marketable, and a little clever marketing strategy can make the products sellable at a surprisingly high price, that they acutely realize that it is necessary to produce "commercial products" with a group of producers.

In order to create specialties based on the tradition of the village and foster them as its industry, it is

important to establish a system in which the cooperative efforts of the producers can lead to increased income.

### 4-2-2 Start with a retail store

Merchants never reveal the knowhow of trade including the method of setting prices and profit margins. The tactics of trade can only be learned by participating in the business. What the villagers can do readily is to retail the products they produced.

They can sell baskets, handicrafts, vegetables, fruits or whatever they think is sellable at the retail market. If it is difficult to enter into the market for the first time, they can open a street stall by the roadside. It is recommended that such a business be started with two or three people, as they can help one another. After they have become used to the dealings, two of them can go back to their homes to do household duties while one person is attending the stall. If the stall is run by five people, three of them can go home with two attending the stall. By experiencing the actual dealings, the villagers can learn what is sellable and what is not. Moreover, they can realize that the brokers are not a group of cunning people earning a margin of profit without effort, but play a useful and indispensable role of distributing the products in the market. The villagers begin to think what the brokers need.

Once the villagers have acquired the knack of operating a street stall or retail store with a group of people, they can open an outlet store of a larger scale to earn more cash. It is important to start with what they can do now even if they do not have enough funds or knowledge to launch a business.

### 4-2-3 Method of organizing an association

#### 1) Start with organizing a group

If the individual villagers sell their baskets to merchants, the products they produced with sincere earnestness will be bought at an unjustifiably low price. It is difficult for an individual producer to negotiate with the brokers or retailers on an arm's-length basis. It is important that the villagers discuss how to establish a system that enables them to negotiate with those merchants on equal footing.

Make the villagers understand that a cooperative association is intended as a means for them to create their own benefits, and that such an organization should be established voluntarily by the basket producers.

At first, organize small groups of producers. A group can consist of producers in the same community, those who usually produce baskets in cooperation, or the like so long as they can communicate frankly with one another. Start discussions about organizing an association with those groups as the nucleus.

What is important in organizing a cooperative association is not to meet the formal requirements of an association but to focus on the needs of the participants. At the outset of the discussion, place a priority on making arrangements they can agree on regarding preparing bylaws, regulations and rules, which are necessary at the time of official registration.

#### 2) Take advantage of the power of tradition

In spite of the differences in methods of agriculture and livestock farming, every African nation has

customs and rules that require the community residents to cooperate together in order to cope with the harsh natural environment.

Such groups of people gathering under the rules of cooperative work should be transformed into an organization that can adapt to the current systems of politics and economy. Under the circumstance where the villagers do not have enough money in cash to live and the difference in income is widening, it is important to suggest a system of earning money necessary for everyday life.

Even in developed countries, the cooperative associations started in the same way as in Africa. The long-standing customs and rules characteristic of the community can work most efficiently. Furthermore, it takes some time to change the way of life they are accustomed to. A new ready-made system that can bring profits to the villagers in the short run will not take root among them.

### 3) Self-finance the association

A cooperative association is an organization intended to create benefits for the producers on their own, which means that all participants should finance the association to launch it.

It is essential that the amount of the investment should be set at a level that the villagers hoping to participate can afford to pay. It is also possible to make investments with goods (investment in-kind). It is a principle of the cooperative association that every member has one vote. The villagers are to understand that, irrespective of the amount invested, all members are treated equally.

Making an investment itself is important even if the amount invested is small. That will bring the members a strong sense of participation.

### 4) How much money is needed to launch a cooperative association?

The expenses required include ① renting an office, ② office expenses, ③ communication expenses, ④ cost of equipment, ⑤ personnel expenses, and ⑥ registration fee.

Among them, ② and ③ are absolutely necessary. By delaying the registration, ⑥ can be paid at a later time when the money has been earned.

If there are not sufficient funds, devise an inexpensive method of organizing an association. Under the circumstance where no governmental support cannot be expected, the villagers should understand that they cannot secure benefits for themselves if they depend on foreign assistance for funds, or give up launching an association without help from sponsors.

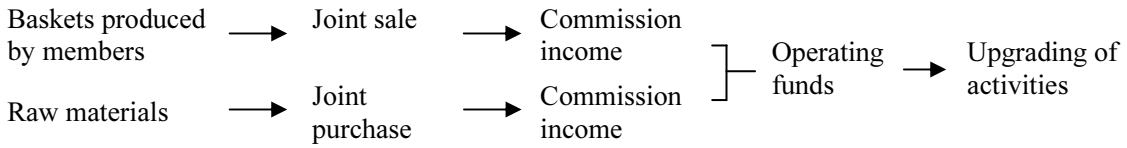
It seems to be taken for granted that they can rely on foreign assistance to provide funds for the initial launch, facilities, and operating funds. This may enable the assisting organization to control the cooperative association as it desires, and it may even be possible that the association will be dissolved as soon as the project of said organization is completed. In the latter case, the villagers may lapse into a condition much worse than before the association was launched. To establish a system in which the local villagers take the lead in operating the association, the key to success is struggling to devise a system on their own.

### 6) Ingenious methods of raising funds

Even an association having a small amount of money can upgrade its activities gradually by starting with

what they can do. First, it can manage to raise funds by following some ingenious methods.

An example of such methods is that the members of the association can jointly sell the baskets they produced through the association. No money is required for this. When the baskets have been sold, a portion of the selling price is paid to the association as a commission, which can then be used as operating funds. By purchasing raw materials of the baskets jointly, the association can also obtain a commission.




### 7) Establishment of an organization under the initiative of the leader

In the early days of Japanese cooperative associations, the landlord of the village, outstandingly good farmers, and others who lived affluent lives and were respected by other members of the community provided their private property to raise funds for launching an association. Such people took the lead in repairing the water channels, planting rice, assisting in rice reaping, giving technical guidance, and other activities. As the villagers cooperated with one another, such gatherings developed into an organization as a natural consequence. In Japan, joining a cooperative association is advantageous to all individual villagers in this way, and all of them became members.

When the necessary funds cannot be raised by the members alone, launching an association under the initiative of the wealthy leaders is an alternative. The important thing is not to be quick to receive foreign assistance.

### 8) Qualifications for the leader

The leader, the president of the association, is the key person of the organization. The leader should be elected by all the members with the candidates being chosen from each group. The roles of the leader include:

① Coordination among the villagers, and

② Negotiation with the merchants to build a cooperative relationship.

As the cooperative association handles the money of the members, the persons who are in charge of its management must be trustworthy. Usually, the secretary takes charge of the accounts as the person responsible for the administrative work. The selection of the secretary must be made very carefully.

The qualifications for the secretary are ① ability to do office work, and ② trustworthiness and a sense of righteousness strong enough to handle the money of others.

The president and the secretary are selected by consultation among the villagers. The secretary is appointed by the president as a matter of formality, but the support from the villagers is indispensable.

(When the activities of the association have developed favorably and need to be expanded further, the leader should also have sufficient connections to raise funds, and be able to negotiate with the governmental offices as his/her qualifications.)

To be recommended as a candidate for the presidency, it is important that he/she is always respected by

the people of the community. The election should be held every four years or so to prevent corruption.

### 4-2-3 What does the cooperative association do for the members?

#### 1) Sale

At first, the association should start with an attempt to sell the products produced by the members to earn cash money. During this process, instruct them how to produce marketable products, and when, where, and to whom they should be sold.

##### (1) Sell on a consignment basis

The association should adopt a system in which it sells the products delivered by the producers (members) not by purchasing them, but on a consignment basis with a fixed-rate sales commission being paid to it by the producers. The reasons for this consignment basis are that the producers can be informed of the sales prices set by the association to keep the dealings transparent, and that the consignment system can prevent the association from the affects of price fluctuations.

The sales operations are the most important activities of the association. Tough negotiations with seasoned merchants and brokers are required, and the appropriate sales staff should be selected and trained while accumulating actual sales experience.

##### (2) Rate of commission, and due date and method of payment should be determined through consultation

When the baskets are produced jointly by more than one member, the payment should be made according to the work done by each member. However, many types of work are involved in basket production ranging from skilled work such as sewing by machine to simple labor work, and some jobs are carried out in the joint workplace while others are performed in the member's home. The method of payment in specific cases should be determined as rules by consultation among the members.

#### 2) Procurement of materials

Observe the traditional principle, "Whatever is in the woods should be shared by all the villagers." The quantity of materials allowed to be collected in a certain period of time should be determined by consultation, and planting should be carried out at the same time to promote the sustainable use of the materials. They are the common property of the community.

When the materials are purchased from other areas, they should be purchased directly from the producers of the materials without the mediation of brokers. It serves as a good opportunity to know that it is important to get better materials at a lower price.

During the period shortly after the launch, when the association has only a small amount of funds to buy materials, start with small purchases that are affordable. This can also prevent the association from causing troubles for the existing material suppliers as they may complain about the direct purchase by the association. If any loan from a public agency is available, it should be utilized. Do not borrow money in advance from merchants, traders, or others to whom the baskets are to be sold. Doing that would leave the association in a weaker position in negotiating the prices of the baskets.

Merchants and trading firms may propose to pay for the products in advance. Receiving advance

payment will make it impossible to negotiate with them on an arm's-length basis. Take some measures by consultation among the members so that the necessary materials can be purchased with the funds and commissions on hand. Such consultation about making the shift with small funds is a part of the necessary activities of the association.

### 3) An example of joint purchase of fertilizer (a Japanese case)

#### (1) Repacking into small bags

Every farmer needs fertilizer, but cannot afford to buy it in a large quantity as it is expensive. Individual farmers purchase 3 to 5 kg or at most 10 kg of fertilizer at a time. The fertilizer traders sell it in bags of 30 or 50 kg, and if the farmers want the traders to deliver the fertilizer by truck, they have to purchase 500 to 1,000 kg of it.

To solve this problem, joint purchasing was devised. The farmers place their orders to the association for the desired amount of fertilizer. The association brings all the orders together, buys the fertilizer from a fertilizer trader in a large lot, and repacks it into small bags of 1 kg and provides the repacked bags to individual farmers. The farmers pay the association for the fertilizer when they receive it. The association pays the trader from the money paid by the farmers. It takes some time after the delivery of the fertilizer for the association to pay the trader, but the association negotiates with the trader to accept the payment condition. If a large order is placed, the trader will make a compromise. The association offers purchase conditions that the trader considers more advantageous than doing business with individual farmers in terms of volume and collection of bills.

#### (2) Checking the ingredients of fertilizer

The quality of the fertilizer depends on the ingredients comprising it. However, it is impossible for the farmers and the association to verify whether the indicated ingredients reflect the actual cotents. Laboratories and universities will not accept a request for investigation made by individuals or groups of farmers, but some of them will undertake the analysis of the ingredients if the association makes a formal request.

Public announcements of the results of such investigations dissuade the fertilizer traders from cheating.

Moreover, if the association expands and places larger orders, the traders will offer better conditions in terms of ingredients, price and payment, and the farmers can obtain fertilizer of a better quality at a lower price.

It takes a great deal of time to establish such an efficient system, but the joint purchase has the potential of bringing a remarkable benefit to the farmers. Even if there are little funds on hand, the offer of a volume purchase can win a better compromise from the traders during negotiation. The joint purchase system can be started easily if there is someone to take the initiative.

#### (3) Seeing is believing.

In order to persuade the villagers to participate in the association, it is more effective to have them experience the merits of the joint purchase of fertilizer and joint sale of their products than to emphatically explain the benefits of organizing it in words.

### 4-2-4 Sale by auction at production center - Expansion of activities of the association

#### 1) Expansion of activities in four steps

The job of selling starts with the retail sale by individuals or a group of villagers at the retail markets or street stalls in the villages. This sales method requires much labor, and the sales volume is limited. As the next step, the association sells the products collectively to expand the sales.

In the beginning, the association sells the products to the retailers in the retail markets in the villages and urban areas. When the association has acquired business knowhow and established a system of business operations after accumulating sufficient experience of sales activities and fully understanding the flow of products, the sales activities should proceed to the next step. A "wholesale market of the production center" should be founded where an open auction is held with the association being the seller, and the brokers and retailers being the buyers.

Such an auction market cannot be operated successfully unless the association has sufficient business knowhow and appropriate human resources. If the association sets the establishment of the auction market as its long-term goal, and makes step-by-step efforts toward it, however, it is by no means difficult to achieve it. It is important to organize a setting where both sellers and buyers can gain benefits.

1st step: Direct retail by the villagers

2nd step: Opening of a retail store or outlet by a group of villagers

3rd step: Organizing an association to sell products to brokers and retailers and export them overseas

4th step: Establishing a "wholesale market of the production center" with the association playing the leading role

#### 2) Sales method at the wholesale market of the production center

(1) The sales are made by auction, and the association sets the ① place, ② date, and ③ time thereof.

(2) The seller is the association, and the buyers are the brokers and retailers registered to the association.

(3) Method of sale:
The products are auctioned one by one, and sold to the buyer who bids the highest price.
The auction is open to the public. Large volumes of products are sold by lots.

(4) Payment is made by cash.

(5) The rules of the auction are established by consultation with the buyers. They are disclosed to the public.

(6) Commission method:
The association sells the products on consignment from the producers, and receives commission from them. The rate of commission is determined by consultation.
The method of settlement with the members and producers is also determined by consultation.

(7) Method of bidding:
Three methods of bidding are currently in practice; ① voicing the price, ② indicating the price with fingers, and ③ writing the price on a board. Method No. ③ is the easiest one. The

buyers write the price on a board with a piece of chalk, and show it simultaneously. The buyer who presented the highest price wins the bid. This method is repeated for all the products. It is a method widely used in Japan currently.

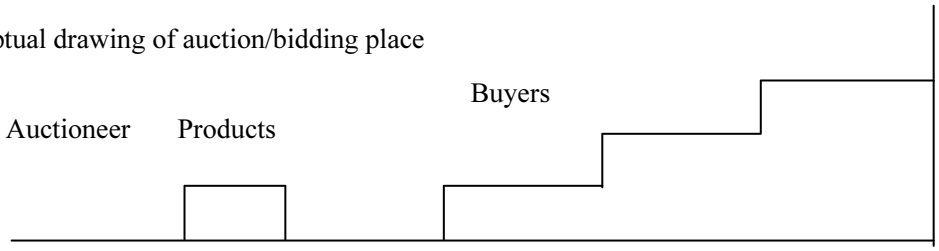
(8) As the first step of the auction, show the brokers products that are considered to attract their interest most, and sell them to the one that offers the highest price. Devise a combination of quality and quantity of products to meet the needs of the buyers. Prepare the time and place for preview of the products.

Being puzzled by this method, the merchants may resist the use of it or even attempt to interfere with it. When they realize that the method is more convenient than the conventional trading practices, they will gradually accept it. By devising an auction method that is more convenient to the buyers, it will become established among them more easily. The merchants are not enemies to the producers but important customers.

When the "wholesale market of the production center" is first launched, various trials and errors are necessary. It is also beneficial to the merchants in that it leads to improvement in buying costs and an increase in profit. Through repeated consultations with them, a reasonable auction method that is most suited to the needs of the local buyers and producers will be developed. It is important to establish a Ghanaian-style auction method.

Once such an open price-building mechanism has been established, the price set at the auction will be used as the guideline of trade in various regions as the "market price of the production center" of Ghanaian baskets.

(9) Conceptual drawing of auction/bidding place




Buyers stand on the stairs. An auctioneer presents the products, and starts the auction.

### 3) Keys to making the market at the production center succeed

① The members deliver all the baskets they produced to the association. The association also sells the baskets produced by non-members on a consignment basis, or persuades them to join it. This means that the merchants cannot purchase baskets from anywhere other than the market run by the association. It is the most important key to success.

② Even if the market is small in scale at the beginning, its merits will be disseminated by word of mouth. As the varieties of baskets become diversified, various types of merchants will gather at the market as buyers.

As they get the baskets they need at the market, they will realize that it is more efficient to utilize the market than to visit the individual producers one by one. The synergy works to expand the activities of the association.

### 4) Merits of the sales method using the market at the production center

① The villagers can readily know what products are marketable at a high price and what are not. Those who produced products sold at a high price will be proud of themselves. It is effective to award prizes to the producers who achieve outstanding sales.

② The brokers and retailers can compare the baskets at the market and purchase those they desire without the need of visiting the producers one by one. They can secure what they need as much as they need, and can obtain information on what the competitors bought. Consult with the buyers to improve the rules of the market so that it is beneficial to both sellers and buyers.

③ As the quantity of products delivered to the market increases, the number of buyers entering the market also increases. When the interested parties realize that the market is beneficial to all of them, they will make efforts to expand the market. Thus, the synergy works to develop the activities of the association.

④ It is motivating for the villagers to see the trading place where the price of their products is determined. They will think about what they should do to increase their income.

⑤ The brokers and retailers may try to resist changes in the method of purchasing products. In the face of the new trend of distribution including the entry of large-scale supermarkets into the country and internationalization, the efficient functions of the market at the production center will be highly evaluated.

## 4-2-5 Entry into the overseas market - Export to developed countries

### 1) The system of sales to overseas markets

The sales system for overseas markets such as Japan and France should be completely different from that for the domestic market. The local villagers can understand what sort of products will be in demand from the brokers and retailers of the local markets in Ghana, but what products would be in great demand in Tokyo or Paris are beyond the reach of their imagination. It is far more difficult for the Ghanaian villagers to imagine such products than for the Japanese handicraft workers to produce products attractive to the people in Ghana.

Unless produced according to detailed instructions with regards to the design, quality of material, feel of the surface and other details, the products made by the villagers will not be marketable in Tokyo or Paris. With respect to the products for export, therefore, the association should place orders to the producers and purchase them by paying cash as promised instead of selling them on a consignment basis. Otherwise, it is difficult to continue the export business over a long run.

### 2) Key points for entering into the markets of developed countries - In the case of baskets and other handicrafts

① Products for export face fierce competition in the market, being selected by the consumers according to their diversified interests and preferences, and they are sold at high prices. As many difficulties are involved such as small sales volume, high transportation cost, high profit margin, need for advertising costs, and risk of dead stock, sales in overseas markets is not very profitable even if the products are sold at a price ten times as high as the buying cost at the local village.

Unlike the sale in domestic markets and markets in neighboring countries, it is a more realistic approach to use the sales channels intended to support developing countries.

② Opening outlet stores in such cities as Tokyo and Paris seems to be unprofitable. It is a good idea to ask the stores dealing in handicraft baskets to set up an exhibition corner for Ghanaian products featuring its culture as an African nation. The baskets may be sold on consignment or purchased by the retailer, depending on the sales conditions.

③ Trading firms are useful when it comes to sales in developed countries. It is difficult for the association to export directly to the retailers in those countries considering the complicated export and import procedures and foreign exchange risk, besides the tough negotiations with the foreign retailers.

It is imperative, however, for the association to obtain accurate information on sales in the retail stores in cities such as Tokyo and Paris. The representatives of the association should participate in the negotiation on the prices and other business conditions between the trading firm and the retail stores without fail. The information obtained indirectly via the trading firm will not be sufficient to persuade the producers to agree on the sales terms in developed countries. The necessary information can only be obtained by participating in the actual business transaction.

### 4-2-6 Role of producers association

This section has summarized the role of the producers association with the focus on basket production. The explanations given here also apply to other articles of folk art, handicraft, and agricultural products as long as the association aims to "take back for themselves the added value created by the producers in the Ghanaian agricultural villages through the activities carried out by their own organization" in order to increase their income.

The activities that can be materialized with the support provided by developed countries will readily bring profit to the local people in the short run, but they have the inherent disadvantage that they will all end in failure once the support is discontinued. Instead of denying the negative aspects of the traditional Ghanaian rural communities, it is important to understand that their products are the gifts of their tradition, and to cooperate with them in establishing an organization that enables them to do business on their own for the betterment of their lives by utilizing such tradition.

Fruits are harvested once annually, while vegetables are harvested two to four times a year. The baskets and other articles of folk art can be produced only during the periods when the materials are available, or in the slack season for farmers. It takes years for the villagers to realize the merits of joint activities.

When the activities of the association have progressed favorably and the joint sale of agricultural and handicraft products has been launched, the villagers can actually experience the benefit of the association as they receive profit. It will certainly take some time to reach this stage.

Therefore, a plan that aims to achieve short-term numerical results will not be successful. It is possible to expect at most that the seeds sown will bud. In Africa, it takes five to ten years after sowing the seeds until a rich harvest can be made.

## 4-3 Development of Agricultural Villages through Utilization of Local Resources

### 1) Utilization of local resources

The one product per one village movement, a measure by the Japanese government to vitalize local communities, has become widely known in overseas countries, and some of the African countries have started to implement the measure. In the case of the Bolga baskets mentioned in this report, the villagers took advantage of the basket weaving techniques handed down to them in the regions in the northern part of Ghana to produce the products that have been enjoying a good reputation in overseas countries. This can be considered as one example of this movement in Africa though the slogan, one product per one village, has not been expressly stated in connection with the baskets. In view of the current circumstances of the African nations, however, not all of them seem to be able to use the same vitalization method in which an increase in income is sought by making use of the local materials and techniques and selling the products outside the local area. It is because, in most of the countries, there are no industries other than small-scale agriculture. Also the population density is low, there are no sufficient networks of transportation including roads and railroads, and their communities are scattered over a wide range of areas and almost isolated from one another. Under these circumstances, it is by no means easy to produce marketable products appropriately by monitoring the market trends and delivering them on time even if the people in those communities have excellent techniques and products. Moreover, regardless of how high the expected profit is, they have no funds to purchase materials for the products.

Accordingly, this section suggests the method of "vitalizing the local communities by utilizing and consuming the local resources (both tangible and intangible)".

It is advisable to use the hidden tangible and intangible resources efficiently, reduce manpower, and use the time saved for other production activities. Locally produce the products purchased from outside the community to the extent possible. The money saved can be used on expenses as the funds for reinvestment. By repeating these activities, the productivity of the community will improve little by little, thus enhancing the living standard of the residents correspondingly. Such "activities of the local residents to utilize and consume local resources" should be widely promoted.

#### Case 1: Increased production and reduction of expenses can be achieved at no cost

In a semi-dry village in the Republic of Zambia, herds of cattle are pastured around it, and their dung can be found anywhere. Cattle dung alone can be used as fertilizer, and mixing it with the residue of agricultural products can produce compost. This will reduce the cost of purchasing fertilizer. The use of organic fertilizer will increase crop yields, and enhance the safety of the products. This in turn promotes the health of the residents and reduces medical expenses. The expenses for fertilizer saved by using cattle dung can be used as living expenses or diverted for investment use, and the reduction in medical expenses can be diverted to education expenses for the children. Emergence of such a virtuous cycle will facilitate the achievement of a self-sufficient society.

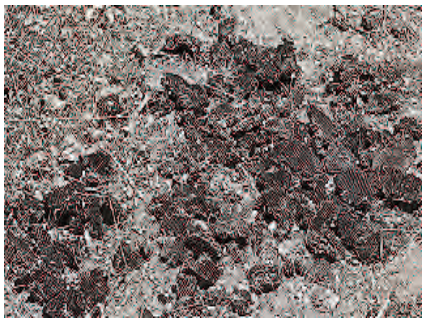
### Case 2: Reducing working hours and environmental preservation can be achieved at no cost

Three stones as large as a man's head are arranged loosely near one another, and long sticks of wood thrust into their center from three directions are set on fire. This is a typical three-stone oven that can be seen anywhere in the country. As the area is highly dry, only low shrubs can be seen around there, and the sticks of wood are precious fuel that must be used sparingly. By arranging the stones more closely and daubing them with mud to bind them together, an improved oven can be made. This will not only reduce the consumption of firewood by half but also shorten the time required for cooking down to two-thirds or one half.[1] As a result, the time spent gathering wood and cooking can be used for other tasks. Furthermore, the use of improved ovens can curb the rate of reduction of woods in the area by half and thus preserve the environment.

By actively eliminating waste in everyday life and "becoming aware" of ways of using the time and resources saved effectively, the clues to the vitalization of the rural communities can be found.

### Case 3: A case where the effective use of resources is possible if a trained expert in development of agriculture or rural communities is dispatched

In a community in a semi-dry area of the Republic of Kenya, honeycombs were left scattered on the ground after a honey badger attacked the beehives. Honeycombs are made of good-quality beeswax, which serves as a material for candles and creams. As it melts under the direct sunlight, it can be processed easily. A glass or dish with melted wax and a string inside can serve as a light. By soaking a string in the melted wax, a long piece of candle can be made without difficulty. It can eliminate the need for going into town to purchase paraffin wax candles, thus saving on household expenses.



Beeswax left scattered on the ground (dark brown matter) (Photographed by the author in Kenya)

[1] Action for a Green Sahel, a non-governmental organization, provided 35 kg of firewood to a family of five in the Abeche region in the Republic of Chad, and measured the number of days required to consume it using a traditional three-stone oven as compared to an improved one. While the former oven used up the firewood in seven days, the latter took 18 days to consume it. The survey in the homes of Raya Therese revealed that the use of an improved oven instead of a traditional one reduced the firewood consumption, time required for cooking, and expenses for firewood by 67%, 27% and 57%, respectively.

Case 4: A case where keen insight of an expert made it possible to apply local tradition to a new product.

To find a handy method of making tofu in Africa, an expert observed the life of the local villagers, to begin with. Finally, he came across a traditional cheese-making method. The villagers mixed the milky liquid of *Calotropis procera*, a plant found everywhere on the roadside of the village, with cow's milk, and boiled them to make cheese. The expert mixed the milky liquid with soybean milk instead of cow's milk, and boiled them to succeed in making tofu. As this tofu-making method applies the local traditional technique, any villager can make tofu. Besides this birthplace of the African tofu, it is currently eaten in many countries in West Africa such as Benin, Ghana, and Cote d'Ivoire.

*Calotorpis procera*

Many difficulties in assisting the development of local communities may be solved easily if advanced technology and equipment are introduced there. However, they may be too advanced for the villagers to master, and require new investment. The existence of an expert who respects the traditional techniques is indispensable in promoting assistance.

It is important to help the local villagers "become aware" of the usefulness of their long-standing traditional techniques, and use them as tools to eliminate waste in their daily life while carrying out activities to improve their living.

### 2) Through the eyes of a third party

The local villagers may become aware of the usefulness of their tradition through the eyes of a third party. An outsider can notice the tangible and intangible property left untapped in the community more easily, and implement improvements without being a victim of convention. On the other hand, if the person involved in assistance activities stays in the same community for a long time, it is possible that the residents may become dependent on such a person and lose their enterprising spirit. It is appropriate, therefore, that the foreign assistant should participate in the early stage of the activities only, and that the later stages should be left to the voluntary efforts of the local administrative bodies and the residents.

What an expert or a volunteer can do to improve the wide range of life and production activities of the residents is very much limited. It is important to build a network among the people involved in assistance activities and officials in administrative bodies to keep oneself always in touch with the latest information so that it can be reflected in the community in charge.

Experts should respect the local culture, be positive so as to become interested in anything new to him/her, and should be flexible enough not to be too insistent on his/her own techniques or experiences.

To help the residents become aware of their hidden resources and maintain the improvement activities for a long time, the existence of the dissemination staff and the community leader is indispensable. It is important to have them understand that the dissemination staff cultivates the soil, the leader sows the seeds, and the community residents supply the water by themselves to foster their activities. The role of the assistance organization is not to take the lead in the activities, but to foster the dissemination staff.

For that purpose, the assistant should provide hands-on training to the staff while consulting with each other every time an issue arises.

### 4) Fostering leaders and the residents' willingness to improve

Rural communities tend to be conservative. The hidden property found will not yield benefit unless the residents are willing to implement the improvement activities on a continuous basis. For that purpose, the community leader should understand the importance of the activities and take the initiative of promoting them to achieve success.

The farmers are busy doing their daily work to earn their living, and have no time to participate in new enterprises. The dissemination staff and community leaders should gather the residents, summarize their talks about the advantages of the community, and discover the hints of the hidden resources in addition to arousing their interest in the activities and making them willing to participate in them.

A workshop is an effective method of grasping the views of the residents. In Japan, the dissemination and other staff repeatedly visit individual residents to listen to their talks over cups of tea. Important hints for the activities can be obtained on such occasions, which means that it is important to develop a relationship built on trust. During the workshop, do not attempt to search for issues. Finding hidden issues may make the residents concerned about issues that are not really all that important, causing them to be more dependent on the administrative bodies and assistance organizations. The purpose of a workshop is to discover the advantages of village cooperation and to make the residents more confident and proud.

### 6) Holding exchange meetings among communities and villages

Information and human exchanges between producers and consumers, among fellow producers, and among producers in neighboring communities are essential for understanding the needs of each person or group and building their awareness toward improvement. It is hoped that communities and villages conducting similar activities should establish collaborative relationships and further promote their own merits by creating a synergistic effect.

The residents devised the tools that were the most appropriate for their lives, and handed them down from generation to generation, while adopting the techniques used in the neighboring communities during the course of that time. By promoting exchanges among communities and villages, it is possible for the residents to look at the techniques and customs of their own in an objective manner. They may be proud if some of their techniques and customs are superior to those of others, and may be willing to adopt those of others that are superior to their own. In the communities and villages located near the place of consumption, exchanges with consumers may make the residents become aware of the hints for improvement.

## 4-4 Fair Trade of Fiber Products

### 4-4-1 Outline of fair trade

Fair Trade is a concept that aims to build a fair trading relationship between the producers in developing countries and the consumers in developed countries, and its market size has been expanding rapidly in recent years.

Various Fair Trade organizations are operating their activities around the world, and there are roughly two approaches for putting this idea into practice. The first approach is the method of notifying the consumers that the specific product is offered under the framework of Fair Trade by putting a certification label on it ("Certification-Type"). Fairtrade Labelling Organizations International (FLO) is the representative organization adopting this approach. FLO certifies the products listed in Table 4-5-1, and to acquire the certification, they are required to meet the standards specified for each of the listed products (see Table 4-4-2). Most of the products subject to the certification of FLO are food products, and the only fiber plant product covered by the list is cotton.

Table 4-4-1: Products subject to the certification of Fairtrade Labelling Organizations International (FLO)

| Food | Other than food |
|---|---|
| Bananas | Flowers and plants |
| Cocoa | Cotton |
| Coffee | Sports balls |
| Fresh fruit/vegetables | |
| Honey | |
| Juices | |
| Rice | |
| Herbs and spices | |
| Sugar | |
| Soybeans and pulses | |
| Dried fruit | |
| Quinoa | |
| Tea | |
| Wine | |

Source: FLO Website

Table 4-4-2: Standards of FLO certification (excerpt)

| Trade standard | Standard for small producers' organizations | Standard for hired labor situations |
|---|---|---|
| Establishment of traceability | Democratic operation of organization | Prohibition of child labor |
| Mutual agreement between producer and purchaser in contract | Adoption of environmentally friendly production method | Warranty of workers' rights |
| Long-term continuation of trade relationship | Prohibition of discrimination in connection with operation and membership of organization | Maintenance of safe working environment |
| Partial advance payment for products | Prohibition of production of genetically modified organisms | Implementation of community and social development project |
| Guarantee of minimum price and payment of premium | Compliance with ILO Treaty provisions pertaining to working conditions | |

Source: FLO Website

The second approach for putting Fair Trade into practice is the method in which a specific Fair Trade organization exclusively controls the whole supply chain process from production of merchandise to retail sale ("Partnership-Type"). An organization that aims to put into practice and disseminate the idea of Fair Trade plays a central role in all aspects of the Fair Trade activities including provision of guidance to producers, purchase of products, import and sales, and actively provides the consumers interested in the products with information about the producers. The most distinguishing characteristic of the Partnership-Type approach is that the Fair Trade organization does not deal in limited categories of products but in any type of product that falls within the framework of Fair Trade. Most of the fiber plant products distributed in the Fair Trade markets throughout the world are under the control of such Partnership-Type Fair Trade organizations. The World Fair Trade Organization (WFTO)[2)], a controlling body of the Partnership-Type Fair Trade organizations, has its own code of conduct (see Table 4-4-3), and only the Fair Trade organizations that comply with it are authorized to use the WFTO mark (see Fig. 4-4-2). It is a so-called Fair Trade certification mark for the Fair Trade organizations, which warrants that the products sold by the organization using the mark are all offered under the framework of Fair Trade.[3]

[2] FTO was formerly known as the International Fair Trade Association (IFAT), and renamed to the present name in 2009. "Certification-Type" and "Partnership-Type" approaches to Fair Trade are not mutually exclusive, and it is not unusual that the products sold by a member organization of WFTO bear the certification label of FLO.

[3] There are many Fair Trade organizations that are carrying out their activities without WFTO membership. The fact that they are not WFTO members does not necessarily mean that their products are not in accordance with the valid concept of Fair Trade.

Table 4-4-3: Code of conduct of WFTO

| |
|---|
| 1. Creating opportunities for economically disadvantaged producers |
| 2. Operation of organization ensuring transparency and accountability |
| 3. Realization of a fair trade relationship |
| 4. Payment of a fair price |
| 5. Prohibition of child labor and forced labor |
| 6. Non-discrimination, gender equality, and freedom of association |
| 7. Securing of a safe and healthy working environment |
| 8. Capacity building of producers |
| 9. Promotion of Fair Trade |
| 10. Environmentally friendly production |

Source: WFTO Website

As of the time when this report was written (January 2010), the WFTO had not yet launched a project to authorize the use of the Fair Trade certification label on individual products. As the FLO certification does not cover handicraft products, there is growing demand by the producers in developing countries to attach a Fair Trade certification label on such products. The WFTO has been considering a system of certifying not only the organizations but also the products on its own (according to the WFTO website). If the WFTO's system of certifying products materializes in the near future, many of the fiber plant products are expected to be subject to such certification. Special attention should be given to the future trends of the WFTO.

### 4-4-2 Fair Trade of fiber plant products

In the world market of Fair Trade products, the "Certification-Type" Fair Trade products bearing FLO's certification label account for 90% of the total volume of sales, and the market share of the products sold by the "Partnership-Type" organizations has remained at 10% (Krier, 2008). Fiber plant products excluding cotton products are a part of those sold by the "Partnership-Type" Fair Trade organizations, which account for 10% of the total sales volume, meaning that the share of fiber plant products in the total sales of the Fair Trade products is by no means large. Also, the items of fiber plant products distributed in the Fair Trade market are limited in number (see Table 4-4-4), and the size of their demand is far smaller than that of food products, which enjoy extensive and continuous demand. The sales of the main "Certification-Type" food such as coffee has been expanding rapidly, as leading retail chains including supermarkets have launched their sale. Due to their nature, it is difficult to distribute fiber plant products via the sales channels of such large-scale retail chains, and they are sold through a limited range of sales channels, namely, retail stores dealing in Fair Trade products, or mail-order sale. As mentioned above, fiber plant products are different from the majority of Fair Trade products such as food in terms of market size and sales channels. They constitute their own niche market within the market for Fair Trade products, which itself is already a niche market.

Another distinguishing characteristic of fiber plant products is that they have to face more fierce competition with other similar products. Most of the products subject to the FLO certification are

large-volume consumer items, which are almost identical with other general products in specifications, quality, and external appearance. When they are exhibited together in the same space in the retail store, the fact that "they are Fair Trade products (with the certification label attached)" itself is an advantageous factor that can differentiate the Fair Trade products from other general products to make them stand out. On the other hand, in the case of fiber plant products such as bags and baskets, the consumers place prime importance on the design, quality, functionality, fashion, etc. of each product. The superiority of being Fair Trade products diminishes, and the consumers will not be interested in the Fair Trade products if they are inferior to other products in design and quality. Fiber plant products should be attractive in their own right without expecting to take advantage of the Fair Trade branding.

Therefore, it is necessary for the producers of fiber plant products intended for the Fair Trade market to obtain accurate information on the needs in the consumer countries (developed countries), the characteristics of marketable products, the designs and functions required by the consumers, etc., and take appropriate measure to address them. It is difficult for the producers alone to obtain such information, and close collaboration in partnership with the Fair Trade organizations in the consumer countries is essential. Furthermore, the partners in the consumer countries need to be involved in the entire process of production as actively as the private competitor manufacturers of similar products by making such efforts as developing products that meet the needs of the consumers and providing feedback of the knowhow thus obtained to the producers. The days when the existing products were imported and sold as Fair Trade products without making any changes are gone. Both the producers and the Fair Trade organizations in the consumer countries should acquire an ability to develop products that can survive the fierce competition with the competitors, and make strenuous efforts in sales promotion.

Table 4-4-4: Examples of Fair Trade organizations selling African products using fiber plants

| Name of Fair Trade organization (country) | Product (raw material) | Producing country |
|---|---|---|
| SERRV (U. S.) | Basket | Uganda, Rwanda and Ghana |
| | Bag (sisal hemp) | Kenya |
| Traidcraft (U. K.) | Basket (oil palm) | Malawi |
| Ten thousand villages (Canada) | Tablecloth | Burkina Faso |
| | Basket (raffia) | Uganda |
| Fair Trade Company (Japan) | Bag (baobab fiber, sisal hemp) | Kenya |

Source: Website of each organization

<Reference>

1) Kitazawa, Kou (2007) "Mystery of Japanese Fair Trade", [at], Vol. 8, pp. 80-87.

2) Nagasaka, Toshihisa (2009) "Fair Trade Markets in the World and Japan", Akashi Shoten

3) Fisher, Eleanor (2009) "Introduction: The policy trajectory of fair trade", *Journal of International*

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4) Krier, Jean-Marie (2008) *Fair Trade 2007: new facts and figures from an ongoing success story - A report on Fair Trade in 33 consumer countries*, Dutch Association of Worldshops.

5) World Fair Trade Organization and Fairtrade Labelling Organizations International (WFTO & FLO) (2009) *A Charter of Fair Trade Principles*.
(http://www.fairtrade-advocacy.org/images/charterfairtradeprinciples.pdf)

6) World Fair Trade Organization (WFTO) website (http://www.wfto.com/)

7) Fairtrade Labelling Organizations International (FLO) website (http://www.fairtrade.net/)

## 4-5 On-Site Report of Development of Fiber Products - The Case of Oudomxay, Laos

Taking up as an example the activities for the development of fiber products in the Lao People's Democratic Republic (Lao PDR), a project which the author carried out under the United Nations Development Programme (UNDP) and with the financial support of Japan International Cooperation Agency (JICA), this section explains what it means to develop products out of the fibers that the local residents have gathered in their sphere of life to use for their living in order to increase their income, while touching upon the changes in their awareness and the processes required for commercialization. The viewpoints and procedure required in developing fiber products can be widely applied to other regions of the world including Africa. It also described what was necessary and what was to be focused on during the process from the search for fibers available for commercialization up to the sale of finished products. The author hopes that this on-site report of the fiber product development will prove helpful to those engaged in the corresponding activities in Africa.

### 1) Search for fibers

As a member of the staff in charge of product development in the Income Generation Activity (IGA) project, my duties were to find potentially profitable fiber products from within the sphere of daily life of the local residents who lived in a mountainous region and had no means of earning income, and to establish the sales channels for the products, thus improving the income of the residents. The first thing I did after the arriving in the region was to visit the village frequently, and check their living implements. At the beginning of such occasions, it is important to visit the residents together with a person trusted by them. This makes it possible to search inside their houses and around their sphere of living, and to hear what is actually on their minds. In other words, it makes it possible to build a relationship of trust, which is the most important key to success in developing products in cooperation. Moreover, the names of the fibers the villagers have planted for a long time will not be uttered in the formal interview. They are deeply rooted in their daily lives, and are not worthy of special mention. Such buried fibers can only be found by walking around their houses and sphere of life as a trusted friend.

As a result of such efforts, three natural fibers were found as potential materials for product development; manually-spun cotton yarn of the Lao Lue tribe, yarn of the Khmu tribe, which is spun from the kudzu vine of the pulse family, and hemp yarn of the Hmong tribe. Here, the product development using yarn spun from kudzu vine is introduced.

The peoples using Austro-asiatic languages such as the Khmu tribe are living extensively on the Indo-Chinese peninsula, and they have traditionally knitted bags and fishing nets out of yarn spun from the kudzu vine. After repeated moves required by the migration-to-lowlands policy of the Laos Government, the Khmu tribe is now living in the northern part of Laos, and spinning of kudzu yarn is no longer a part of their daily lives. Therefore, the process of gathering fibers was nothing but a "troublesome" chore they did not usually have to do. At the beginning of the product development, they could not associate the resumption of the troublesome process with the improvement of their income, and participated in the activities quite reluctantly.

### 2) Building of a group and spinning of kudzu yarn

What motivates the conservative villagers most is the actual experience of earning money from their activities. It is difficult to make them willing to participate in the activities of commercializing fiber products using a tradition that was almost abandoned. Once they have actually received money, however, their awareness changes abruptly, and the product development activities progress smoothly.

Next, group building is an important procedure of fiber product development.

When the villagers are reluctant to join the activities that are completely new to them as mentioned above, the existence of a leader is indispensable for helping them take the first step. The leader should be familiar and a person who is trusted by the villagers. By building a group together with such a leader, they gain the awareness that they are cooperatively engaged in the new activities as well as having a feeling of security.

As the leader takes the active initiative, and the group goes through the process such as the gathering of kudzu, collection of fibers, and spinning of yarn in close cooperation among the members, group awareness will be fostered, which is an important factor to advance the fiber product development.

Photograph 4-5-1: Only the bast fibers of kudzu are collected and dried.
Once they have been dried, they can be readily worked on. The villagers spun yarn when they had time to spare while doing household duties, caring for children, and doing farming work.

### 3) Elaboration of products as articles for sale

When the yarn has been completed, a product is developed by using it. A bag knit with good-quality kudzu yarn looks beautiful and is of great value. As articles of merchandise, however, there was much room for improvement. The joints of yarn thrust out from the bag, and the handles were made of plastic yarn, spoiling the beautiful gloss of the kudzu yarn. Moreover, to elaborate the products to make them attractive enough to arouse the interest of the consumers, it was necessary for the villagers to understand the basic concept of quality maintenance. It took two years until a certain fixed quantity of good-quality yarn could be supplied on a stable basis.

### 4) Limitation and future tasks of the public assistance organization

The most regrettable thing about the IGA project run by the UNDP was that it was impossible to carry out

sales promotion activities actively. Sales promotion activities mean, in this case, a partnership with private enterprises for the purpose of securing sales channels for the fiber products. It is by no means easy to create products that private enterprises desire to handle by forming a partnership. In order for the villagers to earn income from their fiber products on a continual basis, the public assistance organization, which can be involved in the development activities for a few years, can contribute to that purpose only to a limited extent. Viewed from another angle, forming partnerships with private enterprises located adjacent to the consumers and the market, and assisting them is part of the development activities aiming to secure the stable source of income of the villagers. Long-lasting improvement in their income through the sale of their products cannot be expected unless profit-making enterprises are involved.

The most important benefit that the public assistance organization can provide in participating in the project of developing fiber products is that it can foster the human resources required for that purpose. In developing countries, the idea of finding potential fibers in the village that had been hidden from plain sight and developing them into profitable products cannot be fostered easily. Even if such products can be successfully developed, the spirit of entrepreneurship required to make profit from them, maintain the profit, and further expand it is difficult to accomplish. Both capabilities are the minimum requirements for developing and selling products, and gaining profit continuously. If such capable persons are nurtured in remote isolated regions far away from the capital of a developing country, the local village would acquire the potential for developing fiber products on their own without any help from foreign experts. This will have a huge positive impact on the villagers. A few training experiences are insufficient to nurture the human resources. When working with counterparts (C/P) in a long-term project, the assistants should do their utmost to nurture not only the capability for doing the jobs actually assigned to them, but also the capability required for the future development of the local village. It is the most important task that the public assistance organization should perform, and should never neglect. The buyers interested in the native products are concerned mostly about whether the local producers have a strong sense of commitment and responsibility. Profitable native products can be developed only if the producers desire to make even larger profit out of them. Through a series of activities experienced in Laos, the author is convinced that the successful activities of fiber product development that brings long term future profits can only be realized by nurturing local experts who can fully participate in it and a spirit of entrepreneurship to seek expansion of the activities as a business.

### 5) Conclusion

The process and tasks of fiber product development mentioned above are only those experienced in Laos. To find potential fibers and assess the feasibility of developing products using such fibers, it is absolutely necessary to understand the background of the country including its culture, economic infrastructure, and regional development. Without such consideration, there is likely to be a risk of causing confusion in the region. Whether in Asia or Africa, this is the basic understanding that every assistant to be engaged in a project of developing native products needs to have. It is also important that the local capable persons, who understand the local region most, should take the initiative in the project, while necessary training and education should be provided to them so as to nurture them.

The procedure of fiber development can be summarized as mentioned in the case of Laos above. However, the regional development including fiber development is multifaceted, and considering the

backgrounds specific to each region, there are as many methods of regional development as there are regions, so to speak. Based on this understanding, the minimal objectives required in developing fiber products based on the sustainable development of the village are listed as follows:

① Make the direction of the development consistent with the regional development policy of the local government.

② Focus on the traditional techniques.

③ Do not introduce techniques new to the villagers.

④ Nurture human resources capable of participating in product development.

⑤ Foster a spirit of entrepreneurship.

⑥ Form a partnership with private enterprises.

The introduction of new techniques mentioned in ③ will be made possible when local persons capable of looking at the project from a long-term perspective have been nurtured, and the villagers involved in the product development have been fully motivated. It should be kept in mind that putting more emphasis on new techniques and new designs from the outset may cause confusion among the villagers and even invite intense resistance.

The methodology of fiber development in a region should be established by the persons who are involved in the region's future by taking time to fully understand the circumstances thereof. In order to develop the local materials and expand the business, understanding the region is as essential as finding the potential fibers. The author wishes the very best of luck and success to the persons to be engaged in the fiber development projects in local regions.

# Chapter 5 Fiber Plants and Their Cultivation

This document has so far mainly discussed fiber products. This chapter reviews fiber plants, which are raw materials, and summarizes the characteristics and the growing environment/cultivation environment needed to conduct sustainable economic activities. This chapter summarizes the use of fibers as general information, not limited to the scope Africa only.

In addition, the transition to cultivation of rattan as a commercially viable tree species, which is progressively being more and more over harvested, is examined.

## 5-1 Fiber plants of Africa

### 5-1-1 Bamboo; Gramineae

#### 1) Bambusa vulgaris Schrad. (*Bambusa vulgaris* Schrad.)

This bamboo grows in areas from Southeast Asia to the Pacific islands and also has been introduced to Africa.

The stems are used as building materials and materials for other bamboo wares including vases, plates, strainers, screens, shakuhachi flutes, bows, bamboo swords, bamboo brooms, and bamboo rakes.

To propagate this bamboo, dig out a first-year underground shoot with a 40 cm to 50 cm in long stem attached, just before the appearance of bamboo shoots, and transplant it. Alternatively, cut a first or second year bamboo into sections (every 3 to 4 joints), insert only 1 to 2 joints into the ground or bury it horizontally about 20 cm deep. After planting, protect the plant from the sun and give it water. After new shoots appear, apply fertilizer, and cut off the stem after 4 to 5 years, leaving the young stems.

### 5-1-2 Sisal (*Avage sisalana* Perr. et. Engelm; Amaryllidaceae)

Sisal originated in the Yucatan Peninsula of Mexico. As sisal is also suitable for the climate of the savannah region of Africa, it is widely cultivated in East African countries such as Kenya and Tanzania for fiber production.

Fibers are extracted from the thick leaves of sisal to produce strings, ropes, bags, mats, brushes, and rough fabrics. The fibers are also used as raw materials for paper. Fibers need to be extracted from the leaves within 24 hours after they are collected. Fibers that are produced through a fiber processor are dried under the sun and are used as materials for various products after being bleached white. The sap produced from the cut section of a scape is sweet and alcohol (Pluque) is produced by fermenting.

For the propagation of sisal, a bulbil that grows at the tip of a scape or a suction bud that grows from the side of the stem is used. The plant prefers a mild dry climate with an average annual temperature of 23°C or higher and an annual rainfall of 1000 mm or less. It grows in most soils, however, it grows particularly well in an alkaline soil. Bubils and suction buds are kept in a nursery garden for about one

year and then are transplanted into a garden. Crops can be harvested four years after the plants are settled and harvesting is possible for up to 10 years.

### 5-1-3 Palms: Palmae

#### 1) Rattan (*Calamus rotang* L.)

In English, it is called Common rattan palm or Cane palm. The photograph shown here is one of the typical species. Rattan originated in Tropical Asia in countries such as Bengal, Assam, Sri Lanka, and Malaysia and it is also widely distributed over the tropical zones of Australia and Africa.

The generally thin stem grows up to several tens of meters and attaches itself to other objects with hooks in the same manner as vines. Some long stems reach up to 100 m to 200 m. The stems are torn up or skinned and used for making walking sticks and baskets, or furniture such as chairs and beds. The trees are sometimes planted in gardens and pots as ornamental trees.

In general, wild plants are used and the plants are hardly ever cultivated. Growing from seeds may be a suitable means of propagation. The wisteria family requires lots of sunlight, as insufficient sunlight inhibits the growth. In the jungle, rattan is maintained at a length of up to 30 cm. If it is exposed to sunlight after the top trees are cut down or fall down, it grows rapidly and thrives in the forest, covering the canopy. The stems, which grow up to substantial lengths without branching out, are cut into 10 m pieces, left in the bush until the spiky sheaths are decomposed, and then transported for use.

#### 2) African wild date palm (*Phoenix reclinata* Jacq.)

African wild date palm is a typical palm plant that grows naturally in Tropical Africa and has spread from Tropical Africa to South Africa.

In the production region, leaf fibers are used as the material for fabrics (rabane), bags, and weaving. Alcohol is produced by cutting the flower ears at the middle and collecting the sap.

In general, fibers are collected from wild plants and the plants are not cultivated. For propagation, growing from seeds is suitable. Since it also branches out, the plant may be propagated by inserting a suction bud. Transplantation is not difficult and the plant has high environmental adaptability.

#### 3) Raffia palm (*Raphia ruffia* (Jacq.) Mart.)

Raffia palm originated in the Equatorial regions of East Africa and Madagascar and currently spreads in the swamps and riverbanks of these regions. Raffia palm is a single-trunk palm plant reaching a height

of 2 m to 10 m.

The plant is mainly used for its fibers. The fiber (raffia fiber) collected from the surface skin at the back of the young pinna is flat, soft, strong, and does not stretch or shrink easily. The fibers are used as materials for fabrics (rabane), bags, and weaving (hats, baskets, etc.). The plant is imported to Japan also as a binder for grafting and induction and also as a raw material for paper. The scaly skin of the fruit is used as a craft material. The sap produced from the penduncle is used for sweetened beverages (harafa) and alcohol.

Recently, cultivation of raffia palm is under experimentation; however, in general, wild palms are used. Since the palm forms a single trunk, growing from seeds is a suitable means of propagation. Germination takes several days after the seeds are planted and the germination rate is low. Since the root area must be kept moist, a high moisture retention soil is suitable and sandy soil is unsuitable. The growing temperature is 15°C or higher.

A related species, Wine raffia-palm (Bamboo palm, *R. vinifera* Bauv.), originated in Nigeria and grows wild in the coastal region of Tropical West Africa. The stem is shorter than *R. ruffia*, however, the leaf stem is longer. The leaf fiber (piassaba fiber) is used for industrial art and handicraft products, as is the raffia palm. The hard vegetable ivory is used as the material for buttons. As alcohol (toddy and bourbon) is produced using the sap collected from the shank of the flower ear, the palm is also called wine-raffia palm.

### 4) Fan palm (palmyra palm, *Borassus flabellifer*)

Fan palm that originated in Tropical Africa is cultivated in India, Sri Lanka, Myanmar, Malaysia, and Thailand.

The leaves are used for the raw material for paper, roofing material, mats, baskets, ladles, and ethnic musical instruments. Fibers are collected from the leaf stems also. The timbers are used as building materials and decoration materials (the timber is hard and insect-resistant). Fibers are collected from the inside of the timber also. Fibers are also collected from the exterior skins of nuts. The sweet sap, which is produced from the cut section of the flower ear, is used for making sugar, alcohol, and vinegar. The core of a young bud is used in soup and palmito salad.

In general, the plant is propagated from seeds and it takes about 10 years to bear any fruit. A related species is *B. aethiopum* Mart., which grows in Tropical West Africa. Although it is not clear if the plant is used for fibers, however, it is likely to be used as a similar plant. The fruit turns a yellow orange color when it ripens and is eaten raw. The albumen of an immature seed is also eaten raw.

### 5) Oil palm (*Elaeis guineensis* Jacq.)

Oil palm originated in Tropical Africa and is cultivated in tropical areas worldwide.

The leaves are used as materials for roof thatching and mats. For oil extraction, the palm is cultivated commercially on a large scale in the tropical zones worldwide.

Although many leaves sprout and grow, in general, about 40 to 50 leaves are kept and the remaining old leaves are removed. The plant is a monoecious plant; however, as the flowering timings of stamen and pistil do not match, pollination within the same plant hardly ever occurs and pollination relies on insects or wind under natural conditions. Normally, in commercial cultivation, artificial pollination is applied. The seeds have a latent period and it takes three to six months or more for the seeds to germinate under natural conditions so that germination occurs unevenly. The desirable cultivation environment is an average annual temperature of 24°C to 30°C, rainfall of about 3000 mm, sunny, and well-drained rich soil.

### 6) Coconut palm (*Cocos nucifera* L.)

Coconut palms grow in tropical seashore areas worldwide.

Fibers (coir) of the seed vessel of the fruit are used for ropes, scrubbing pads, and coir yarns. The fibers are light and strong, and to collect high quality fibers, fruits are harvested for use one month prior to full maturity. The shells of the inner seed vessels are processed for containers, buttons, and figurines as well as fuel and palm shell activated coal. The activated coal is also popular for use in factories due to its high gas absorbability. It is also used for refrigerator air fresheners. Rice is cooked by wrapping it with a basket of undeveloped leaves, and dried young leaves are used for mats and baskets. Matured leaves are used as the material for thatching. The trunks have a high water-proof feature and are used for posts and bridge piers. By chipping the hard material, in particular, the dense outer section, various cooking utensils and figurines are produced.

For cultivation, in general a fruit (seed) is collected from the plant that bears high-quality fruits and the seeds are used for propagation. Seeds are planted sideways in a nursery field. The seeds germinate in around one month from micropyles without having any latent period, and take root in about 40 days. The plants are settled in the main field in around 10 months. The planting interval is 9 m to 10 m. The palm bears fruit after three years. The maximum commercially viable tree age is about 50 years. The palm prefers alluvial soil with rich organic matter and lime. It requires an average annual temperature of 20°C or higher. It requires rainfall of 1500 mm to 2000 mm and prefers conditions of strong sunlight and the seashore, estuaries, and riversides with a constant gentle breeze.

### 5-1-4 Cyperaceae

#### 1) Jointed flatsedge (*Cyperus articulatus* L.)

Jointed flatsedge, which is a Cyperaceae plant, originated in Tropical Asia and grows in tropical areas worldwide, North and South America, Central and South America, Asia, Africa, and Australia. The perennial grass grows in freshwater wetlands such as swamps, lakes, and channels.

Dried stems are used as the materials for mats, and split stems are used for baskets and bags.

The plant can be propagated by division; however, in general, the ones that grow wildly in wetlands are used. A similar plant is Scirpus tabernaemontani (*Schoenoplectus lacustris* (L.) Palla subsp. *Validus* (Vahl) T. Koyama) of Cyperaceae.

#### 2) Papyrus (*Cyperus papyrus* L.)

This famous plant known as papyrus originated in the areas from Egypt to Palestine and grows in wetlands and swamps in Tropical Africa, Middle and Near East, and Southern Europe.

In the era of ancient Egyptian culture, the stems were used for reed boats and fibers were used for paper. In general, the plant is used very widely and not only as the material for ropes and weaving. It is also used for walls, mats, baskets, simple houses, and fences for livestock barns.

Although papyrus is not artificially cultivated, the plants growing in swamplands are harvested, dried, and used. It can be propagated by division.

### 5-1-5 Trees

#### 1) Baobab (*Adansonia digitata* L.): Bombacaceae

Baobab, which is a giant deciduous tree, originated in the savannah region of Tropical Central Africa and grows in Africa, Madagascar, India, Sri Lanka, and South America.

Fibers are collected by peeling off the bark and are used for bags and strings. The fruits are eaten raw and consumed as drinks. The young leaves are edible. The leaves are also used as medicine. Cooked seeds are used as food or medicine. The green fruit is used as floats for fishnets.

The tree is propagated from seeds. Propagation by cutting is also possible. Seeds germinate quickly soon after planting. The tree grows quickly. Baobab prefers a dry land with good sunlight and drainage in the subtropical and tropical zones.

### 2) Kapok (*Ceiba pentandara* (L.) Gaertn.); Bombacaceae

The origin of Kapok is unknown; however, the tall deciduous tree may have originated in Africa or tropical America. The tree mainly grows in those regions as well as the tropical regions of Asia and the islands of the Pacific Ocean.

Young fruits are used as food (vegetable) and seed oil is used as food or soap material. The fibers surrounding the seed are long and have high durability and resiliency. Kapok is used for cushions, pillows, mattresses, filling of chair cushions, soundproofing, insulation material, and raw cotton. By combining with other fibers such as cotton, the fibers are also used for silk cotton, velvet, rugs, lace, and felt hats. The timber, which is light and strong, is used for dugout canoes, furniture, wood carving dolls, and bodies of drums and violins. The fibers that are collected from the bark are used as materials for paper and ropes.

Kapok, which is cultivated in various areas of the tropical zone, prefers mild rich soil. Kapok prefers the areas with a definitive dry season and a rainy season with low rainfall during the harvesting period. Kapok is propagated using seeds or by cutting. The tree reaches a fruit bearing stage in five to six years. When the outer skin of a green fruit becomes brown and shows wrinkles, the crop is harvested and the fibers are extracted.

### 3) Bark cloth fig (*Ficus natalensis* Hochst.): Moraceae

The origin of bark cloth fig is assumed to be the South African region. This medium-height evergreen tree grows in wide areas of the tropical African region.

Bark fabrics are produced from this plant by peeling off the bark and the fabrics are used for religious garments and for wrapping dead bodies. Recently, the bark is also used as the material for bags and pouches. The body of the tree is used for shading and as a windbreak.

Propagation is achieved by cutting. Bark cloth fig is often used for producing fabrics by peeling the bark while using it as a mixed windbreak to protect the banana trees in banana plantations.

### 4) Kyenkyen (*Antiaris Africana* Hengl.): Moraceae

Kyenkyen originated in tropical Africa. The tall evergreen tree grows in the areas from Senegal to Sudan, and Nigeria, and areas from Cameroon to Tanzania.

Bark fabrics are produced from the bark tissues that are carefully peeled off. The timber is used for plywood boards as well as for interiors, boxes, and woodwork. The white yellowish timber is soft and does not have high durability or strength. In Africa, it is used for doors, benches, and the handles of daggers used by locals. The timber is useful for general joinery work.

Kyenkyen can be propagated from seeds. However, as it is a Moraceae plant, it can also be propagated by cutting.

The related family is Upastree (*A. toxicaria* Lesch.). Upastree is not originally from Africa and grows in

India, New Guinea, and Southern China. The tree exceeds 50 m in height. The bark is used for producing bark cloth, which is used as a fabric in the same way as Kyenkyen.

### 5-1-5 Gramineae herbs

#### 1) Guineagrass (*Panicum maximum* Jacq.)

Guineagrass originated in Tropical Africa. Currently, Guineagrass is cultivated in the tropical and subtropical zones worldwide as feed crop and some escaped plants grow wildly. The perennial herb grows to a height of about 2 m.

The leaves and canes are dried and used for feed and fuel. Guineagrass is mostly cultivated as a feed crop. In Africa, the canes are used for weaving material. The entire grass is used in the same way as for leaves. Spikes with a long elliptical shape with a length of about 3.5 mm grow sparsely.

The plant is propagated from seeds, by division, and shallow planting of the stems. Guineagrass grows in open grass fields such as along rivers where tropical trees and shrubs grow. The grass field is maintained for a long time if it is a fertilized pasture. Guineagrass can be cultivated in bushes as it can be adapted to shady environments to some extent. Guineagrass can be adapted to a wide range of soils and has high adaptability to draining conditions and a change of fertile soils.

#### 2) Elephantgrass (*Pennisetum purpureum* Schum.)

Elephantgrass originated in Tropical Africa and has been widely naturalized in North and South America, Australia, and South East Asia as a feed crop. The perennial grass grows up to 3 m in height.

The canes are dried and used as the materials for thatching, fencing, and weaving. The leaves are dried together with canes and are used for feed and fuel. The entire grass is cultivated as a feed crop as well as for soil erosion prevention of sloping lands and as a windbreak.

The grass propagates by division or planting stems that are cut into 3 to 4 joint units from the base section. Although the grass can be propagated from seeds, seed collection may be difficult as ear emergence occurs in warm places only. In warm places, once the grass is planted, it can be used as feed for five to six years.

Pearl millet (*P. typhoides* (Burm.f.) Stapf & Hubbard) that originated in Sudan is a related species. In Africa, this plant was used as an important staple together with Sorghum and the stems and leaves are used as feed and thatching material.

### 3) Sorghum (*Sorghum bicolor* Moench)

Sorghum originated in the savannah region called Sahel at the edge of the Southern side of the Sahara desert of Africa. This annual plant of 2 m high or more is cultivated in the areas from the temperate zone to the tropical zone worldwide as a staple food and for feed.

The seeds are used as food as sorghum flour and stems and leaves are generally dried and used for livestock feed as silage. In some developing countries, the dried stems and leaves are used for starting fires and for fibers.

The plant is propagated from seeds. Sorghum, which withstands dry weather, grows in most soil conditions; however, the plant grows better in the areas with a period of long sunlight. This is a short-day plant and in a long day of 14 hours or more, flower bud differential does not occur in most varieties. The optimum soil acidity is about pH 6; however, the plant endures alkaline soils. In a mild climate, seeds are generally planted in March, June, and October.

For hoki sorghum (*S. bicolor* Moench var. *hoki*), which is a related species, the fruit spikes that remain after the berry drops are used for the brush section of a broom. Sudan grass (*S. sudanense* (Piper) Stapf) is also used as a fiber material in Africa.

### 4) Vetiver (*Vetiveria zizanioides* Stapf)

Vetiver originated in India, Sri Lanka, and Myanmar and is cultivated in India, Myanmar, Sri Lanka, South East Asia, and the Seychelles. Vetiver also grows on the Gold Coast of Africa. Vetiver is a perennial plant of about 2 m in height and belongs to the Gramineae family.

The foliage is used as material for thatching and paper manufacturing. The plant is also used for producing rugs, chick blinds, mats, and fans. Vetiver oil is collected from the roots by distillation and is used for incense and perfumes, cosmetics, and soaps. Roots are also used as the filling for mats after being washed and dried. It is also used as insect deterrent incense for garments and for medicinal purposes. Oil extracted from seeds is used as a medicine. The grass is used for prevention of soil runoff or soil erosion of sloping farm fields.

Vetiver propagates by division. Propagation should be carried out in a rainy season. To improve root development, the above ground section should be cut occasionally. In tropical flat lands, the plant can be cut twice a year.

The related species is *V. nigritana* (Benth.) Stpf and is used in a similar way.

### 5) *Phragmites Karka* (Rez.) Trin.

It is assumed that Phragmites Karka originated in the Asian region and grows in wide areas from the temperate belt to India, Malaysia, and Australia. It is similar to reed; however, the perennial plant Gramineae grows larger. The cane diameter is about 2 cm.

The canes are dried and are used as the materials for reed blinds, reed screens, and baskets. The canes may be used as raw materials for manufacturing paper as pulp.

In general, the plant is not cultivated and it propagates by division.

Reedgrass (*P. communis* Trinius) and *P. Japonica* Steeud are related species.

## 5-1-6 Other herbaceous species

### 1) Kenaf (*Hibiscus cannabinus* L.); Malvaceae

Kenaf originated in Africa and grows wild mainly in the tropical zone and subtropical regions of Africa. Kenaf is also cultivated in tropical zones and subtropical regions worldwide as a fiber crop. Kenaf is a straight annual plant that grows to 2.5 m to 4 m in height.

The surface skins are peeled off from the stem and the fibers are used as the material for ropes, mats, and jute bags. Recently, the fibers are also used as the material for paper, electrical insulation, and filters. The fibers are also used as roofing material binding strings, harnesses, fishnets, and joint filling material for boats. Leaves are eaten as vegetables and the seeds, which contain about 20% of linoleic acid, are used as edible oil. The oil is also used as a lubricant, lamp oil, material for linoleum, paints, and varnish.

Kenaf propagates from seeds. Kenaf grows wild and is also cultivated in the tropical and subtropical zones. The suitable temperature for the growing period is 16°C to 27°C and an average rainfall of 500 mm to 750 mm. As Kenaf is a short-day plant, it is important to accelerate growth by nourishing under long hours of daylight until flowering. The plant does not require a special soil condition; however, cultivation in lowland swamps is not suitable as it has low moisture resistance. Seeds need to be planted in May to June. After the stem has grown sufficiently, the plant is removed and dried under the sunlight. The surface skins are peeled off after soaking them in water for 10 to 20 days, and the fibers are extracted.

### 2) Upland cotton (*Gossypium hirsutum* L.); Malvaceae

There are many species other than this species. Upland cotton is assumed to have originated in Central America or South America and the plant is cultivated in tropical and subtropical zones worldwide. This annual plant grows to 1 m to 15 m in height.

Flosses are removed from the seeds with a cotton-ginning machine and cottonseed oil is extracted from the seeds. The semi-dried cottonseed oil is also used as food. Flosses around the seeds are also used. The residue of the expressed oil is used as feed and fibers surrounding the seeds are widely use as fiber

materials.

Upland cotton propagates from seeds. Adequate rainfall is necessary during the growing period before flowering. After flowering, the plant is cultivated in the dry areas until harvesting or such an environment is selected for cultivation. The plant does not grow well in acidic soils. As Upland cotton can grow in areas of comparatively high saline concentration, it can be cultivated in reclaimed lands also.

A related species, *G. arboreum* L., which originated in India, is a woody plant and grows up to 4 m to 6 m in height. Some breeds diverged from the elementary species. *G. herbaceum* Oliver are assumed to have originated in the areas from Asia Minor (region enclosed by the Mediterranean Sea and Aegean Sea/Black Sea) to the Northern part of the Arabian peninsular. This plant is also called old world cotton and many breeds grow in areas from the Middle Near East to India and Africa. *G. barbadense* L., which originated in South America, is called new world cotton and is cultivated in Brazil, West Indies, and the East Coast of America. There are many other divergent species and breeds as they have been used for a long time and these species and breeds are widely cultivated as fiber crops.

## 5-1 Transformation from gathering from the wild to cultivation - Using rattan as an example

Rattan is a collective term for the palmae plants across 13 genera and about 550 species that spread[1] over tropical and subtropical regions of the old world centering around South East Asia, Southern China, Oceania, India, and Africa. About 20% of them are commercially viable. Tree species[2] that are classified as rattan normally have long joint intervals, are not self-reliant unlike other palmae plants, and grow by creeping around other trees. Rattan can be considered a vine plant of the palmae family[3].


Figure 5-2-1 General morphology of rattan: A. Old trunk that lost its leaf sheath, B. Young bud, C. Spiky leaf sheath, D. Runner in lash shape (sourced from Tropical Palms, FAO)

In Africa, four genera and 22 species are known and in Ghana, the following three genera and nine species are known. All of them grow in humid evergreen forests and semi-humid deciduous forests with comparatively high rainfall.

- *Calamus deërratus* G.Mann
- *Eremospatha dransfieldii* Sunderl.
- *Eremospatha hookeri* (G.Mann & H.Wendl.) H.Wendl.
- *Eremospatha laurentii* De Wild.
- *Eremospatha macrocarpa* H.Wendl.
- *Laccosperma acutiflorum* (Becc.) J.Dransf.
- *Laccosperma laeve* (G.Mann & H.Wendl.) Kuntze
- *Laccosperma opacum* Drude
- *Laccosperma secundiflorum* (P.Beauv.) Kuntze

Among those, *E. macrocarpa* (trunk diameter: 10 mm to 18 mm) and *L. secundiflorum* (trunk diameter

[1] In the new world, plants related to the Chamaedorea genus and the Desmoncus genus are known.

[2] As there are many species, rattan plants of many different morphologies and ecologies are available. In this section, rattan that is normally used is described in general terms.

[3] The plant climbs by clinging to a tree rather than coiling like other vines.

30 mm to 35 mm) have the highest commercial viability followed by *E. hookeri* and *C. deërrtaus*.

### 5-2-1 Transformation from gathering from the wild to cultivation

In many countries, rattan has traditionally been used as a secondary income source[4] such as for savings for unexpected expenses and has been regarded as a native forestry product that can be collected from forests, much like medical herbs and mushrooms[5]. In terms of criteria for growth, rattan is a very unique plant. In general, rattan is extremely susceptible to strong sunlight and dry conditions during the initial growth period and requires the environment conditions of sufficient shade such as a forest, and suitable amounts of humidity and water. As the plant is not self-reliant, it requires trees for its support and when it reaches the canopy, the plant transforms into a sun tree and grows rapidly. In other words, rattan requires a forest at every growing stage and cannot survive without a forest. Due to the recent transformation from forests to agricultural lands, and thus the reduction and deterioration of suitable habitation areas, the quantity has decreased. With the increase of the demand for rattan materials, shortage of the resource supply is accelerating. Under the circumstances, three measures can be suggested for securing materials and resources for the rattan industry; ① increase of rattan resources by appropriate management of native forests, ② introduction of cultivation, and ③ material importation.

#### 1) The limits to gathering from the wild in natural forests

In general, rattan productivity is low in natural forests that are protected to some extent such as a protected forest area[6]. In terms of ecology, the productivity of rattan is basically high under a high light interception environment such as at the edge or in a gap of a forest, so that the two objectives of conservation of a dense primary forest and expansion of rattan resources are incompatible.

#### 2) Necessity for cultivation

Transformation to cultivation cannot be avoided if the stable supply of products and materials is to be maintained in sufficient volumes. To realize this, it is necessary to promote rattan forestation in suitable cultivation areas and secure a resource increase of rattan and its products. Therefore, there needs to be a fundamental transformation of the mentalities of rattan producers and local residents from the present exploitation of forests to cultivation and harvesting. The Government should also implement some reinforcement measures as described later.

### 5-2-2 Actual conditions and issues of the rattan forestry industry

#### 1) Propagation of and raising seedlings

In this section, mainly Asian precedents are discussed. Although some descriptions may not be applicable to specific plant species, the rattan forestation techniques are commonly applied in general.

In order to cultivate rattan, the first necessary steps are the collection of seeds and nursing of seedlings.

[4] In some regions, the young buds are used as food.

[5] It is reported that in the areas where clear traditional ownership is available, selected harvesting has been exercised.

[6] In a region where the wild animals that assist rattan distribution are scarce, this tendency is more prominent.

Although tissue culture is being attempted, it is still a long way from commercial feasibility. A direct seeding is not recommended unless a large quantity of seeds can be secured due to the high probability of artisan pressure. Transplantation of natural seedlings is comparatively easy and is effective for farmers who carry out small-scale planting. However, the quantity that is secured is limited and it is necessary to ensure that the seedlings are definitely the right ones.

Figure 5-2-2 Method of raising natural seedlings (transplant the seedling to a pot while keeping the soil surrounding the root)

At the initial stage of raising seedlings, it may be difficult to secure the seeds. A sufficient quantity must be secured by collecting a small amount of seeds at a time and cultivating them. As rattan is a recalcitrant type of plant, the germination rate decreases quickly within one and half months and the seeds must be kept moist to avoid dryness during storage, long-term storage is not practical. Therefore, in principle, immediate planting is recommended and by closely watching the timing of flowering and fruit bearing, raising seedlings needs to be considered according to the timing.

Although no special seed processing is required other than thoroughly washing off and removing scale-patterned shells and flesh before planting the seeds, it is important that the seeds do not become dry during the period from collection to planting. Normally, the seeds are planted after thoroughly soaking in water (flowing water is desirable) for 24 to 28 hours. When the seed is fresh and very likely to germinate, it can be planted directly in a pot. However, it is recommended that planting beds be prepared to ensure germination. Plant each seed at a depth of 2 cm to 3 cm according to the size. As rattan seedlings are susceptible to dryness, the nursery field is often prepared in the middle of a forest such as a plantation. When preparing a nursery field in fallow land, it is important to provide an adequate sunshield constantly using palm leaves and so on. Germination occurs within 2 to 3 weeks. The germination rate is 70% to 80% for fresh seeds.

Photograph 5-2-1 Box of seedlings and transplanted seedlings (Seedling bed in a farm of East Kalimantan, Indonesia)

When a seed is germinated and the first leaf fully opens, the seedling is to be transplanted to a pot of a suitable size. After transplanting, rear the plant by providing a sufficient sunshield. A sunshield of 50% is assumed to be ideal for rearing rattan seedlings. Seedling rearing management is the same as that for normal plant species, except for ensuring sufficient moisture and prevention of dryness. As the seedlings are susceptible to dryness, it is safe to rear the seedlings in pots. When the pots cannot be obtained easily or the farmer directly plants seeds near the farmer's residence in a wet climate, seedlings can be reared as bare seedlings if the transportation period is short. In this case, divide the seedlings into the required quantity and transport them directly to the planting location keeping the roots surrounded by soil.

Photograph 5-2-2 Seedlings with soil attached

Cultivating comparatively larger rattan seedlings is recommended to increase the survival rate, prevent artisan pressure, and delay weeding. Therefore, the suitable pot size of the general tree species is 8 x 10 inches[7]. For a tree species with an extremely large trunk diameter, a pot of 16 x 20 inches that can be used for oil palms may be suitable. In any case, when the seedlings grow to 40 cm to 50 cm high, this is the suitable time for transplanting them to a larger space. Normally, it takes about 12 months for a seedling to reach this height. If seedlings are too small, the failure rate after planting becomes high. However, if small seedlings of 5 cm to 10 cm are preferable, it is possible to plant them. In this case, it is recommended to set a rearing period to match the suitable planting timing, which is the beginning of the rainy season.

Photograph 5-2-3 Rattan seedling cultivation state in the middle of the forest (Nursery for business in the Sabah State, Malaysia)

### 2) Rattan forestation model

As described above, rattan requires trees and adequate water and humidity in the forest floor for support, and an existing forest is required for its cultivation. The reason for most failures in rattan cultivation is the failure in securing the adequate water and humidity required for growing the plants due to the exposure to direct sunlight at the initial stage of cultivation. The following three practical patterns can be assumed for rattan forestation, although it depends on the condition of the existing forest of the target area.

- Planting using the edge of a primary forest
- Introduction by upgrading of secondary forest configuration
- Introduction into an artificial forest

Rattan is classified into three types descriptively based on the propagation morphology; a single trunk type, a bushy type, and a running bush type. Rattan with a large trunk of a single trunk type represented by *Clamaus manan* Miq. (Manau) of South East Asia is most difficult to conserve and propagate as it does not propagate by division. Only one plant grows from one seedling and its life ends if it suffers from insect damage or is harvested once. Such a tree species is under a highest risk of extinction and its

[7] Size in a flat state without spreading.

protection and cultivation must be implemented urgently. On the other hand, bushy type rattan, which is represented by *Calamus caesius* Blume. (Sega) and has multiple trunks, can be harvested many times and propagates by sprouting from a stump; these crops can be harvested continuously in three-year cycles. Running bush type rattan, which is represented by *Calamus trachycoleus* Becc. (Jahab/Irt) propagates most vigorously. However, this type of rattan is not grown in Africa. The forestation method such as rattan planning interval varies according to the morphology also.

### (1) Planting using the edge of a primary forest

When the forest is conserved in good condition (assumed tree height is 15 m to 20 m or higher), approximately 10 m around the edge of the forest can be set as a rattan garden and rattan can be planted and cultivated by weeding the forest floor. Several weeding sessions may be necessary until the rattan reaches the upper layer to adjust to the amount of light interception at the suitable level.

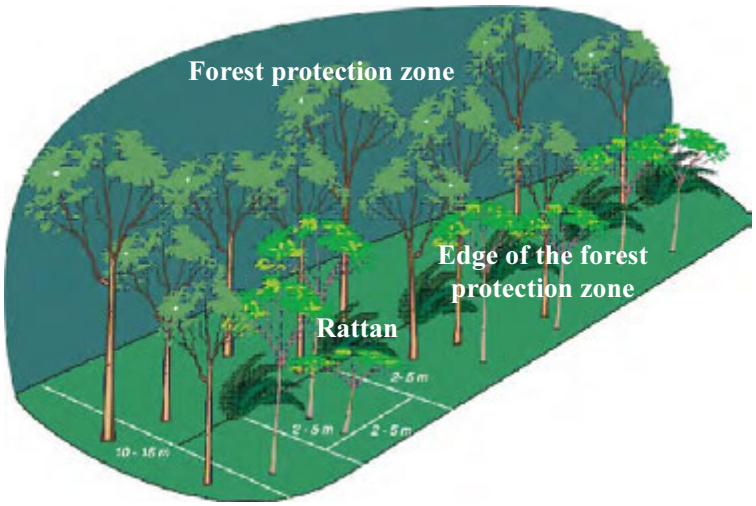


Figure 5-2-3 Example of rattan planting at the edge of a primary forest

### (2) Introduction by upgrading of secondary forest configuration

For a primary forest that has been degraded by erosion due to excessive harvesting or transformation to an agricultural land, or a secondary forest after a certain fallow period or in a conservative state (assumed tree height of 10 m to 15 m), an open belt space is created inside of the forest, and rattan is planted after weeding. Creation of an open belt space is intended for work efficiency and if rattan is planted by an individual farmer or on a small scale, rattan can be planted in a gap in the forest or a degraded section at the edge of the forest. This way saves labor and achieves higher forest conservation effects.

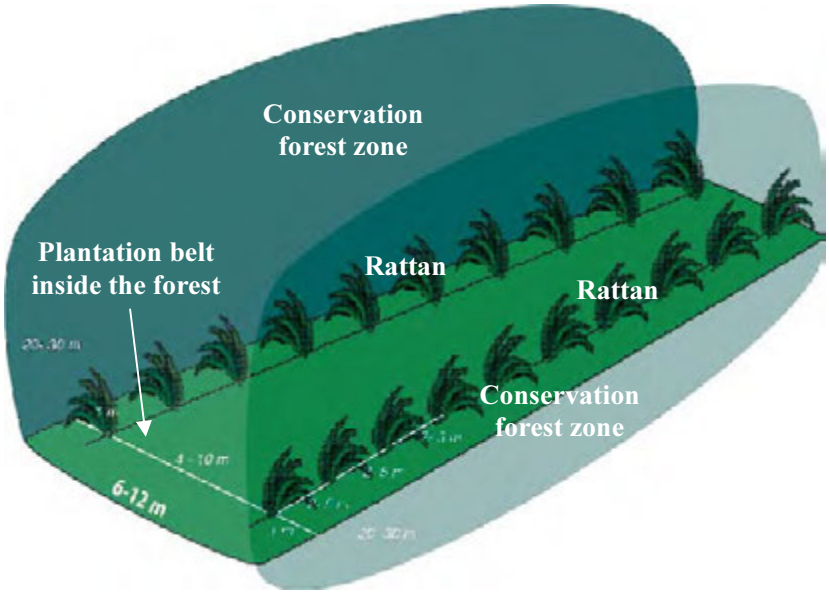


Figure 5-2-4 Example of rattan planting on the secondary forest configuration upgrading belt

Photograph 5-2-4 Planting belt by opening and preparing the inside of a secondary forest

Photograph 5-2-5 Suitable rattan planting area prepared using the gap inside the forest

As the economical value of the secondary forest itself such as this is generally low, the forest can be managed as a permanent rattan garden without harvesting its timbers.

### (3) Introduction to an artificial forest

Rattan can be cultivated between established artificial forests. However, forests that have not reached the adequate height may be affected by rattan, suppressing the growth of the main forest, and damage suffered at the time of harvesting also needs to be taken into consideration. Therefore, introduction of rattan is restricted only for an established forest of a long-term-harvesting species or a low-value artificial forest. For instance, in Malaysia, rattan is introduced into rubber plantations whose values have decreased and rattan is managed and produced in the forest as a rattan garden. In this case, although the planting interval is restricted by the plantation that already exists, the recommended planting densities are 400 plants per hectare for the very large species and about 600 plants for the small species. A forest of young trees that still has a gap in the forest canopy is preferable for the growth of rattan rather than the inside of a dense forest.

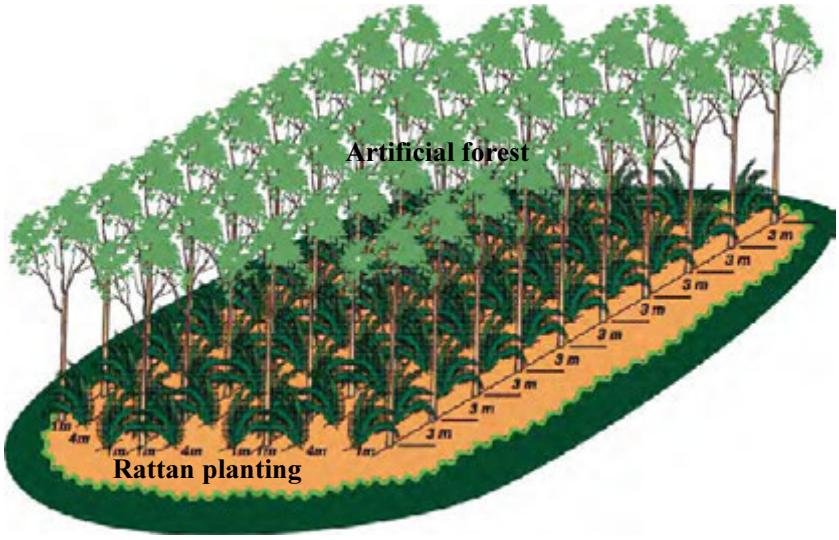


Figure 5-2-5 Example of rattan planting inside an artificial forest

Photograph 5-2-9 Planting rattan between forests of an abandoned rubber plantation (Sabah State, Malaysia)

#### 4) Cultivation management

Covering must be provided to prevent the plants from drying during the initial stage. When the plants are planted at the edge of a forest, weeding is necessary to prevent artisan pressure. During the initial growth period, damage by wild animals such as rats and elephants that eat apical buds has been reported[8].

When the plant reaches the sufficient height (5 m or higher), the forest canopy must be exposed to the sunlight by gradual thinning. There are many cases where growth is compromised due to insufficient sunlight caused by neglect of thinning during the latter period of cultivation. The species of thin trunks can be harvested after seven to eight years and the normal species can be harvested after 10 to 15 years.

### 5-2-3 Measures for promoting the rattan forest industry and issues on the institution

In the promotion of the rattan forest industry, the improvement of the institutional framework is more important than the technical issues. As described previously, rattan requires a "forest" for its growth and it is difficult for it to grow in areas other than a forest. If forests need to be left undisturbed for conservation purposes, establishment of a rattan forest industry is difficult. To cultivate rattan, an intermediate area called a rattan garden, which is neither a pure native bush nor a field, must be secured. Therefore, a complex vantage point for actively cultivating resource-rich forests that foster forestry products while conserving existing forests is essential. For instance, in the Sabah State of Malaysia, which is known as the advanced rattan forest industry region, rattan was introduced into a large area by upgrading the forest configuration of the secondary forest in the nature reserve and large profits were successfully gained from the barely productive forest.

The issues to be examined here are the institutional matters such as ownership of the forest and the right of use. The essential issues for the community residents to implement such a rattan forest industry by using the existing forest region include the guarantee of the long-term right of use and the permission of

[8] In South East Asia, serious damage is caused by elephant beetles also.

forestry management for cultivation, such as the opening and thinning of the forest canopy, maintenance thinning, weeding, and product harvesting. Otherwise, although the residents can harvest rattan as a forestry product, they cannot actively cultivate and grow it. Comprehensive agreements and contracts that satisfy the above-mentioned cultivation conditions over the long term must be concluded between Government organizations and the local residents as the recognized users. The rattan forest industry will surely take root in the region if the Forestry Bureau and Forestry Government Corporation clearly position rattan cultivation as a livelihood improvement activity for the local community with the community participation type forestry management contract, prepare the necessary institutional framework, and support the production and planning guidance for seedlings.

For instance, the Government zones a 10 m swath around the edge of a forest reserve as a rattan garden, leases the rattan garden to the local residents, and provides guidance on cultivation methods. The residents acquire cash income from the cultivation and production of rattan. An institutional framework needs to be created that enables the establishment of such a cooperative relationship. As an example, the author believes that the distribution of the burden and profit as shown below is a reasonable contract for both the Forestry Bureau and the local residents.

Table 5-2-1 Example of a rattan cultivation contract between the Forestry Bureau and the residents

| Forestry Bureau | Local residents |
|---|---|
| Long-term lease (15 years or longer) of the rattan garden forest | Compliance with the contract and obligation of conservation of the main forest |
| Permission for thinning/opening the forest canopy in a certain range, maintenance thinning, and weeding | Implementation of maintenance thinning and weeding and compliance with the usage range and purposes |
| Raising and providing rattan seedlings | Rattan planting and cultivation management |
| Permission for harvesting management | Harvesting and use of products |

Once the high income from rattan cultivation becomes certain, the residents' focus must switch to forest conservation. This is because rattan cannot be harvested without the forest and thus no income can be obtained if this forest is not protected. In this way, release of a secondary forest or an edge of the forest to the local residents, permission for certain maintenance thinning, and establishment of an institutional framework that enables rattan cultivation all contribute to the policies for sustainable conservation of forests.

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