

INDIGENOUS KNOWLEDGE ON THE PRODUCTION AND PROCESSING OF MAGUEY/ SISAL (*Furcraea foetida* L.) AND THE AVAILABILITY OF OTHER FIBER PLANTS IN BENGUET¹

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ABSTRACT

The province of Benguet is a home to different fiber yielding plants some of which were used by the people as clothing in the olden times. Maguey/Sisal (*Furcraea foetida* L.) is the most common fiber plant known to the local people, they are mostly found in the rocky mountains of the municipalities of Bokod and Kabayan. The maguey/sisal fibers are usually extracted for rope making. More common fiber plants in all municipalities that are next to maguey/sisal are the wild banana locally named as *pintok* or *amosleng*, abaca, native piña and *pandan/fangshan*. The fiber yielding trees that were identified in their common local names are: *balete* or *kuba* tree, *pakak*, *pitikan/anabiong/anadong*, *bayukan*, *baloy*, *alino/alinew*, *malacapas* and *apehang* trees, bamboo (*kawayan* or *bolo*). The barks of these trees were beaten and woven into cloth, which were worn by the olden people. The vine plants are: *labtang*, *bantalaan* or *bagingey*, *nito*, *waka*, *luay/ogwey/lituko* (rattan) and *anes*. These vines including the bamboo were made into rope for tying or woven into basket and other uses. However, most of these plants are already very rare, and maybe considered endangered species which can be considered in the development of the textile and fiber industry

The indigenous knowledge on fiber processing reflects the resourcefulness of the Benguet people. The knowledge and skills on maguey/sisal fiber processing is a passed on knowledge among families (1950-80's) though now a dying home industry. This survey identified more than ten (10) maguey/sisal processors (rope making) from Bokod and Kabayan. Documentation showed that these people do not use high technology machineries in processing maguey but uses the simplest tool they have within their environment. Most of them have shifted to polypropylene rope making. The itchiness of maguey and its tedious process prompted these individuals to stop their maguey processing. There is however, a promising potential for increased propagation and product diversification considering the suitability of the crop for forest protection and livelihood source.

Helping the existing processors to revive the maguey fiber industry and to share and improve their skills is needed. Research and product development of maguey fibers, fabrication of machine for maguey fiber extraction, wider plantation of maguey and sisal, and further studies on the identification and possible propagation and processing of endemic fiber plants are recommended.

Keywords: indigenous knowledge and practices on fiber plant production and processing, fiber plants, endemic fiber plants

INTRODUCTION

¹This study is part of a project that gathered baseline data on the status and potentials of the textile industry in Benguet Province and the other provinces of the Cordillera Administrative Region implemented by members of CARASUC with Sen. Angara's financial assistance. ²Associate Professor (UBA), ³Science Research Specialist (NPRCRTC), and ⁴Research Assistant

The province of Benguet is endowed with natural resources for which different fiber yielding plants are part of this richness. With the availability of resources, old people were able to produce essential skills and products taught not by the outsiders but driven by the urge for existence. This skills and knowledge became indigenous or native to them.

True to other ethnic groups, tree barks, fiber plants and animal skins were sources for their clothing. Bark cloth beating and twisted bark fiber weaving are not forgotten facets of what anthropologists call the "material culture" of the Cordilleras to the present day. Also, bark cloth still figures significantly in rituals (Roces, 1991). Beaten bark cloth was most likely the earliest Philippine cloth tradition. Archeological evidence in the form of bodies wrapped in bark cloth were uncovered in Central Philippines, cave sites in Palawan island and the Calamian islands, that date from around 1,000 BC (Solheim, 1981 cited by Miligard 1991). The material for bark cloth was readily accessible as it was obtained from the local fig and *sopot* trees, the latter, specie of fast growing mulberry planted purposely for cloth making (Scott, 1974 & Dozier, 1966 as cited by Miligard, 1991).

Time came when woven cloth from the Ilocos Region was introduced to this highland people which become the main source of ethnic woven clothing over the years.

Objectively, this study looked into: (1) the availability of maguey/sisal and other endemic plants in Benguet; (2) the indigenous knowledge and practices on the production and processing of maguey/sisal, and; (3) the potentials of improving the indigenous practices on the production and processing of maguey/sisal and other endemic fiber plants in support of the textile industry.

METHODS AND PROCESSES

As shown in Figure 1, the iterative process of data gathering was employed. With very insufficient literatures, key informants were tracked down beginning with the focus group discussions with municipal agriculture and other local government personnel, and their referrals based on local knowledge, reputation, and individual observations. In-depth interviewing, field visits, observations, and process documentation were then done. Interview guide questionnaire and photo documentations were used to gather data needed.

The key questions were: (1) Are there available maguey/sisal and other endemic fiber plants in the locality?; (2) How are these plants produced and processed into fibers or other uses?; and (3) How can the indigenous practices on production and fiber processing of maguey/sisal plants and other fiber plants be improved?

RESULTS AND DISCUSSION

Availability of Maguey/Sisal and Other Fiber-yielding Plants

Survey shows that maguey/sisal plants can grow in all municipalities of Benguet (see Table 1).

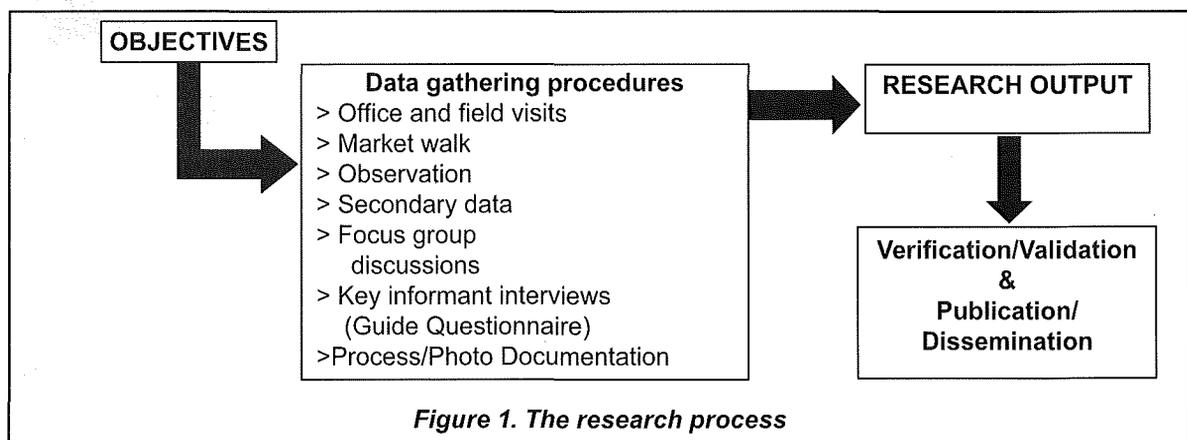


Figure 1. The research process



This is evident by the presence of a few existing plants that are used in the landscapes or vacant lots in the different municipalities. Likewise, all municipalities acknowledged that their old folks used to be engaged in processing maguey/sisal into ropes for tethering animals until the late 1970's. This practice was a part of the old culture since, almost every household before have to raise their own animals as their source of food and livelihood, especially carabaos (water buffalos) as working animals. This practice became extinct due to the availability of ropes made out of nylon or synthetic materials. At the same time, because of the emergence of other livelihood opportunities that the rope-making industry has vanished. During the time of this study, it is only in the municipalities of Bokod and Kabayan, that clusters of maguey/sisal plants are mostly seen growing wild at the very steep and rocky mountains particularly in barangays Ambuklao, Bila, and Poblacion, Bokod and Adaoay, Kabayan (Figure 2). Locals also planted these plants around the swidden farms to protect the crops from roaming animals and forest fires. Some are also planted as ornamentals and seen in landscapes.

Further, Table 1 shows that there are several fiber-yielding plants that were identified to be found in the province. Also common to all municipalities is the wild banana locally

named as *pintok* or *amosleng*. Considerably large number of wild banana fiber plants was seen along the national highway and forests of Sablan municipality. Currently, the Fiber Industry Development Authority (FIDA) of the Department of Agriculture is studying this, and had identified that the wild bananas found in Sablan are a variety of abaca. Also, an abaca plantation (tissue cultured from Tacloban and Bicol) is being experimented at Amgaleygey, Buguias. The success of the present abaca project of FIDA would help sustain the abaca industry of the whole country as a potential source of clean planting materials.

Result of the interviews shows that the statement of Roces (1991) and Solheim (1981) cited by Miligard (1991) that bark of trees were used to produce clothing is true during the olden times in Benguet. The bark of the trees were pounded to extract the fiber and used as clothing. The trees locally identified, all in local/common names, are: *balete* or *kuba* tree, *pakak*, *pitikan/anabiong/aladog*, *bayukan*, *baloy*, *alino/alinew*, *apehang* and bamboo (*kawayan*) trees. The vine plants are: *anes*, *bagingey*, *bantalaan*, *nito*, or *labtang*, *waka/wakal*, and *luay/ouay/lituko* (rattan), and the leafy plants *pandan/fangshan*, *piña*, *pikaw*(wild taro), *malacapas*. These plants could be considered in developing the textile and fiber industry of Benguet.

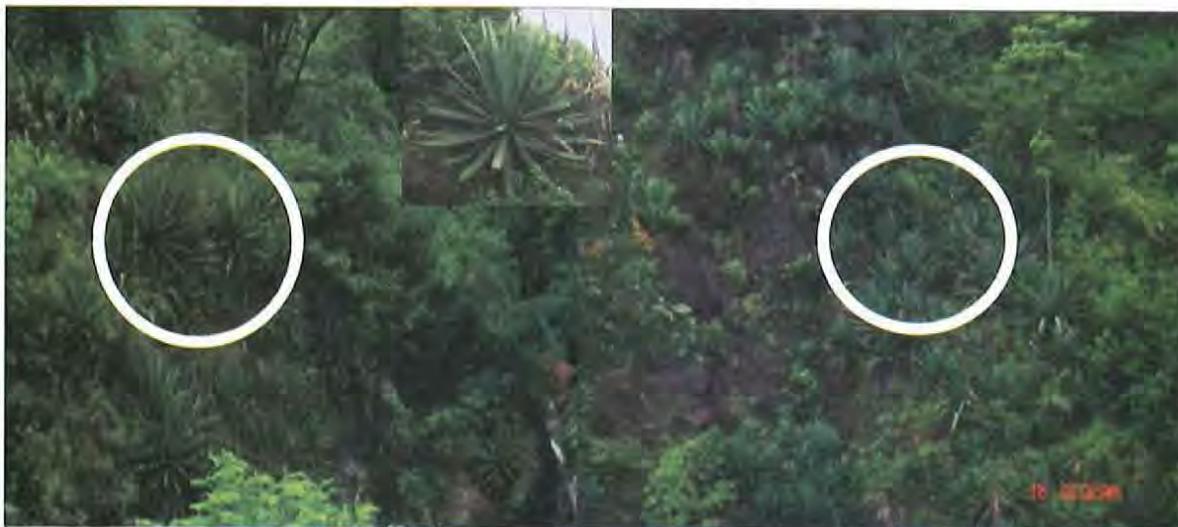


Fig. 2. Maguey at the steep and rocky part of the mountain at Bokod (left) and Adaoay, Kabayan near a waterfall above the road (right).

Table 1. Identified fiber plants (local names) found in Benguet province

LOCAL NAME OF FIBER PLANT	PARTS USED AND USES	AREAS WHERE FOUND
<i>Alinew</i>	Bark fibers are made into rope/binders	Bakun, Bokod, Atok, Kapangan, Itogon, Tuba, Kabayan, Sablan, Tublay,
<i>Amosling /pintok/ wild banana/Abacca</i>	Bark for rope, <i>apid</i> (a head strap used to carry baskets, <i>kayabang</i> or <i>tiklis</i>), used also as a packaging material for eggs in the olden days.	All municipalities *FIDA recently confirmed that the wild banana in Sablan is a true variety of abaca
<i>Anabiong/pitikan/ aladog</i>	Bark fibers are made into ropes, skirt, g-string and bracelet material	All municipalities
<i>Apehang</i>	Dye plant	Bokod
<i>Atelba</i>	Dye plant	Bakun
<i>Bantalaan, nito, bagingey, anes</i>	Vine are woven into bags, baskets and used for binding/tying things	All municipalities
<i>Balete/kuba tree</i>	Bark were beaten and woven into cloth, while the juice/sap is used as dye	All municipalities
<i>Baloy tree</i>	Bark were beaten and woven into loin cloth, and the juice/sap is used as dye	Itogon
<i>Bayukan tree</i>	Barks were beaten and used as clothing	Sablan
Bamboo (<i>kawayan, bolo</i>)	Strips of trunk with skin were woven into baskets, tying purposes, fish traps, rain gear (<i>teshong</i>), and binders (tying purposes)	Sablan, all municipalities
<i>Labtang</i>	Fern vines were woven into baskets, bags, and other handicrafts	Itogon
<i>Malacapas</i>	Fibers were used for bird's trap and as threads and rope	Bakun
<i>Maguey/sisal</i>	Fibers were extracted from leaves, made into ropes or used as threads	All municipalities
<i>Pakak</i>	Bark were beaten into loin cloth	Kibungan, Mankayan, Itogon, Tuba
<i>Pandan or pangshan/ fangshan</i>	Leaves were made into bango, bags and baskets	Sablan, Buguias, kabayan
<i>Pikaw</i> (wild gabi)	Dried stalks can be woven into bags or ropes	All municipalities
Piña native	Leaf fiber were made into twines/ropes	All municipalities-except Bakun
<i>Rattan/lituko/luay/ oguey</i>	Strips of the vine were made into baskets, bags, binders and other handicrafts	Kabayan, Bokod
<i>Wakal/(uban-uban)</i>	Vines were used for rope/binders	Itogon, Tublay



However, most of these plants/trees are already very rare, thus they are considered endangered species. The scientific names and characteristics of these endemic fibers plants as well as their development is taken cared-off in a separate project in the textile program.

Result of the survey corroborates the report of FIDA, 1997 as cited by Aragon, 2000 that there is limited and unstable supply of maguey fibers caused by the inefficient fiber extraction method, the existence of many old, abandoned, or sparsely planted maguey plantations, and the reduction in area devoted to maguey as a result of conversion to other more profitable agricultural crops (FIDA, 1997, cited by Aragon, 2000). The long gestation period before harvest (four years from planting) and the relatively low returns from maguey farming compared to other crops also contributed to the farmers' losing interest in venturing into maguey fiber production.

Indigenous Cultivation and Processing of Maguey/Sisal Fibers in Benguet

Cultivation. There is no deliberate cultivation of maguey for fiber extraction purposes. After their introduction as fire barrier and fencing in reforestation, the maguey plants have self-propagated. The respondents also did not observe any diseases affecting the maguey plants. Maguey plants were just left growing in the very steep and rocky mountain and only a few

have existing plants in their farms/ homestead area. Only one respondent has mentioned that he purposely transplanted the maguey runners in his area. They usually gather the maguey leaves to be extracted from the mountains. Maguey leaves can be harvested in two to three years after planting. It was mentioned by some respondents that maguey was not much cultivated or planted in the pasture lands because of the thorns at the tips of the leaves which is harmful to animal. The eyes or skin of the grazing animals are hurt when they come in contact with the sisal plants.

Fiber Processing. Result of the interviews during the focus group discussions shows that indigenous maguey fiber processing was a practice since 1950's until the early 1980's in almost all of municipalities of Benguet. Informants recall that their parents used to make rope out of maguey/sisal fibers, they used these ropes to tether their animals and for binding purposes. However, with the availability of synthetic or nylon ropes in the market, the practice became a part of history. At present, only two individuals are identified processors of maguey fibers in Kabayan (Emilio Modi and Melkong Atos) while four individual processors were identified in Bokod (Manuel Kitan, Emiliano Beray, Bacwing Alis, and Julio Puyao). Maguey fibers, after extracting, are manually twisted into rope, a source of additional income for older men. This is convenient to them because it does not require heavy physical work. While sitting, they can twist the fiber strands

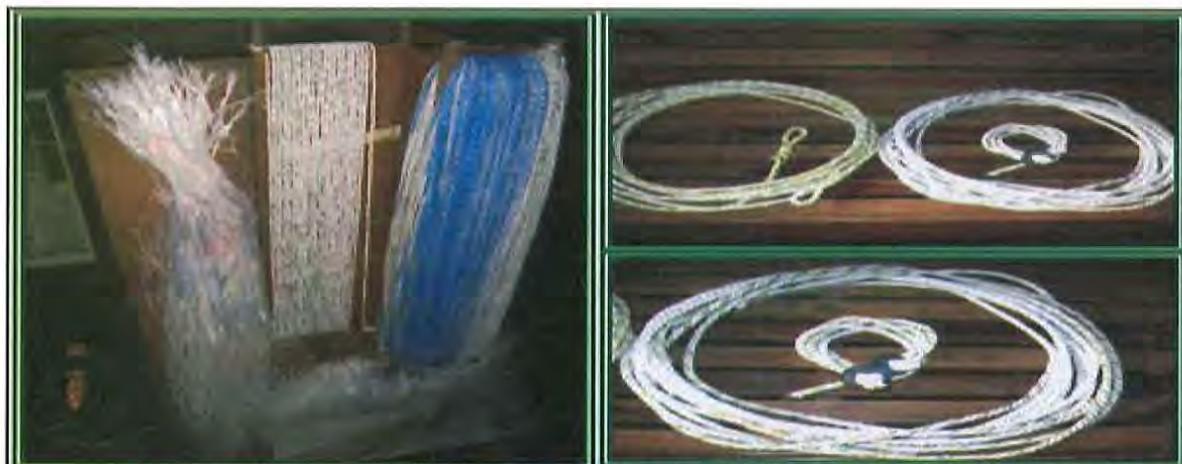


Fig. 3. Samples of the rope made out of strands of polypropylene sack

into rope. Individuals who are into rope making consider it as a hobby rather than a source of income. Due to the difficulty of extracting maguey fibers, rope makers in Bokod and Kabayan, now use strands of polypropylene fibers from used sacks of rice in addition to maguey fibers. Two of these rope makers in Bokod have totally shifted to the polypropylene fibers as substitute to maguey/sisal fibers. (Figure 3). Nevertheless, they still have the skills and knowledge on fiber extraction and rope making. Mr. Leon Diwas, 70, relayed that maguey plants were probably brought along with coffee by the Spaniards during their expedition. He said that maguey fiber extraction could have been learned from the Spaniards as well. However, no literatures were found to corroborate this story.

The know-how is passed-on to their children because children then help their parents who were maguey fiber processors in this kind of activity. However, due to change of interest among young people and other job opportunities outside the locality, this activity is left to old folks. The few existing rope makers only process maguey fibers when there are orders but according to them, orders have tremendously decreased due to the availability of polypropylene/plastic ropes, which are cheaper and readily available in the market. There were other seven processors identified in Bokod (Chapis Poliden, Roque Sotero, Alex Oldico, Noel Basatan, Wilson Dio, and Estong, Fortel Balagot) who used to extract maguey fibers and make ropes but have totally stopped. Some of them stopped because of old age and nobody among the children wanted to continue the industry. Others have shifted to other livelihood activities due to the tedious processing of maguey and the sap of the maguey leaf is very itchy that can cause skin irritation when not managed properly.

The Benguet maguey rope makers employ several steps on maguey fiber extraction and rope making. There were different initial techniques being done by the processors. Some of the techniques which are deemed appropriate and convenient for the processors are either of the

following: (a) soaking the maguey leaves in water for almost a week until it is soft and the green pulp is ready to be scraped off, (b) sun-drying the maguey leaves for 2-3 days before scraping to lessen the itchiness caused by maguey sap, (c) maguey leaves are heated over the fire instead of sun drying to lessen the itchiness, and (d) direct scraping of maguey after harvesting. The fourth or last (d) technique of maguey fiber extraction is a practice developed by Mr. Emilio Modi of Kabayan, Benguet which he demonstrated as shown in the succeeding photo documentation.

Indigenous Processing of Other Fiber Plants

During the olden times, as recalled by the elder key informants, when clothing was not yet readily available in the market, people used to wear loin cloth made out of beaten barks of trees. People have their own improvised ways of extracting fibers from tree barks for their clothing. The barks of balete or baloy tree are beaten to soften then woven into loin cloth as skirt or G-string, called *binalbal* in the Ibaloi dialect. Barks, vines, and stems are stripped from trees, shrubs, ferns, and other plants, sliced, air-dried then woven or used for tying and other purposes. These practices are no longer existing due to the availability of clothings and ropes out of cotton, silk, or synthetic materials. As claimed by the key informants, they have not witness any recent indigenous fiber extraction in the province, except few maguey/sisal fiber extraction for ropes.

The *waka/wakal* are directly used as binders for various items. *Malacapas*, and *luay* are plants that were prepared into strips and maybe used for tying or binding purposes, like binding firewood, baggage, fence, nipa huts, farm equipment, or woven into baskets, and other things. The *bantalaan/nito* or *bagingey* plant is woven into bags or baskets and other handicrafts. Another plant that is locally called in Kabayan as *fangshan/pangshan* because it has similar physical characteristics with pineapple and is mostly found at the mossy forest. This is said to be made into *bango* or indigenous raincoat (Figure 5). A sample of this can be found at the local museums.





Step 7. Sisal strands are carefully separated into smaller bundles.



Step 8. Strands of sisal fibers are rubbed against the leg to bind the fiber strands together and for easier handling/ twisting.



Step 9. While twisting, the clustered strands are alternately connected to make the desired length of the twine rope. The twines can be twisted by hand or with a use of improvised tools/ simple machine.

Step 10. The duberan, a simple gadget for twisting the three pieces of twines. These twines are properly inserted into their respective holes.



Step 11. The twisted fibers are connected to both ends where they are further twined into a rope. While twisting, a wooden guide is used to prevent the twine from tangling and for even twists. To complete the process, it needs two to three persons to operate the two wooden gadgets in order to easily make a rope. One person is needed to twist the first end. The other will hold the guide towards the end.

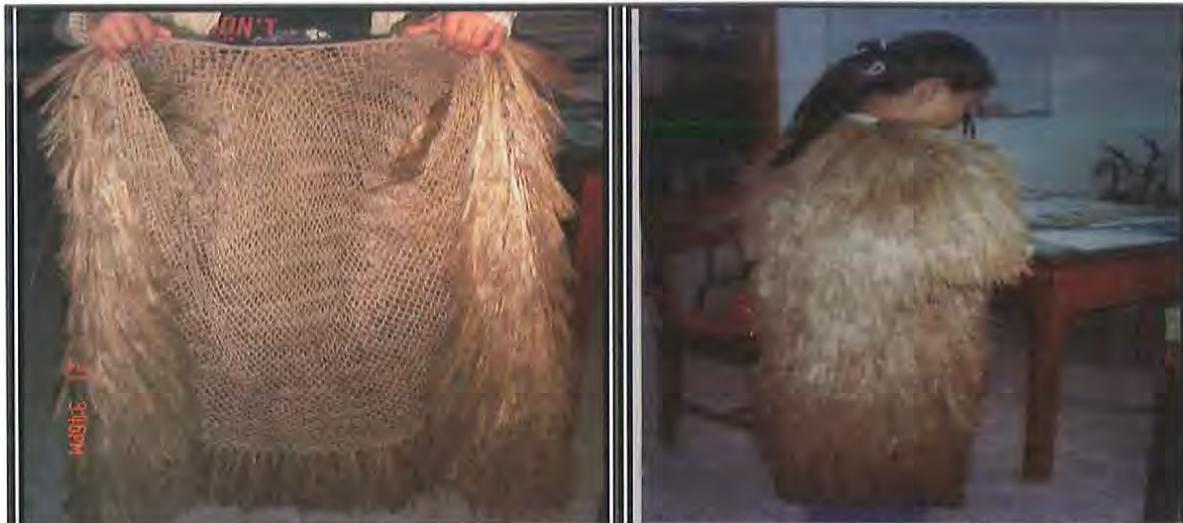


Fig.5 Bango (an indigenous rain gear made out of bark of the Balete tree or leaves of fangshan).
The picture was taken in Buguias, Benguet.

Potentials of Improving the Production and Processing of Endemic Fibers

Before massive processing will be introduced and improved, it is very important that the production aspect of the fiber plant have to be established. Since it takes the maguey plant 3-4 years before matured leaves can be harvested for processing, there is a need to encourage people to plant maguey/sisal plants in their respective areas. It was noted that maguey plants can thrive in marginal areas, with its ever-green foliage, it has a great potential in the reforestation and re-greening of the barren mountains that cannot be used for agricultural production. It is also a good barrier of forest fires to protect the forest and agro-forests.

The existence of indigenous knowledge on the fiber processing of maguey/sisal shows that the industry is not new to them, hence there is a great potential for improvement. Documentation shows that only simple tools are needed. Though in a limited scale, the processors can produce useful things in their own community like ropes, cordage, rugs and other handicrafts. Commercializing this indigenous knowledge needs further improvement of the processes to avoid the itchiness of the maguey sap that causes skin allergies. A simple low cost and simple decorating machine can be developed to avoid contact with the sap.

Economically, maguey processing is a potential source of additional income for the household. Income derived from this activity may contribute to augment the educational needs of the children. Accordingly, a processor can have an income of Php 400.00 for a 6 to 7 meters rope. This could be a potential summer job or part time jobs for housewives and children in the home industry because a lot of products can be made out the maguey fibers. Examples are hand bags, shopping bags, wine holders, wall decors, rugs, slippers, and many more.

Socially and culturally, there is no problem in the dissemination, replication and acceptance of this traditional way because it became a part of their daily lives. More than its being indigenous, it is once an instrument to build stronger ties amongst the family members, giving time for family bonding and to develop love for work. Moreover, the idle time of the members of the household will be utilized by this industry to avoid their exposure to other vices or unproductive activities.

According to Fortel Balagot of Ambuklao, Bokod, he used to make rope out of maguey from 1950's to 1964 but stopped because he worked for a company. As recalled, rope making is done during free time thus not hindering the old men to attend social





Fig. 5. Brush animals out of maguey fibers by Lingayen Handicrafts Inc.

gatherings. There were instances that even during social occasions like *cañao*; old men brought with them their maguey fibers and twisting them into rope while telling stories among themselves. Personally, Balagot can make five to ten meters of maguey rope out of 20 maguey pulps soaked for a week. Moreover, he is much willing to revive his maguey rope making. But then, he mentioned that the problem of the maguey industry is the source of raw materials, since it takes longer time (3 to 4 years) to grow before harvesting.

Result of the survey corroborates the report of FIDA, 2008 that maguey fiber in the early days was manufactured into twines and ropes for fishing and agricultural purpose and further used in the production of rugs, drapes, doormats, bags, cords, sacks, slippers and decorative items. It was once used for pulp manufacturing but due to supply problem, its commercial production was short-lived.

Since Bokod and Kabayan have existing wider areas of maguey plant population, this industry might as well be revived and of course with the presence of the identified processors. The weaving skills of the Kabayan women can also support the maguey fiber processing.

The book "A Half Century of Philippine Agriculture" recorded that maguey fiber was produced and exported

from 1909 to 1951. During these periods, maguey fiber blended with abaca was the main raw materials in the manufacture of carpets, rugs and drapes for exports. Foreign processors used maguey fiber for making binder twine, cordage, fishnets, hammocks and similar purposes (FIDA Report, 2008). In later years, maguey fiber was utilized by cordage manufacturers which have contributed ever since to the Philippine economy.

Nearby Benguet, the Lingayen Handicrafts Inc. (LHI), a registered maguey processor and handicrafts manufacturer at Lingayen, Pangasinan stopped processing maguey because of the limited supply of maguey leaves. They previously buy maguey leaves in Dasol, Pangasinan but is already depleted. They tried to source out maguey leaves from Mankayan, Benguet but nobody is willing to sell at their buying price of PhP0.40 per leaf. As an alternative, they shifted to using buri fibers (PhP40-60 per kilo) purchased from Bohol in their production of brush animal handicrafts. These brush animal products are exported to other counties and are sold at the different zoos.

Presently, maguey fiber is made into twines and ropes of different sizes for household and agricultural purposes and for various fibercraft, the manufacture of industrial papers like heavy-duty bags, wrapping papers, and wallboards. Further, FIDA (2008) mentioned that maguey fibers could also be utilized for other industrial purposes. Cottonized maguey



can be blended with acrylic or polyester fiber to be spun into industrial yarns suitable for wall cover, upholstery, bags, and curtain materials. With all the aforementioned potentials, maguey can be an agricultural/forest product for Bokod, Kabayan and other municipalities of Benguet. It may not be as good as other cash crops but can be a source of additional income to other people who do not have enough vast land to plant with vegetables. For product development, people who have access to maguey are encouraged to start developing products out of maguey fibers and start improving the plantations. Those with existing plants are encouraged to replant/replenish and plant more so that the source of raw materials will be established.

The different uses of maguey fibers could revive maguey production and processing in Benguet. The Benguet School of Arts and Trades (BSAT), now BSU-Bokod, could pursue maguey product development. Previously, teachers and other women make bags out of maguey fiber but eventually stopped. At present, BSU-Bokod campus accepted the tasks to explore on improvement and utilization of maguey in Bokod to develop more products that are usable and salable. This may serve as additional source of income for the students and their families.

It is also good to note that a certain individual from Kabayan is interested to produce novelty items like bags and hats out of maguey fiber. Adding to this, Kabayan is a weaving community, maguey fiber may be considered for woven products such as wall décor, placemats and the likes. Other parts of maguey (not fiber) may be used to produce special paper since technology on paper making can be availed through trainings/seminars. A Japanese-national residing at Kapangan is producing special papers from different fiber plants in the area.

This may pave a way for maguey to gain entry into business. The possibility of having locally produced raw materials for the textile industry of the region can boost not only the tourism but revive the innate skills of the olden people. They can showcase the skills they have inherited from their forefathers because of the opportunities given

them. Combining the innate artistry, richness of cultural heritage, skills, knowledge and interest of the community, maguey production may go a long way than expected.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Among the fiber plants, maguey/sisal is identified to be prevalent in almost all municipalities. Wider plant populations of these are seen in the municipalities of Bokod and Kabayan. Existing fiber processors were also identified in these areas. However, the existing maguey plants are not enough to revive the fiber industry.

Other fiber yielding plants were identified in Benguet such as *alinea*, *abaca*/Wild bananas, *balete*, *baloy*, and *fangshan* to name a few. These indigenous plants were once essential in the survival of the olden people. The barks of these trees were the source of their clothing (*binalbal*) or bark cloth. Presently, these trees/plants are endangered because their habitats were developed into vegetable farms that would provide immediate cash for the family.

Looking at the indigenous processes in extracting the maguey fibers, there are several techniques that these processors practice. The processors have different preparatory steps before the actual extraction is done. One is water retting, i.e., soaking the leaves in the water/river until the pulp and skin will rot and soften before scraping. This process takes weeks before they can extract the fiber. Soaking is done to lessen the itchiness caused by the sap of the pulp. A shorter and better process of extracting the maguey/sisal fiber was also discovered and employed by one of the respondent directly extracting the fibers without soaking. This is done by beating the leaf against a lumber to soften, then scrape the pulp off with a bamboo split (not too sharp), until the fiber becomes clean then the fiber can be dried under the sun before making them into ropes or twines. To avoid the



itchiness caused by the sap of the leaf is to refrain from scratching your skin and eyes, when the juice come in contact with the skin just let them dry and never wash or scratch them off.

The potentials of improving the production and processing of endemic fiber plants particularly maguey/sisal is high in Benguet especially in Bokod and Kabayan considering the existence of the larger maguey/sisal plant population in the area, the presence of indigenous fiber processors, the availability of technologies on fiber processing and fiber craft, and the existence of government agencies like BSU-Bokod Campus, DA-LGU, TESDA, DTI, DA, DENR, DAR and other private entrepreneurs to support the textile industry. Maguey/sisal fibers can be an alternate source of raw materials for the textile industry to augment the high cost of imported threads for handicrafts; and the presence of tourist areas like Mt. Pulag, Daclan Hot Spring, Ambuklao Dam, Agno River, including Baguio City as market outlets for the finished products. Moreover, the maguey/sisal fiber is biodegradable that it can be promoted as an alternate source of raw materials for bags, packaging, rugs, and other novelty items that can help reduce the use of non-biodegradable materials.

Recommendations

LGU-DA, DENR, DTI, DAR, DOT, education sector and other concerned GOs and NGOs need to include in their program, plans to revive and improve local industries like rope making and handicrafts making use of indigenous fibers, dyes and other ventures to improve the textile industry. Maguey/sisal production and processing is a recommended additional source of livelihood. Tangible support may be seen through the allocation of fund for the realization of the programs on maguey.

The concerned agencies should continue to put their acts together in coming up with research and product development activities to improve the indigenous technologies on fiber

production to provide additional source of income for the local households. Empower the individuals by capitalizing on the indigenous skills and knowledge for the development of the local industry like textile.

The indigenous processors should be encouraged to promote their products by letting them participate in local and national trade fairs.

Machinery for fiber processing may not be needed for now since the production is in a limited scale. This may be considered in the future undertakings for maguey production. BSU-Bokod may initiate the fabrication of similar machine.

Encourage the propagation and planting of more maguey and sisals to sustain the processing or manufacturing industry.

Further studies on the identification and possible propagation and processing of endemic fiber plants is recommended.

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