

Utilization of non-conventional fibre yielding crops in Karnataka

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■ **ABSTRACT** : Natural fibres have wide range of application in the field of textiles, particularly in the light of recent global inclination towards eco-friendly textiles. User friendly fabrics are gradually gaining importance and consumers are continuously looking for bio-degradable and eco-friendly textiles to preserve their natural environment, flora and fauna. The present study was carried out to know the availability and utilization of non-conventional fibres in various agroclimatic zones of Karnataka state. The results revealed that respondents utilized mesta and agave fibres for making cordages, ropes for home or farm requirements and also sell the cordages. The farmers lose market price significantly due to the reason that they do not undertake proper cleaning and grading of the produce before sales, which is also one of the reasons for low price. Although pineapple, arecanut and coconut are extensively grown in zone – 10, coconut husk was transported to nearby towns and co-operative societies for fibre extraction. However, no reports of pineapple leaf fibre and arecanut fibre extraction was found and are thrown as agricultural waste due to the improper knowledge of fibre qualities, and lack of facilities for fibre extraction. Hence, there is need to study the fibre qualities and produce variegated products for commercialization.

■ **KEY WORDS** : Biodegradable, Eco-friendly, Fibre extraction, Non-conventional fibres, Utilization

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Natural fibres have been used to produce textiles since pre-historic time and are still used because of their excellent performance. These fibres serve as the raw materials for many vital industries sustaining the economy of our time. Unique properties of some of these fibres indicate their versatility to be used as excellent textile materials to produce various end products (Goel and Nishkam, 2003).

In recent years, industrialization and technological advancements has raised the need for development of innovative fibres especially from natural origin. Therefore, eco-friendly fibres are gradually gaining importance as consumers are continuously looking for biodegradable and user-friendly textiles to preserve the environment, flora and fauna (Mahale *et al.*, 2012).

Agro based fibres, classified as bast/ leaf/ seed

fibres and grasses are available throughout the country that can be utilized for various end uses. Bast fibres are mainly used for the manufacture of composites, cordages, etc. Leaf fibres are fine and lustrous that can be blended with other fibres to produce versatile fabrics. Seed fibres are mainly used for filling of mattresses, preparation of floor mats, wall hanging and other household articles like ropes, twines, bags, etc. Fibres such as cotton, wool and silk have developed as major organized sectors while on the other hand, non-conventional fibres such as flax, hemp, jute, mesta, okra, coir, arecanut need to be developed into organized sectors (Das *et al.*, 2010).

Today, as there is more stress on eco-friendly fibres, the non-conventional fibres are given due importance as these fibres have a special advantage of easy availability, are biodegradable, renewable and possess high specific

strength as compared to synthetic fibres. Further, growing concerns for user friendly products among the people have increased the scope for agro fibres blended with other fibres for production of textiles to meet the growing demand (Devi and Sumanthy, 2000). Hence, researchers are exploring various alternatives for diversification of agro fibre products with respect to socio-economic point of view to meet the demand of eco-friendly and pure natural textile materials thereby opening a wide avenue to utilize these agro fibres. Therefore, the present study was undertaken with an aim to study the availability and utilization of non – conventional fibres in various agro – climatic zones of Karnataka state.

METHODOLOGY

Locale and sample selection :

Availability of non-conventional fibres were found to be more in Koppal, Dharwad, Belgaum and Uttar Kannada districts comes under Zone 3, 8 and 10.

Therefore, survey was conducted in these areas. Totally eighty respondents, ten respondents for each fibre were selected for the study.

Tools used :

Prestructured questionnaire was used to elicit information on demographics of respondents and availability and utilization of fibres. Personal interview method was followed.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Demographics of respondents :

Table 1 records the demographic status of the farmers in different zones. Majority of the respondents from Zone 3 and Zone 8 belonged to the middle age and

| Table 1 : Demographics of respondents | | (n=90) | | |
|---------------------------------------|--------------------------|---------------|---------------|----------------|
| Sr. No. | Demographic categories | Zone-3 (n=30) | Zone-8 (n=30) | Zone-10 (n=30) |
| Age | | | | |
| 1. | Below | 07 (23.30) | 07 (23.30) | 06 (20.00) |
| 2. | Middle | 15 (50.00) | 13 (43.30) | 10 (33.30) |
| 3. | Older | 08 (26.60) | 10 (33.30) | 14 (46.60) |
| Education | | | | |
| 1. | Illiterate | 12 (40.00) | 16 (53.30) | 04 (13.30) |
| 2. | Primary education | 18 (60.00) | 14 (46.60) | 26 (86.60) |
| 3. | Intermediate | - | - | - |
| 4. | Degree and above | - | - | - |
| Income | | | | |
| 1. | Low (up to30,000) | 08 (26.60) | 09 (30.00) | 04 (13.30) |
| 2. | Medium (30,000 – 50,000) | 19 (63.30) | 17 (56.60) | 21 (70.00) |
| 3. | High (above 50,000) | 03 (10.00) | 04 (13.30) | 05 (16.60) |
| Family | | | | |
| 1. | Nuclear | 21 (70.00) | 25 (83.30) | 20 (66.60) |
| 2. | Joint | 09 (30.00) | 05 (16.60) | 10 (33.30) |
| Land holding | | | | |
| 1. | < 3 acres | 06 (20.00) | 05 (16.60) | - |
| 2. | 3-8 acres | 10 (33.30) | 18 (60.00) | 13 (43.3) |
| 3. | >8 acres | 04 (13.30) | 07 (23.30) | 17 (56.60) |
| Subsidiary activity | | | | |
| 1. | Dairy | 06 (20.00) | 08 (26.60) | 09 (30.00) |
| 2. | Sheep/goat rearing | 04 (13.30) | 03 (10.00) | - |
| 3. | Backyard poultry | 03 (10.00) | - | 05 (16.60) |
| 4. | Wage earning | 12 (40.00) | 15 (50.00) | 12 (40.00) |
| 5. | Petty business | 05 (16.60) | 04 (13.30) | 04 (13.30) |

those in Zone 10 belonged to older age group. Similarly majority of the respondents in zone 3 and 10 had completed primary education and 53 per cent of them from zone 8 were illiterates. With respect to the income, majority of the respondents in zone 3 (63.3%), zone 8 (56.6%) and zone 10 (70.00%) belonged to the middle income group. However, more than ten per cent in each zone belonged to high income group. Majority of the respondents in all the zones belonged to the nuclear family type. The land holdings of the respondents in zone 3 (33.30%) and zone 8 (60.00%) was 3-8 acres, whereas the respondents in zone 10 (56.6%) had >8 acres of land. Subsidiary occupations of the respondents in zone 3 were wage earning, dairy, petty business, sheep / goat rearing and backyard poultry. Similarly, in zone 8, respondents were wage earners, had dairy units and pet businesses as subsidiary occupation. Wage earning, dairy, backyard

poultry and petty business were the subsidiary occupations of the respondents in zone 10.

Type of fibre yielding crops grown :

It is evident from Table 2 that majority of the respondents in Zone 3 grew flax (56.60%) followed by agave/sisal (40.00%), Mesta (33.3%), okra (30.00%), maize and sunhemp (26.6% each), banana (23.30%) and coconut (20.00%).

Similarly, respondents in zone 8 grew okra (56.60%) followed by Mesta (46.66%), flax and agave (43.30% each), maize (40.00%), sunhemp (33.30%), coconut (30.00%) and banana (16.60%).

Whereas, majority of the respondents in zone 10 grew arecanut (63.30%) followed by coconut (56.60%), banana (43.30%), pineapple (40.00%), okra (23.30%) and maize (13.30%) crops, respectively.

| Sr. No. | Crops | Zone-3 (n=30) | Zone-8 (n=30) | Zone-10 (n=30) |
|--------------------------|-------------|---------------|---------------|----------------|
| Cereal crops | | | | |
| 1. | Maize | 08 (26.60) | 12 (40.00) | 04 (13.30) |
| Vegetable crops | | | | |
| 2. | Okra | 09 (30.00) | 17 (56.60) | 07 (23.30) |
| 3. | Mesta | 10(33.30) | 14 (46.60) | - |
| Oilseed crops | | | | |
| 4. | Flax | 17 (56.60) | 13 (43.30) | - |
| Green manure crop | | | | |
| 5. | Sunhemp | 08 (26.60) | 10 (33.30) | - |
| Hedge plants | | | | |
| 6. | Agave/sisal | 12 (40.00) | 13 (43.30) | - |
| Horticultural | | | | |
| 7. | Banana | 07 (23.30) | 05 (16.60) | 13 (43.30) |
| 8. | Pineapple | - | - | 12 (40.00) |
| 9. | Coconut | 06 (20.00) | 09 (30.00) | 17 (56.60) |
| 10. | Arecanut | - | - | 19 (63.30) |

| Sr. No. | Crop | Zone-3 (n=30) | Zone-8 (n=30) | Zone-10 (n=30) |
|---------|----------|---------------|---------------|----------------|
| 1. | Maize | - | - | - |
| 2. | Okra | - | - | - |
| 3. | Mesta | - | 05 (16.60) | - |
| 4. | Flax | - | - | - |
| 5. | Sunhemp | - | - | - |
| 6. | Agave | 02 (6.60) | 04 (13.30) | - |
| 7. | Banana | - | - | - |
| 8. | Coconut | - | - | 06 (20.00) |
| 9. | Arecanut | - | - | 01 (3.30) |

Fibre extraction :

From Table 3 it is noted that only 6.6 per cent of the farmers in Zone 3 extracted fibre from agave, 16.60 per cent and 13.30 per cent of respondents from zone 8 extracted fibres from Mesta stalks and agave leaves, respectively. Twenty per cent of the farmers in zone 8

extracted coir from coconut and very few (3.3%) farmers' extracted fibre from arecanut husk.

Reasons for not utilizing waste for fibre extraction:

Reasons for non-extraction of fibres by the farmers is exhibited in Table 4.

| Table 4 : Reasons for not utilizing waste for fibre extraction | | | | | |
|--|------------------|---|------------|------------|-------------|
| Sr. No. | Crop | Reasons | Zone-3 | Zone-8 | Zone-10 |
| 1. | Maize (n=24) | Lack of knowledge of fibre extraction | 08 (33.30) | 09 (38.00) | 04 (16.60) |
| | | Lack of facilities for fibre extraction | 08 (33.30) | 12 (50.00) | 04 (16.60) |
| | | Lack of skilled labour | 04 (16.60) | 07 (29.20) | 02 (8.30) |
| 2. | Okra (n=33) | Lack of knowledge of fibre extraction | 09 (27.20) | 14 (42.40) | 07 (21.20) |
| | | Lack of facilities for fibre extraction | 07 (21.20) | 17 (52.00) | 07 (21.20) |
| | | Lack of skilled labour | 08 (24.20) | 09 (27.20) | 06 (18.10) |
| 3. | Mesta (n=19) | Lack of knowledge of fibre extraction | 08 (42.10) | 06 (31.60) | - |
| | | Lack of facilities for fibre extraction | 09 (47.30) | 09 (47.30) | - |
| | | Lack of skilled labour | 06 (31.60) | 04 (21.10) | - |
| | | Tedious and time consuming process | 09 (47.30) | 09 (47.30) | - |
| 4. | Flax (n=30) | Lack of knowledge of fibre extraction | 17 (56.60) | 13 (43.30) | - |
| | | Lack of facilities for fibre extraction | 17 (56.60) | 13 (43.30) | - |
| | | Lack of skilled labour | 08 (26.60) | 06 (20.00) | - |
| | | Tedious and time consuming process | 13 (43.30) | 08 (26.60) | - |
| 5. | Sunhemp (n=18) | Lack of knowledge of fibre extraction | 08 (44.40) | 10 (55.50) | - |
| | | Lack of facilities for fibre extraction | 08 (44.40) | 07 (39.00) | - |
| | | Lack of skilled labour | 04 (22.20) | 03 (16.60) | - |
| | | Tedious and time consuming process | 05 (28.00) | 08 (44.40) | - |
| 6. | Agave (n=19) | Lack of knowledge of fibre extraction | 10 (52.60) | 08 (42.10) | - |
| | | Lack of facilities for fibre extraction | 10 (52.60) | 09 (47.30) | - |
| | | Lack of skilled labour | 06 (31.50) | 07 (37.00) | - |
| | | Tedious and time consuming process | 09 (47.30) | 09 (47.30) | - |
| 7. | Banana (n=25) | Lack of knowledge of fibre extraction | 05 (20.00) | 05 (20.00) | 13 (52.00) |
| | | Lack of facilities for fibre extraction | 04 (16.00) | 05 (20.00) | 13 (52.00) |
| | | Lack of skilled labour | 07 (28.00) | 03 (12.00) | 09 (36.00) |
| 8. | Banana (n=25) | Tedious and time consuming process | 07 (28.00) | 02 (8.00) | 06 (24.00) |
| 9. | Coconut (n=26) | Lack of knowledge of fibre extraction | 06 (23.10) | 03 (12.00) | 02 (8.00) |
| | | Lack of facilities for fibre extraction | 06 (23.10) | 09 (35.00) | 11 (42.30) |
| | | Lack of skilled labour | 03 (12.00) | 02 (8.00) | 07 (30.00) |
| | | Tedious and time consuming process | 02 (8.00) | 04 (15.30) | 03 (12.00) |
| 10. | Pineapple (n=12) | Lack of knowledge of fibre extraction | - | - | 12 (100.00) |
| | | Lack of facilities for fibre extraction | - | - | 12 (100.00) |
| | | Lack of skilled labour | - | - | 08 (67.00) |
| | | Tedious and time consuming process | - | - | 05 (42.00) |
| 11. | Arecanut (n=18) | Lack of knowledge of fibre extraction | - | - | 12 (67.00) |
| | | Lack of facilities for fibre extraction | - | - | 18 (100.00) |
| | | Lack of skilled labour | - | - | 10 (56.00) |
| | | Tedious and time consuming process | - | - | 07 (39.00) |

* Multiple responses possible

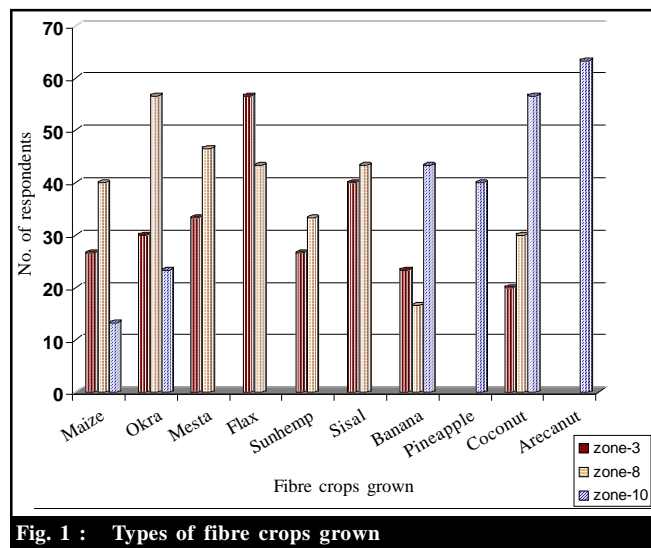


Fig. 1 : Types of fibre crops grown

Maize :

Maize is a major cereal crop in Karnataka. After harvesting the sheath covering the cob is removed that is merely wasted. These sheaths are split into ribbons and manually spun to form continuous strands of yarn for product development in Zone 3. Majority of the respondents in all the three zones expressed lack of facilities and improper knowledge of fibre extraction to

be the major reason for non-extraction of fibre from maize crop. However, lack of skilled labour was also a reason for non-extraction of fibres in all the three zones.

Okra :

Okra is a vegetable crop that every farmer sows at least for household requirements for the vegetable. Reviews notify the extraction of fibres from okra stalks. Majority of the respondents in Zone 3 mentioned the lack of knowledge of fibre extraction from okra stalks. Lack of skilled labour (24.20%) and lack of facilities for fibre extraction (21.20%) were reasons for non-extraction of fibre from okra stalks. Majority of the farmers in zone 8 mentioned (52.00%), lack of knowledge of fibre extraction (42.40%) and lack of skilled labour (27.20%) as the reasons for non-extraction of fibre. Among the farmers from zone 10, around twenty one per cent of them expressed the lack of knowledge and facilities for fibre extraction followed by lack of unskilled labour (18.10%).

Okra/bhendi (*Abelmoschus esculentus* L.) is a vegetable crop. Which has not been exploited commercially (Mujeera and Arunachalam, 2006). Okra fibre was discarded after vegetable extraction. This is a soft fibre and possesses an excellent quantity of cellulose.

Table 5 : Utilization of fibre by respondents

| Sr. No. | Crop | | Zone-3 | Zone-8 | Zone-10 |
|---------|----------|-------------------------------------|-----------|------------|------------|
| 1. | Mesta | Fibre for sale | - | - | - |
| | | Cordages for home/farm requirements | - | 05 (16.60) | - |
| | | Cordages for sale | - | 05 (16.60) | - |
| | | Product development | - | - | - |
| 2. | Flax | Fibre for sale | - | - | - |
| | | Cordages for home/farm requirements | - | - | - |
| | | Cordages for sale | - | - | - |
| | | Product development | - | - | - |
| 3. | Agave | Fibre for sale | - | - | - |
| | | Cordages for home/farm requirements | 02 (6.60) | 04 (13.30) | - |
| | | Cordages for sale | 02 (6.60) | 04 (13.30) | - |
| | | Product development | - | - | - |
| 4. | Coconut | Fibre for sale | - | - | - |
| | | Cordages for home/farm requirements | - | - | 04 (13.30) |
| | | Cordages for sale | - | - | - |
| | | Product development | - | - | 02 (6.60) |
| 5. | Arecanut | Fibre for sale | - | - | - |
| | | Cordages for home/farm requirements | - | - | 01 (3.30) |
| | | Cordages for sale | - | - | - |
| | | Product development | - | - | - |

It can be blended with jute and used in paper and card board manufacturing (Md. Shamsul and Arifuzzaman, 2007).

Mesta :

Mesta is grown as a hedge crop and leafy vegetable. Matured stalks are harvested during December-January every year and staked in the field upright for drying. The stalks are rippled, bundled and soaked in ponds, lakes and river beds for retting (Dhanalaxmi and Vastrad, 2013). Majority of the respondents in zones 3 and 8 expressed that the fibre extraction process was tedious and lack of facilities for fibre extraction (47.30% each) was the major problem followed by lack of knowledge and unskilled labour for fibre extraction.

Flax :

Flax is mainly grown for its seed-linseed that is largely consumed in north Karnataka region. It was evident that majority of the respondents use the stalks for fuel. However, the reasons for non-extraction of fibre from linseed stalks in both the zones were lack of knowledge and facilities for fibre extraction. Nearly forty three per cent of the farmers in zone 3 and zone 8 expressed that the fibre extraction process was tedious and time consuming.

Flax is one of the oldest natural fibre available all over India and is grown in larger quantities either for fibre or seed (Basu *et al.*, 2003). The earlier use of flax fibre was limited to packing and furnishing fabrics due to its weak strength and abrasion resistance (Tyagi *et al.*, 2000).

Sunhemp :

Sunhemp is a manuring crop grown in fields of zone 3 and zone 8. Plants are uprooted and spread in the fields to form manure and enrich the soil. Most of the respondents opined that they were unaware of the fibre extraction process and had no facilities for fibre extraction. However, 44.4 per cent of the farmers in zone 8 expressed that the fibre extraction process was time consuming and tedious (Basu *et al.*, 2006).

Sunhemp is a poor farmer's fibre extracted from the stem. It was grown on lands of scanty rainy water and available abundantly in all over the India (De *et al.*, 2006). It was used for the preparation of cattle rope making and sold in weekly bazaars of the villages (Doke

and Susant, 2004).

Agave :

Agave is a hedge crop and is planted on the bunds of irrigation rows to prevent soil erosion (Quadiani *et al.*, 2009). Leaf of this plant is a rich source of fibre used for making cordages in the villages. Mechanical extractor (raspador machine) has made the job easy. However, majority of the farmers expressed that they lacked facility for fibre extraction followed by the lack of knowledge of fibre extraction. However, 47.3 per cent each of the respondents expressed that the process that fibre extraction was tedious and time consuming.

Banana :

Banana is a plantation crop grown in almost all climatic zones of the state. Banana stem has no use after harvesting. No by-product of this tree is utilized except for the plantain (Kumar and Kumar, 2011). The florescence and the seedling stem are used in zone 10 as a vegetable. Therefore, the knowledge of fibre extraction was unknown to the respondents of zone 10 and zone 8. Farmers in zone 3 were aware of the fibre extraction process but did not extract fibre because the fibre extraction process was tedious and time consuming and also due to the lack of skilled labour to extract fibres.

Coconut :

Coconut is a major plantation crop in zone 10. Majority of the farmers lacked the knowledge and skilled labour for fibre extraction. It was observed that the coconut husk was used as fuel or was thrown into the farm pit for manuring.

Coconut fibre is one of the natural fibre abundantly available in tropical regions and is extracted from the husk of coconut fruit. The fibre is most ductile and energy absorbent material. It is used in composites for different purposes and also in constructional material as reinforcement composites (Majid, 2010).

Pineapple :

Pineapple was a major fruit crop of Sirsi taluk in zone 10. As a practice the leaves of pineapple are pruned and thrown beneath for mulching. The farmers in the area lack in the knowledge and facilities for fibre extraction. Lack of skilled labour was the reason mentioned by sixty seven per cent of the respondents

for non-extraction of fibre.

Pineapple leaf fibres are a type of lignocelluloses fibres readily available in tropical regions. The fibres extracted from leaves of pineapple plant. These fibres have proven to be potential for yarns and fabrics of quality comparable to that of jute, ramie/linen (Kannojiya *et al.*, 2013 and Sricharussin *et al.*, 2009).

Areca nut :

Areca nut is also one of the most important horticultural crops in zone 10. Cent per cent of the respondents lacked the facilities for fibre extraction from areca nut husk. However, 67 per cent lacked the knowledge of fibre extraction.

Utilization of fibre :

Table 5 explained about utilization of fibre by respondents. In zone 8 only 16.6 per cent of respondents utilized Mesta fibre for making cordages for home or farm requirements and also they sold the cordages. Greater percentages (13.30%) of zone 8 respondents utilized agave fibre for cordages preparation. Prepared cordages were utilized for farm/home requirements and some of the respondents also sold the cordages. Very few farmers from zone 3 (6.60%) prepared most of cordages from agave fibre. Thirteen per cent of coconut farmers from zone 10 make use of fibre for making cordages for home/farm requirements. Small percentages (3.30%) of farmers utilized areca nut fibre for cordages preparation and make use of cordages for home and farm requirements.

Goel and Nishkam (2003) reported that Murva fibres are available abundance in nature and are not used. The fibre was extracted from leaves of Murva plant and exploited their use in textile and handicraft. Kunda *et al.* (2005) noticed that Khimp fibre plant is abundantly available in the desert region. It is mainly used for rope making, thatching and animal fodder in rural areas. Susan Paul *et al.* (2007) found that *Girardina Heterophylla* is an agro based fibre and available abundantly in hilly region of North India. It was extracted by retting method and used for producing various handicraft materials.

Huang (2005) conducted a study on Nettle fibre and found that stinging Nettle (*Urtica cannabina* L.) is a perennial plant grown in temperate and tropical waste land areas. Entire plant is used for medicinal uses. While the fibre is very similar to that of hemp/flax and can be

used for the same purposes. But the plant yields lower quantity of fibre, difficulties in fibre extraction from stem and short and coarse fibre have limited its wide application as a textile fibre. Further, Prasad (2006) also stated that Aak fibre is a natural cellulosic bast fibre obtained from the stem of *Calotropis Procera* plant. Fibre was extracted by retting method and used for blended with other fibres in producing fabrics.

Conclusion :

Natural fibres have wide range of application in the field of textiles, particularly in the light of recent global inclination towards ecofriendly textiles. Non-conventional fibres such as flax, jute, sisal, coir, banana and pineapple fibres are classified as minor fibres. In recent years, the commercialization of natural fibres is losing prominence owing to competition from synthetic fibres and the difficulties in large scale production due to the cultivation of cash crops by farmers. The results revealed that respondents utilized Mesta and agave fibres for making cordages, ropes for home or farm requirements and also sold the cordages. The farmers lose market price significantly due to lack of improper sale arrangements in markets. In addition, farmers do not undertake proper cleaning and grading of the produce before sales, which is also one of the reasons for low price. Although pineapple, areca nut and coconut are extensively grown in zone – 10, coconut husk was transported to nearby towns and co-operative societies for fibre extraction. However, no reports of pineapple leaf fibre and areca nut fibre extraction was found and are thrown as agricultural waste due to the improper knowledge of fibre qualities, and lack of facilities for fibre extraction. Hence, such fibres need to be exploited, study their fibre qualities and produce variegated products for commercialization.

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