Potentiality of Value Added Products from Toddy Palm and Long Term Sustainability in Central Dry Zone

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Mandalay Region located in Central Myanmar has renowned for ubiquitous trees of toddy palm since Bagan Period. *Borassus flabellifer* L. belonging to the family Arecaceae are widely grown in Central Myanmar. This species is one of the useful palms among the plants. It is accounted as symbol of communities of central dry zone area, as their way of live ties up with the benefit used of toddy-sap-based products for long time until it become culture and living by transforming for daily-life used commenting-based farmyard plantation of toddy palms help the rural people to employ system that produces the goods, income generation and services which they need now and in the future. It is found that every developmental stage of the plants which means from the germinated seeds to the adult plants can be used for human being. The traditional applications of toddy palm are mentioned as human needs. Recent study of this plant have emphasized on the juice collection, snacks and fodder, building utensils, household articles, containers, furniture, pots, beverage, toys, medicinal uses and firewood. In addition, traditional culture of toddy palm in regard with indigenous knowledge which was distilled from community experiences, interacting with toddy palms in the field of culinary, religious, rustic daily life, income generated works of local communities and traditional toddy-based agroforestry system were discussed in this research paper. This community initiative project conducted in 2012-2018 to have a better understanding of productive potential of community toddy palm project, which should be exploit and explore existing wealth of local knowledge recognizing strong local cooperation and participation is critical to on farm ***in situ*** conservation of toddy palm trees, understanding the ecological services provided by then. Enhanced productivity through toddy sap-based and fruit-based products is only way to secure and sustain in particular dry zone area. These feasibility studies due to participatory project has been initiated with two mandating such as to create sustainable livelihood system development and to conserve the plant resources by means of making useful for toddy-based diversification of products.

Key words: Toddy palm, Indigenous knowledge, Traditional application, Toddy- based agroforestry, Sap-based

Introduction

Central Myanmar, especially Mandalay Region is endowed with the largest palm tree population, making up about the estimation of million palm trees according to the last palm tree censes done in 2013 (Kalaya Lu 2014) and also possesses the highest diversity of palm utilization. These tremendous palm trees provided both subsistence and commercial products for the local communities for thousands of years. Long-term co-existing of local communities and toddy palm trees, they could have experienced and managed to distill the knowledge and local technologies in terms of traditional knowledge and technologies exploiting the palm products. Toddy palm provide significant diversity of food, beverage, fiber contraction material and any other

Toddy palm also known as palmyra trees naturally grow on the crop field without human's nursing and wedding. Through the century, these toddy palms play an important role in the traditional and culture of people live in Central Myanmar. It has to be considered that Central Dry regions of Myanmar toddy palm plants could be

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cultivated abundantly in many suitable places due to their valuable usefulness and traditional applications.

Therefore, it will hope that to conserve the ancient agroforestry system and toddy palm culture through ethnobotanical survey, to develop the socio-economic condition of local people by using the modern technology of toddy palm products and to create ancient agro-toddy palm forest as ecotourism sites with local authorities.

Local Community Innovation in Toddy Palm Resource Management

However, there is one people who rely on toddy palm sap-based products have also realized on conservation and production for this livelihood. Therefore, the development strategy for sustainable development toddy palm tree and community development was undertaken as local initiatives. Awareness was firstly created in Chaung Shae and Shwe Hlaing villages through local community participation. People participation in preservation conservation and maintenance to make the optimum use of plant resource can also be established with the strength of the community. It is "community- based cooperative for toddy-palm and sap-based products, firstly practices at Chaung Shae village.

Self-dependent toddy-sap products and conservation activities were operated in a manageable scale, depending on some important fund shared by local villagers, integrating with some existing resources such as cultural capital, plant resource capital and social capital. It was a good opportunity to rehabilitate community potency by using resource, strong society, for protection *in situ* on-farm conservation of toddy palms trees and creating environmental friendly income generation for sustainable development. All theory, formal sap-tapping is very risky. But it can provide only marginal returns.

Therefore, the possibilities for new food processing enterprises and users (or) consumers for many of these products have been explored in dry zone areas. New commercial opportunities will also continue to increase the range and size of particular this plant resource-based. This cooperative is the informal section that is they are not officially recognized by the conventional financial institutions. Therefore, it is often difficult for then to get financial assistance to start-up small scale food processing or marketing. The degree of situational support received from co-operatives, government, NGOs, bank and any other organization was very limited.

But technology transfers were provided by Mandalay University, Department of Botany and Industry Ministry in terms of training and food processing technologies as capacity building. Increasing commercial values, expanding markets can lead to the introducing of appropriate green technologies effecting ecology and economical development in dry zone area.

Objectives

- To develop local (or) village sale micro-enterprise development program for poverty eradication
- To promote enterprise based on the diversification of toddy sap-based products and high value, and low perishability which is particularly relevant for the central dry zone area.
- To promote sustainability of traditional Agroforestry and on-farm *in situ* conservation of toddy palm trees.

Materials And Methods

The design of the research is trended on ethnobotany and conservation of toddy-palm plant resources. Qualitative and quantitative measures are mainly included. The works will also include eco-environment observing, agrobiodiversity inventory and local knowledge. Participatory Rural Approach (PRA) methodologies by means of a questionnaire survey will carry out to reveal the eco-friendly knowledge for long-term sustainability. Available literature and source of information could increase the knowledge information of their traditional way of sustainable agroforestry.

Results

Morphological Characters of Toddy Palm *(Borassus flabellifer* L.)

Family - Arecaceae
Local name - Htan
English name - Toddy palm, Palmyra palm, Tala palm, Wine palm
Flowering Time - January to May

Perennial, robust tree, dioecious palm, up to 20m, trunk stout, unbranched. Leaves simple, crowded at the top of the trunk, with numerous segments. Inflorescences axillary, spadix, enclosed by the leathery and spatheous bract. Staminate spadix cylindric, catkinlike, with numerous dense flowers. Pistillate spadix spiciform, with large and globose flowers. Staminate flowers circular clusters, enclosed by scale-like bracts. Pistillate flowers solitary, large, convolute, persistent. Fruits drupaceous, subglobose, large, black or dark brown, with obcordate and fibrous pyrenes; the wall of pyrene bony; fibrous layer pulpy; pulp yellow or orange. Seeds depressed, oblongoid.

There are two kinds of production, based on sap and fruits such as
1. Sap-based toddy products
2. fruit-based toddy products

1. Sap-based toddy products

(i) Toddy sap non-fermented juice

Harvested sap is pale yellow, excessively sweet and contains sucrose, fructose. The juice has to be immediately processed to prevent the fermentation of sucrose. The juice is allowed to settle down in steel tanks and 1% lime is added where its pH from 5.8. The juice is then boiled within a steam coil. Filled within the steel tank when the juice becomes dark colour and syrupy. It is ready for the next process (or) it is bottled and sterilized with an autoclave. It hygienically prepared the sap drink can be store until six months without deterioration boiling the sap until it reaches 110°C temperature or under a moderate to very low heat. The sticky liquid is allowed to cool then poured into the desired container.

One bottle ..... 100 mm
Price ..... 1500 kyats

(ii) Toddy sap syrup

Toddy sap is boiled within the steam coil fitted within the steel tank until it becomes dark colour and thick like honey. This can be sonly done immediately by heating at 60°C then tightly sealed and place in the refrigerator. It can be used for the confectionary and substituted for honey.

One bottle ..... 100 mm
Price ..... 2500 kyats

(iii) Jaggery

The sap obtained from the up opened inflorescences the tip of the inflorescence anis is cut off and oozing sap is collected in pot containers tread beneath the yield of this sweet juice is known as toddy sap contain 14-17 of sucrose the juice so collected is boiled and then cooled to form hard piece of crude sugar known as jaggery about 1 kg of jaggery is obtained from 3-4 gallons of toddy sap.
1 kg ..... 1000-1500 kyats

(iv) Sap natural vinegar

Harvested toddy are poured in an earthen container with a clean netted cover to allow aeration prevent the any thirty to be entered. After 10 days of fermentation, the sap can be used as vinegar. To maintain the desired quality of the matured quality with at least 4-5 of acidly pasteurize it by boiling for 15 min at 67°C.

(v) Toddy sap used as alcohol beverages

Boiled toddy sap mixed with molasses and led off to the fermentation tank (earthenware) where it is thoroughly mixed with yeast (*Saccharomyces cerevisiae*) and than allowed to stand for a (3) weeks. The temperature has to be maintained at 35°C. It is undistilled beverage. It comprises of about 10-12 of alcohol.
One bottle ..... 100 mm
Price ..... 3500 kyats

(vi) Sweet wine

Toddy wine that is formed prior to the completion of fermentation, about (10) days after fermentation.

(vii) Naturally fermented toddy wine

It is one of the most popular drunks of Central Myanmar known as Htun Yae Khar. The sap obtained from the inflorescence is fermented with naturally existing flora yeast of toddy and set aside the pot for 5 hours. Traditional toddy wine is largely consumed for its appetite increasing qualities.
One pot ..... 500 kyats

(viii) Fortified wine

Toddy wine which is strengthened or fortified by the addition of distilled toddy gin and has a higher alcoholic content are known as fortified toddy wire.
One cup ..... 500 kyats

(ix) Sprout seed wine

The fermented toddy sap is formed in infusion by mixing with toddy sprout seeds (Htun pin Myit). This beverage is used as medicinal alcohol and is highly carbonated.

(x) Distilled toddy alcohol

Molasses, the dark colour syrup containing 60% of carbohydrate, 40% of sucrose can be used as raw materials. After fermentation, the process is then distilled in a continuous still to separate the alcohol and other volatile constituents. The final distillate contains 90% of alcohol.
One bottle ..... 2000 kyats

2. Fruits Based Products

(i) Toddy fruits endosperm

One of the most ancient fruits known to Myanmar. It was essentially cultivated in central Myanmar for sap and fruits. Though fruits are seasonally available, used as traditional table fruits like dessert and also regarded as one of the most nourishing food of summer time. It is also listed in the cheapest fruits of the central dry zone area. Fresh fruits can be also used as vegetable.

5 fruits ..... 100 kyats

(ii) Dry toddy fruits

Mature toddy fruits are sundries for 10 days and kept in the dry and cold place for off season availability.

(iii) Fermented Toddy fruits

Mature toddy endosperm is freshly prepared in the process of traditional Tai (Shan) fermented mustard. These kinds of preservation can contribute the year around available of fermented toddy fruits.

One bottle ..... 1500 kyats

(iv) Canned Toddy fruits

Mature toddy fruits endosperms are boiled with toddy sap and bottled. After that toddy sap and bottles are sterilized in an autoclave at 121°C for 15 min.

One bottle ..... 2000 kyats

(v) Toddy fruit endosperm jam

Traditional Jam making process is that toddy fruits are boiled in the hot water for 5 min and then washed under the running water. Fruits are chopped into the small pieces and mixed with jaggery paste. The mixture is then stirred and cooked for 15 min until the fruits become sticky and turn into brown colour.

One package ..... 500 kyats

(vi) Toddy fruits endosperm jelly

Mature toddy fruits have pectin so that it is also a good source of making Jelly. The fruits are boiled in the hot water for 5 min and washed under running water. The fruits are crushed into the small pieces and cooked until it becomes jelly.

One cap ..... 200 kyats

(vii) Toddy palm endosperm paste

Toddy palm fruit paste is unusual food that uses extracts from the mesocarp of the ripe fruits. It is the most popular traditional Myanmar desserts made by mixing rice flour with toddy palm flesh yellow paste and jaggery. The ingredients are fermented 3-4 hours and steamed fruits microorganisms of toddy palm located in the monocarp flesh produce CO_2 which will course fermentation and make the palm leaven, soft and spongy. It can be used as coloring agent, a flavoring agent in addition to its leaven properties. It has great potential for being used in confectionary.

3. Stem of Toddy Palm for Building Utensils

The stems of toddy palms can be used as wood in the construction of huts, houses, bridges, and stairs because of their hardness and resistance to insects.

4. Utilization of Leaf Blades and Petioles of Toddy Palm

The toddy palm leaves are one of the most important materials for building materials, household goods, containers and toys. Fibre small scale cottage industries are now encouraged producing toddy palm fibre to produce value-added products of hat, mat, card, bags for local use. Toddy fibre can be an excellent alternative for rattan.

5. Uses as Medicine

The parts of the toddy palm are variously used as several traditional medicines in some regions of Myanmar. The mature green fruits can be applied in diuretic and to cure asthma and hypertension. The seedlings of toddy palm are used for carminative and digestion. The fresh and sweet juice of toddy palm is applied to clean the urinary bladder and for sleeping well. If the ferment and bitter juice will be drunk suitably, the human will be lower the risk of the disorders of urine and hypertension.

Discussion and Conclusion

Many people, especially in rural regions, rely on wild collected plants for food, construction materials, fuelwood, medicine and many other purposes. Traditionally, local communities are extremely knowledgeable about local plants and other natural resources, on which they are immediately and intimately dependent. Today, much of this wealth of knowledge is becoming lost as traditional cultures become eroded. Economic botany or the applied part of botany is concerned with the application of the knowledge of plant science to man's well-being. To be more specific it may be said to deal immemorial, man is dependent on plants for his existence. Therefore, it is evident that in order to meet the ever-increasing demand for food, clothing and other necessary commodities, knowledge of applied plant science is indispensable.

Local people are experiencing an acute shortage of water resources, underground water, and animal fodder. Climate changes integrating with land use pattern changes due to cutting off all existing toddy palm trees can be the main drivers of environmental change in Central Myanmar. These drivers will change the livelihoods of the rural community and will increase their economic and environmental vulnerability dramatically.

Local people are used to practicing the traditional agroforestry system with palm trees in their farm indirectly and directly providing goods and services to the central dry zone ecosystem. As a remedial measure for climate change, the protection of ecological niche-based toddy palm trees is increasingly important. It needs to promote income activities that balance the need for conserving plant resources and meet the requirement of the local communities.

Therefore, it is believed to conserve ancient agroforestry system and toddy palm culture through ethnobotanical survey, to develop the socio-economic condition of local people by using the modern technology of toddy palm products and to create ancient agro-toddy palm forest as ecotourism sites with local authorities.

Toddy palm is important to dry zone's local communities because it is property transferring from their ancestors since ancient age. It is also accounted as a symbol of dry zone area and way of living of communities up with benefits use of sap-based products for a long time until it becomes a culture and living by transforming for daily life use. Local People are also realizing the tremendous losses of ecological niche-based of trees of the dry zone when result from improper utilization and indiscriminate falling. This awareness needs to be reinforced by allowing local community to have a role in resource management. It is particularly important to ensure that toddy plant based small scale enterprises link to sustainable management of biodiversity integrating with agrobiodiversity. There is no doubt that toddy sap-based small food processing can play a substantial role in improving the livelihood of local sap-tappers and those families.

This research reveals that the most significance for community development is local people's participation. Another important factor for community development is effective development strategy implemented by stakeholder and local community who really understand and share the benefit from the development without impacting the local ecological condition.

In 2013-2014, dry zone are have started effecting climate change. It is coming and negatively impacting on timely water availability, biodiversity crop diversity and food security in that area.

Natural landscape of dry zone area was endowed with the existence of millions of toddy palm trees. Local people are used to practicing the traditional agroforestry system with palm trees in their farm indirectly and directly providing goods and services to the central dry zone ecosystem. As a remedial measure for climate change, protections of ecological niche-based toddy palm trees are increasingly important. In that area, it needs to promote income activities that balance the need for conserving plant resources and meet the requirement of the local communities.

This small scale enterprise can be especially effective in providing essential supplementary income often during the seasonal period of critical shortage, creating a bridge between desperation and hope. In order to maintain the multipurpose toddy palm trees, it needs to preserve and improves or develop the cultural like practice to be inconsistent with modernized aged appropriately and effectively. By increasing the access to toddy-palms based economic benefits. It is hoped that small scale enterprises will involve people in there are active management giving then a stake in the future sustainability of natural resources.

Green business is part of the green economy. The green economy understands as the economy has brought happiness to the community and social justice both significantly reduce environmental risks and ecological crises. Green economy and green growth is the process of redirecting investment incentives for economic activity

and to obtain results from investment for human resources, natural resources while reducing the amount of emission and climate change effect. Better use of Biological resources creates less waste and climate contributes to reducing inequality of society. According to this green economy concept, toddy palm business meets the criterion and has great potential for manufacturing the ecofriendly products which can fulfill the requirement of local community and eco-development of Mandalay region of central dry zone area.

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