Department of
Agriculture Development and Farmer's Welfare
Government of Kerala

Farm Information Bureau

MAY 2021
VOLUME - 8
ISSUE - 11

KERALA KARSHAKAN

English journal

The First English farm journal from the house of Kerala Karshakan

Elephant apple

An underutilized Fruit crop

INSIDE

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The First English farm journal from the house of Kerala Karshakan

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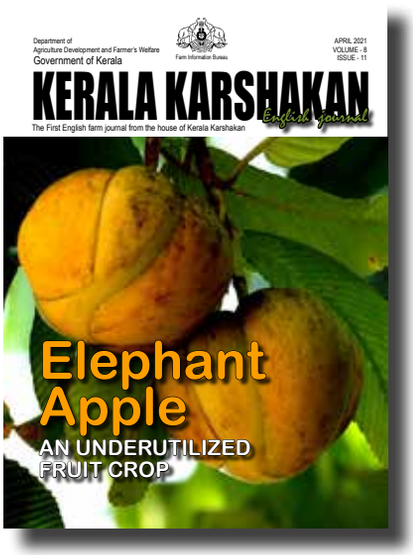

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***Dillenia indica* Flower**

Elephant apple

An underutilized Fruit crop

Elephant apple is a staple fruit in the villages where the fruit grows, but it is not well known in urban cities. This fruit is common in the northern tropical regions of India, particularly in Assam and Kolkata. Other parts of India growing elephant apple includes the dry hill areas of Bihar, Odisha, Karnataka, Andhra Pradesh and Madhya Pradesh. The fruit also thrives in swamps, semi-tropical forests and the evergreen forests of the sub-Himalayan tract from Kumaon to Garhwal. The tree bears aromatic, magnolia-like flowers in June/July, and bears fruit from October to January.

With decorative foliage and fragrant blooms, 'Elephant Apple' tree is highly valued for its medicinal properties. Since, fruit is hugely popular amongst the local wild elephants and being widely consumed by them, it is called as Elephant apple. Scientific name is *Dillenia indica* which is named after German Botanist Johann Jacob Dillenius *('indica' is the Latin word for India)*.

In 'Kannada,' it is called as 'Bettakanigalu.' Other common names are Indian catmon, Hondapara tree, Ma-tad (Hindi: Chalta, Karambel; Malayalam: Punna, Vazchpunna; Sanskrit: Avartaki, Bhavya, Bharija; Tamil: Kattaral, Ugakkay; Telugu: Revadi).

Plant description

Tree: It is an evergreen or semi-evergreen, medium-sized tree with a spreading canopy.

Leaves: Large, attractive with a ribbed surface and impressed veins. They are glossy, silky, dark green with teeth-like margins and slightly lemon-scented when crushed.

Flowers: Large and solitary at the ends of the twigs. The flowers face downward and are perishable as they fall off easily.

Fruits: Yellow-green with a leathery brown covering having brown-black seeds. We can observe flowering from June to August.

Medicinal uses

- The fruit pulp is used as tonic and laxative in the treatment of abdominal disorders, mixed with sugar and used against coughs. The bark and leaves are used as laxative and astringent; bark as a mouthwash to treat thrush.
- **Helps to treat hypertension** - Naturally low in cholesterol apart from possessing ample potassium, is an ideal remedy for those with hypertension.
- **Rejuvenates ageing skin** - Rich in antioxidants like Vit C & E and flavonoids which facilitate collagen synthesis to maintain elasticity of skin. Drinking a glass of fresh chalta fruit juice immensely enriches skin texture, diminishing wrinkles, fine lines and other signs of

***Dillenia indica* Fruit**

***Dillenia indica* Tree**

ageing to give a youthful appearance.

- **Boosts vitality** - An expansive array of useful plant constituents are present in chalta fruits, which makes them a prominent source of vital nutrients. They are inherently rich in vitamin C, vitamin B complex, vitamin E, potassium, healthy fats, amino acids and proteins, besides being low in cholesterol. Moreover, chalta abounds in beneficial phytochemicals namely tannins, saponins, flavonoids, triterpenoids and phenolics, which supply powerful anticancer, antibacterial and antioxidant characteristics.
- **Treats kidney disorder** - Just a few slices of a ripe elephant apple or chalta fruit juice with breakfast is a fantastic detox drink to cleanse the body from within and a great way to flush out toxins accumulated in the system, due to its umpteen powerful antioxidants.
- **Lowers anxiety and depression** - The phytonutrients including sterols, saponins and tannins contain prominent neurotransmitter -modulating properties, which adjust neuronal signaling in the brain and normalize central nervous system function.

Edible / Culinary Uses

Fruits can be eaten raw or cooked. The bulk of the fruit actually consists of thick sepals, which have a sour taste and used in dal and fish preparations and often mixed with coconut and spices to make chutneys in North eastern states. The unripe fruits can be pickled.

Other uses

The fruit pulp can be used for washing hair. The leaf juice is applied to the scalp to treat dandruff and falling hairs to prevent baldness. The dried leaves are used to polish ivory. The wood ash is added to clay bricks to increase fire resistance.

Helpful tips to grow

- As it is an excellent shade tree, it suits best for parks, big gardens and avenues.
- It is better to plant them in a corner of the lawn.
- Prefers sunny position, a well-drained slightly acidic soil rich in humus.
- The tree can be easily propagated by seeds / semi-ripe cuttings.
- Attracts several birds and bees.

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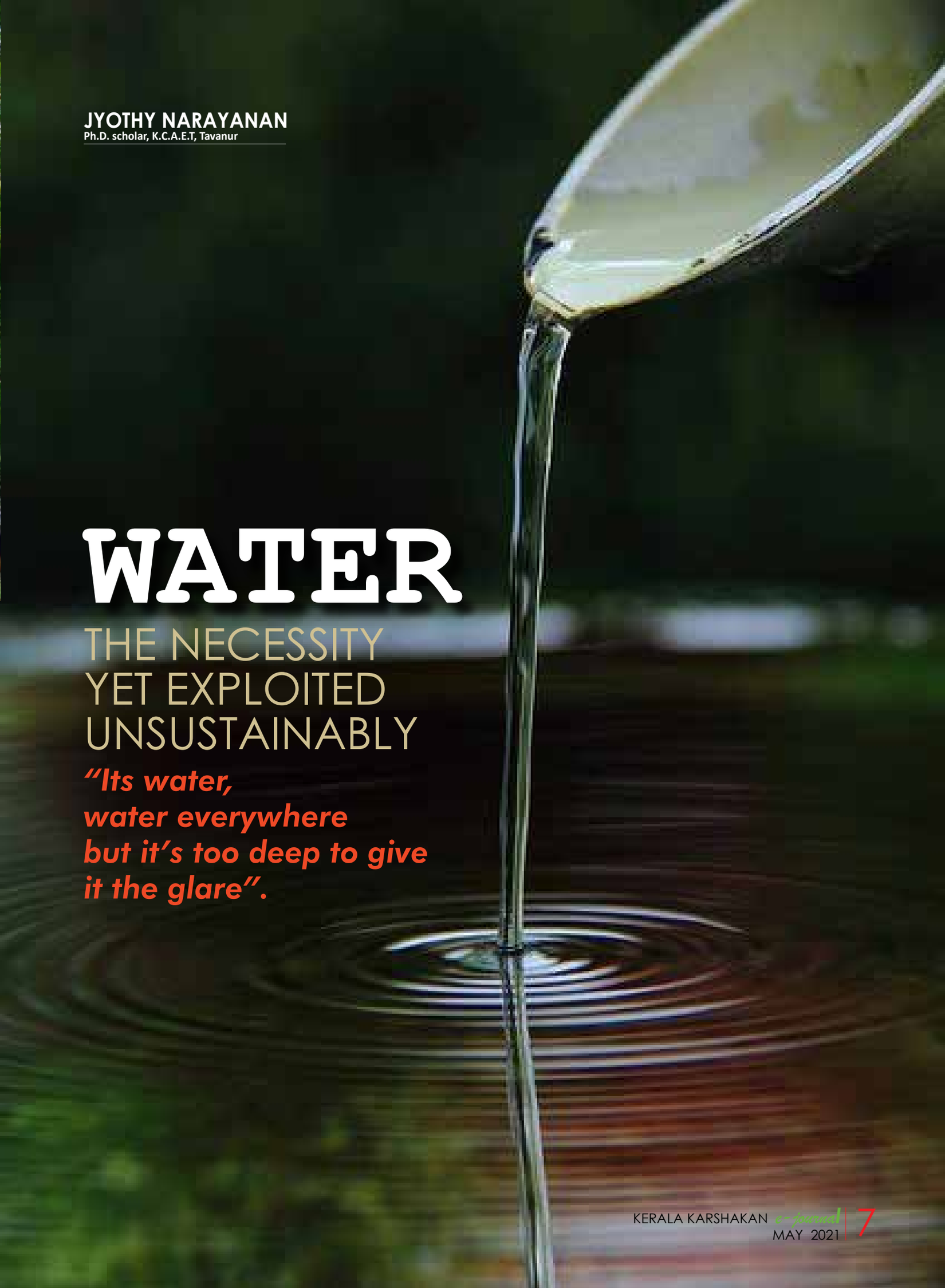

WATER

THE NECESSITY YET EXPLOITED UNSUSTAINABLY

"Its water, water everywhere but it's too deep to give it the glare".

The average annual rainfall of India is 1127mm. The State of Kerala is among the highest rainfall receiving states in the country with an average annual rainfall of 3100 mm. Conversely, as per a survey conducted by NITI Aayog in 2010, the baseline water stress (withdrawal/total supply) is constantly increasing in the State. Further, the State has been classified among the poor scorers in water resource management, according to the composite water management index (CWMI), provided by NITI Aayog for the financial year 2017-18.With, more than 60 percent of the total State's population depending solely on the groundwater in the form of open wells, the groundwater table is declining at a greater pace than ever before. The wells are becoming a seasonal source of water. The physiographical, hydrogeological and emerging anthropogenic conditions of the State have further aggravated the prevailing situation.

"Scarcity in Abundance"

Due to inadequate awareness and knowledge of the soil physical properties and its hydraulic conductivity, water conservation had not been a trend in the State which receives an average annual rainfall, almost three times of that received by the whole country. The water scarcity and hydrological drought situations during post-monsoon season are becoming common in many districts of the Kerala state. It can be further attributed to growing population and urbanization

which has increased the water demand and reduced the infiltration opportunity time needed for the rainfall to have deeper percolation. The high porosity and lower fissures of the soil and bedrock system respectively, increases the lateral draining of infiltrated water into the Arabian Sea. Moreover, illegal sand mining in the State is continuously paving the way towards depreciating water table levels. Inspite of abundant rainfall, the State is encountering a general depletion of water resources due to unsustainable water usage and its management.

Conservation in abundance

The concept of water conservation to its maximum would be worth if it is done, when there is abundant water to conserve. This hypothesis may greatly resolve the rising water scarcity issues in the State. Unlike, many other states like Rajasthan, Gujarat, Punjab and Haryana where the average annual rainfall ranges from 250-1000mm, Kerala receives abundant rainfall to perform efficient water conservation through rainwater harvesting. It will not only be a gesture of reciprocation to the Mother Nature but also will ensure a greater synergy between all the hydrological processes which is necessary for the human survival and existence.

'Every solution to a problem needs awareness and acceptance'

Technically, there are numerous water conservation practices, programmes and structures that can be adopted to conserve rainwater, and thereby, augment the groundwater table levels. But, the greater part of the issue in the State lies in creating awareness among the masses regarding the possible consequences of unsustainable water management practices. Additionally, it is essential to understand that the sloping topography and crystalline bedrock system in the State allows quick draining of rainfall water and is impermeable (flow occurs through fractures) respectively.

Thus, it is essential to first augment the shallow aquifers which are acting as the main source of water in the State.

'Three-level rainwater harvesting'

Kerala can be subdivided into three physiographical divisions namely; highland, midland and lowland. The heterogeneity in the soil properties with depth and space, amount of rainfall, land slope and aquifer types need to be analyzed prior to the adoption of any water conservation structures. Three level rainwater conservation practices that can be beneficial in augmenting groundwater sustainably are;

1. Rooftop rainwater harvesting and supplying the water directly into the wells via rainwater filters for direct conservation of rainwater.
2. Agronomic and engineering measures for harvesting surface runoff and direct rainfall on the soil surface.
3. Subsurface water conservation structures to harvest interflow in hilly areas where soil lateral hydraulic conductivity is higher in the deeper soil profiles as compared on the soil surface.

Types of rooftop rainwater harvesting techniques

Nowadays, there are varied rooftop rainwater harvesting designs available on the basis of materials used for construction, location,number of rainy days in the region and the needed maintenance interval. Rainwater overhead tanks, rooftop rainwater harvesting with storage tank on the surface, ferro-cement tanks for storing large amount rain water, rainwater syringe designed by Antoji for marginal farmers specially living in coastal areas.

Agronomic and engineering measures

Agronomic measures useful for groundwater recharge by increasing the soil moisture retention involves mulching, bench terraces, intercropping, crop-rotation, conservation tillage and contour farming.

Engineering measures

It involves construction of rainwater harvesting pits, check dams, farm ponds, contour bunds and percolation ponds.

Subsurface water conservation structures

These structures can be of great importance in the regions of State where interflow is greater through the soil matrix as compared to the overland flow. The subsurface structures can be used to restrict the preferential flow of water and can be used to augment groundwater table directly. It includes construction of subsurface dams and subsurface water storage trenches.

"Let us save few more drops of clean water for our forthcoming generation"

MULCHING

TO SAVE, RESTORE AND FLOURISH

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As we are at the peak of summer, the temperature is rising every day. It becomes necessary to protect the plants from the scorching sun and the dearth of water. The easy solution for this is to go in for mulching.

Mulching is the process of using various materials to cover the soil surface in order to reduce the moisture loss, minimise the weed population and finally to improve the crop yield. One can use natural materials like leaf litter, compost, saw dust or even old newspapers and synthetic materials like plastic sheets etc. as mulch. It is highly beneficial for agriculture, for the plants and the environment at large.

ADVANTAGES OF MULCHING IN AGRICULTURE

- Mulching helps in conservation of soil moisture by acting as a barrier at the soil-atmosphere interface thereby reducing evaporation.
- The organic mulches enhance the percolation and retention rate of water by acting as a sponge and, hence reduce the rate of supplementary irrigation as well as the runoff of the soil

particles.

- Mulching helps to reduce soil temperature during summer, and increase soil temperature during winter, thereby protecting the plants from extreme temperatures under varying conditions.
- Organic mulches will recoup the lost nutrients and organic matter in the soil and thus improve the physical, chemical and biological properties of the soil and also reduce soil compaction.
- Mulch acts as a barrier to weed growth by cutting off the light and by being a physical obstacle to weed emergence. Some organic mulches are having allelopathic effects also against weeds.

ADVANTAGES OF MULCHING ON PLANT GROWTH AND DEVEOPLMENT

- Mulching provides congenial environment for optimum plant growth, which makes the plants healthier and may even render resistance to pest injury.
- Maintenance of favourable temperature and moisture ensures good rooting, early maturity, weed control, increased nutrient uptake and results in enhanced yield.
- Mulching ensures the protection of fruits from contact with ground or splashes during rainfall, which are the main reason for various diseases and physiological disorders.
- Mulching is now an integral part of integrated disease and pest management strategies as it is easy, cost effective and successful in reducing disease and pest incidences. However, care should be taken to select suitable mulch materials according to the soil conditions.
- Mulching helps in restoring the soil biota, which improve the soil and plant health.

ADVANTAGES OF MULCHING TO ENVIRONMENT

- Mulching using the leaves of eucalyptus, pine, other popular trees etc. are found to be capable of removing heavy metals from the soil solution, which are harmful to all living things.
- Mulching reduce the need to use various chemicals for field management and thus bring down pollution of land, water and air. They lower the entry of chemicals into the food chain (biomagnification) and reduce emergence of resistant biotypes in pests and pathogens, which are the results of excessive chemical usage.
- Use of live mulches like grasses and smooth rocks/ stones beautify the landscape along with providing protection against extreme climatic, biotic and abiotic factors.

TYPES OF MULCHES

ORGANIC MULCHES

Organic mulches are easily available and degradable. They add nutrients to the soil which help in plant growth, soil health restoration and improve the soil microflora. Materials like grass, straw, newspaper, dry leaves, bark clippings, saw dust, compost, cocoa bean hulls, seaweed, crushed corncobs, peanut hulls, coconut husk etc. can be used as organic mulch.

In coconut plantations, soil moisture conservation can be done by opening basins and placing materials like coconut husk, farm waste, green manure, composted coir pith etc. and covering the soil. This should be preferably done by the end of rainy season for best results.

INORGANIC MULCHES

Gravels, pebbles, crushed stones or plastic sheets are the types of inorganic mulch material. Plastic mulches are of three types- photodegradable plastic mulch, bio-degradable plastic mulch and coloured plastic mulch (black, transparent, white, silver etc.).

Plastic mulches can be one or two-side colour mulches like yellow/black, white/black, silver/black, red/black etc. and the thickness of plastic mulch should be based on the type and age of crops. Mulch of thickness 20-25 microns are preferred for annual or short duration crops, 40–50-micron mulch for biennial or medium duration crop and 50–100-micron mulch for perennial or long duration crops. These are more durable than organic mulches and the durability depends on the composition of mulch which are made to meet specific requirements of the crop, crop duration and farmer.

ECONOMIC IMPORTANCE OF MULCHING

In comparison to the cost for synthetic chemicals for pest and disease control, weed control and even fertilizers, mulches are cost effective and also reduce our dependance on these chemicals. Even locally available materials (saw dust, leaf litter or old newspapers etc.) can be used. Thus, mulches reduce the overall cost of production and help the farmers to earn more profit.

DISADVANTAGES OF MULCHING AND HOW TO OVERCOME IT

- Use of some mulches like saw dust or wood chips can cause soil acidification especially in nursery.
- The allelopathic effect caused by the use of certain organic mulch materials may hinder the crop growth.
- If live mulches like grasses are used, it will lead to competition for resources between the crop and grasses.
- If any diseased material is used as mulch, it may be transmitted to the standing crop.
- Use of woody mulches or gravel may attract termite infestation in the field.
- Some weed seeds may be mixed up with the mulch which may lead to weed infestation
- Some mulches combust rapidly causing damage and loss of crop, property and money.

These disadvantages can be easily overcome by analysing the field condition, soil properties, purpose of mulching, stage of the crop for mulching etc. and then choosing the suitable mulching material and ensuring its proper application and maintenance.

HOW AND WHEN TO MULCH

- **Organic mulch:** organic mulches are to be applied after the bed preparation. The weeds are to be removed. Sterilize the organic material prior to application to kill weed seeds, pathogenic spores or the insects present in them. The best time to apply mulch is near the end of the rainy season as the soil will have sufficient moisture. During summer, light-coloured materials are preferred as they reflect the heat.
- It is preferable to apply a layer of plain cardboard or a 4-6 pages thick layer of newspaper before applying the mulch, which will help to control the weeds better. If the mulch material is coarser, it should be applied more thicky than fine textured material for easier air and water penetration.
- **Plastic mulch:** the mulch should be applied prior to planting. It has to be applied after the beds are prepared, the drip pipes are laid and preferably after soil fumigation. The plastic mulch has to be applied properly and the edges should be secured with generous amount of soil. Transplanting may be carried out only after the completion of mulching. These are more durable than organic mulches.

MANAGEMENT

Mulches are to be managed well for better results. Regular checking for pest and disease should to be done. Organic mulches must be reapplied as and when required. Establish and follow good agricultural practices. In the case of plastic mulches, they should be removed after the use and disposed in prescribed landfills.

After the completion of the crop period, never plough the plastic mulch into soil or discard it in the field itself.

Thus, in this present scenario of climate change, water scarcity, degrading lands, pollution and other harmful effects due to excessive use of chemicals, mulching seems to be an easy and cheaper solution to these problems and offers a simple way to restore the balance in nature.

REFERENCES

1. Bhardwaj, R.L.2013. Effect of mulching on crop production under rainfed condition - A review. *Agricultural Reviews,* 34 (3) : 188-197.

2.Iqbal, R., Raza, M.A.S., Valipour, M., Saleem, M.F., Zaheer, M.S., Ahmad, S., Toleikiene, M., Haider, I., Aslam, M.U., and Nazar, M.A. 2020. Potential agricultural and environmental benefits of mulches-a review. *Bulletin of the National Research Centre,* 44:75. https://doi.org/10.1186/s42269-020-00290-3

3. Kumar, S.N. 2004. Drought Management in Coconut Gardens. Practical Manual on Plastic Mulching. *Technical Bulletin*, CPCRI Kasaragod.

4. Rajan, P., Patle, G.T., Prem, M., and Solanke, K.R. 2017. Organic mulching-a water saving technique to increase the production of fruits and vegetables. *Current Agriculture Research Journal,* 5(3): 371-380.

5.Sharma, R. and Bhardwaj, S. 2017. Effect of mulching on soil and water conservation-A review. *Agricultural Reviews,* 38(4): 311-315

6. Telkar, S.G., Singh, A. K., Kant, K., Solanki, S.P.S. and Kumar, D. 2017. Types of Mulching and their uses for dryland condition. Biomolecule Reports-An International e Newsletter. BR/09/17/06.

WATER MELON

A Natural Coolant

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The summer is at its peak and so is the scorching tropical summer thirst. Rising temperature on a day to day basis strongly pull back all the bodily activities. In this hot and tiresome climate, there is every possibility for getting dehydrated and weaken ourselves. The immense dehydration may adversely affect the skin tone and also may lead to various health ailments. In order to prevent these, water melon may be considered as a natural coolant with amazing refreshing effects.

Water melon is a natural, delicious, healthy and refreshing healthy fruit with low calorie, high contents of Vitamins C and A and also many plant compounds. Water melon had originated in South Africa and its cultivation was started in India during the 7th century. It has five common types viz. seeded, seedless, mini, yellow and orange of which seeded types are in plenty. 1 cup of watermelon seeds is said to contain 10 grams of protein. Also, these seeds are safe to swallow! Currently, there are 1200 different varieties of watermelons all over the world which is grown in 96 different countries.

On fresh weight basis each 100g watermelon contains:

Energy	-	30 kcal
Carbohydrates	-	7.6 g
Protein	-	0.6 g
Total fat	-	0.15 g
Cholesterol	-	0
Dietary Fibre	-	0.4 g
Vitamins		
Folates	-	3 µg
Niacin	-	0.178 mg
Pantothenic acid	-	0.221 mg
Pyridoxin	-	0.045 mg
Thiamin	-	0.033 mg
Vitamin A	-	569 IU
Vitamin C	-	8.1 mg
Vitamin E	-	0.05 mg
Vitamin B6	-	0.1 mg
Micronutrients		
Calcium	-	7 mg
Phosphorous	-	10.9 mg
Magnesium	-	10 mg
Potassium	-	111.6 mg
Phyto-nutrients		
Carotene-alpha	-	303 µg
Cryptoxanthin-beta	-	78 µg
Lutein-zeaxanthin	-	8 µg
Lycopene	-	4532 µg
Citrulline	-	250 mg.

NUTRITIONAL COMPOSITION

As the name of the fruit implies, 92 % of the fruit content is water itself, which makes the fruit a prime rehydrator. Thus, the consumption of this fruit can curb the appetite by providing a fullness feel.

HEALTH BENEFITS

Keeps hydrated

Consumption of watermelon helps the body to stay hydrated and provides a cooling effect thereby preventing oral dryness. It also cleanses the body and keeps the skin healthy.

Maintains skin tone and health of hair

Watermelon contains Vitamins A and C. Vitamin C helps the body to produce collagen, which is essential for cell structure and immune function and keeps the skin supple and maintains strength of hair. Vitamin C also promotes wound healing. It promotes healthy skin, including reducing the risk of age-related damage. Vitamin A is very important for healthy skin since it helps to create and repair skin cells

Improving cardiovascular health

Regular consumption of a watermelon slice can stop the accumulation of bad cholesterol, thereby preventing chances of heart diseases. The citrulline and lycopene present in watermelon have beneficial effects on atherosclerosis and is also found to reduce arterial stiffness in postmenopausal women.

Fights inflammation

Watermelon helps in lowering inflammation and oxidative damage, due to the rich anti-inflammatory antioxidants

lycopene and Vitamin C. Lycopene is an inhibitor for various inflammatory processes and also works as an antioxidant to neutralize free radicals. Additionally, the watermelon contains choline, which helps to keep down chronic inflammations.

Aids digestion

The huge water content of water melon can easily aid digestion. It also contains fibre, thus promoting digestion and preventing constipation.

Prevents Asthma

Watermelon has about 40% of vitamin C that is good for preventing asthmatics. The lycopene content also regulates the reaction of body towards flu and cold.

Reduces dental problems

The Vitamin C content of watermelon reduces the chance of periodontal disease to a great extent. It also keeps the capillaries and gums healthy. The vitamin C in watermelon can also kill the bacteria in the mouth that might otherwise lead to gum disease and other gum infections.

Improves bone health

Vitamin A and C content in watermelon is good for bones and aids in wound healing. Lycopene content also prevents osteoporosis to some extent.

Helps in weight loss

Regular consumption of a slice of watermelon aids in weight loss. The high water content of the fruit speed up metabolism and flush out toxins and fats. It reduces the appetite considerably.

Strengthens immunity

Watermelon, being rich in vitamin C, strengthen the body's immune system. The fruit also contains vitamin B6 that helps the immune system to produce antibodies. The vitamin also aids in the formation of red blood cells. The fruit has vitamin A that regulates the immune system and protects it from various infections.

Anti-diabetic property

This juicy fruit help kidneys to convert L-citrulline (amino acid) into L-arginine (amino acid). In fact, these two amino acids have a tendency to protect you from diabetes. L-arginine supplement in watermelon is crucial for regulating glucose metabolism and insulin in the body.

Controls blood pressure

Watermelon is the richest natural source of citrulline. It is closely related to arginine, which is an amino acid essential for maintaining healthy blood pressure. Watermelon is a good source of potassium, the nutrient that is known to lower blood pressure, is often prescribed for people with high blood pressure.

REFERENCES

Naz, A., Butt, M. S., Sultan, M. T., Qayyum, M. M. N., and Niaz, R. S. 2014. Watermelon lycopene and allied health claims. EXCLI J. Clinical Sciences. 13: 650-660.

Hong, M. Y., Hartig, N., Kaufman, K., Hooshmand, S., Figueroa, A. and Kern, M. 2015. Watermelon consumption improves inflammation and antioxidant capacity in rats fed an atherogenic diet. Nutr. Res. 35 (3): 251-258.

Oseni, O. A., Odiosanmi, O. E. and Oladele, F. C. 2015. Antioxidative and antidiabetic activities of watermelon *(Citrullus lanatus)* juice on oxidative stress in alloxan-induced diabetic male Wistar albino rats. Niger Med. J. 56(4): 272-277.

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Arecanut
Cultivation Advisory

Introduction

Area under arecanut is increasing consistently all over India. Arecanut cultivation was confined to the traditional areas of Karnataka, Kerala, Assam and North Eastern states. Today arecanut cultivation is spreading to non-conventional areas like Tamil Nadu, Andhra Pradesh etc. The high net return on each rupee invested by farmers on arecanut cultivation can be cited as a reason for this area expansion. The yield of arecanut is increasing continuously from 2013 to 2018 as per the data of DASD, Calicut, but the yield increase is meagre when compared to the rate of area expansion.

Maximum productivity can be obtained from arecanut by following scientific cultivation practices. To ensure higher yield from arecanut scientific methods of cultivation starting from planting to crop management is inevitable. The selection of site for planting requires at most care to ensure the better establishment and maximum economic returns from arecanut plantations. Arecanut is

predominantly cultivated in deep gravelly laterite soils to fertile clay loam soils with irrigation during prolonged dry spells. The establishment of arecanut garden should be carried out after ensuring that the soil is at least 2m deep and there is adequate drainage facilities. Water logging can affect the root growth, nutrient uptake and yield of the palms adversely. It is advised to avoid planting arecanut in reclaimed paddy fields or wetlands. This article is prepared for the benefit of arecanut growers, extension officials, developmental agencies and other stakeholders.

1. Varieties: Improved high yielding arecanut varieties released by ICAR-CPCRI are, Mangala (Yield: 2.90 kg dry kernel/ palm/ year), Sumangala (Yield: 3.28 kg dry kernel/ palm/ year), Sreemangala (Yield: 3.18 kg dry kernel/ palm/ year), Mohitnagar (Yield: 3.67 kg dry kernel/ palm/ year), Swarnamangala (Yield: 3.88 kg dry kernel/ palm/ year), Kahikuchi (Yield: 3.70 kg dry kernel/ palm/ year), Madhuramangala (Yield: 3.54 kg dry kernel/ palm/ year or 2.95 kg dry tender processed nuts/ palm/ year), Nalbari (Yield: 4.15 kg dry kernel/ palm/ year), Shatamangala (Yield: 3.96 kg dry kernel/ palm/year or 3.26 kg dry tender processed nuts/ palm/ year) and two dwarf hybrids, VTLAH-1 (2.54 kg dry kernel/ palm/ year), VTLAH-2 (2.64 kg dry kernel/ palm/ year).

2. Spacing and planting: Planting of seedlings is done either in May-June or September-October, depending on the intensity of rain. Where the South-West monsoon is high/ severe, it is advisable to plant at the end of South-West monsoon during the month of September - October. In other places, where the South-West monsoon is not severe, planting may be done in May-June. The seedlings may be planted with a ball of earth in a pit of size of 60 cm x 60 cm x 60 cm or 90 cm x 90 cm x 90 cm depending on the depth of soil and clay content after filling half portion with top soil, farm yard manure and sand. Planting depth is important to avoid growth of aerial roots above the ground. Seedling should be planted at the center of the pit and put soil up to the collar region of the seedling. Mulching should be done immediately after planting to avoid drying up of top soil. The optimum spacing for planting arecanut is 2.7 m x 2.7 m. Wider spacing of 3.3 m x 3.3 m is advisable for accommodating high value inter/ mixed crops. In perennial crop like arecanut superior quality planting materials should be used for planting.

3. Shading: Sun scorching can cause stem breaking in arecanut. To avoid sun scorching, while digging pits for planting, the rows may be aligned in North-South direction by deflecting the North-South line at an angle of 35° towards West. Banana can be raised as a shade crop in the interspaces during initial years. Fast growing shade trees may be planted along the borders on South-West side. If planting of shade trees is not possible, sun scorching can be avoided by covering the stem with arecanut or coconut leaves.

4. Nutrient management: Nutrient management strategies need to be planned for arecanut , taking into account the soil fertility status.

1. It is advisable to consider nutrient deficiency/toxicity before the development of visual symptoms with the help of leaf and soil analysis.
2. Soil testing is important to avoid nutrient disorders. Nutrients may be applied based on soil test reports.
3. Fertilizers and organic manures should be applied when the soil has sufficient moisture to maximise uptake but not during heavy rainfall and dry periods.
4. In laterite soils with acidic pH of below 6.0, application of 100 g N (220g Urea), 40 g P_2O_5 (200 g Rock Phosphate) and 140 g K_2O (235 g Muriate of Potash) is generally recommended every year, if chali or dry kernel yield is around 2kg per palm per year. In addition, 12 kg each of green leaf manure and compost per palm can be applied.
5. In soils with pH above 7.0, Single Super Phosphate (250g) or Di Ammonium Phosphate (DAP) can be used as source of phosphorus. When DAP is applied as phosphorus source, 182 g Urea, 87g DAP and 230 g MOP may be applied per palm per year
6. The fertilizers may be applied in two split doses during May-June and September-October, in the basin at 40-50 cm distance around the trunk. The organic manures are applied during September-October in basins around the base of each palm.
7. In the first year of planting 1/3rd of the recommended dose of fertilizer may be given. In the second year, 2/3rd of the recommended

h. Fertilizer recommendation for arecanut (g per palm per year)

Nutrient requirement (g/palm/year)	First year of planting	Second year of planting	From third year onwards
Nitrogen (N)	33	66	100
Phosphorous (P_2O_5)	13	26	40
Potash (K_2O)	46	92	140
Rock Phosphate/ Single Super Phosphate as source of Phosphorous			
Urea	72	144	220
Rock Phosphate (RP)	65	130	200
Single Super Phosphate (SSP)	83	167	250
Muriate of Potash (MOP)	77	154	230
DAP as source of Phosphorous			
Urea	61	121	182
Di Ammonium Phosphate (DAP)	29	58	87
Muriate of Potash (MOP)	77	154	230

dose and from third year onwards, full dose of fertilizer may be given.

8. Soil aeration is most important for production of fine roots, which are required for uptake of nutrients and water. Raking up of basin will aerate the soil.
9. Wherever possible fertigation may also be followed. Only 50% and 75% of the recommended fertilizer dose is sufficient during pre-bearing stage and bearing stage, respectively. For bearing palms, recommended nutrient dose to be given through fertigation is 75:30:105 g N, P_2O_5, K_2O per palm per year. Quantity of fertilizer required to supply recommended dose per palm per year is 136g Urea, 65 g DAP and 175g MOP which can be given through irrigation water once in 10 or 20 days (18 or 9 splits) from December to May.
10. Nutritional disorders like crown choking, crown bending and oblique nodes are due to zinc deficiency. Soil application of zinc sulphate @ 10 g per palm is ideal if disorder symptoms are in initial stages. In case of severe reduction in leaf size and crown choking, spraying of 0.5 % zinc sulphate mainly on fresh foliage can be done. Nut splitting is due to less potassium and boron deficiency. Therefore, soil test based supply of nutrients is very important.

5. Annually 5 to 8.5 tonnes of recyclable waste will be generated per hectare of arecanut garden. Direct application of these wastes in arecanut gardens will lead to nutrient imbalances due to high C: N ratio. Hence, these materials can be converted to nutrient rich vermicompost. To prepare vermicompost, arecanut wastes like arecanut leaves, leaf sheath, husk etc. are chopped into small pieces of 10 cm and heaped. Cement tanks or trenches can be used for this purpose. A layer of 10 -15 cm waste material is alternated with 2cm layer of cow dung, sprinkled with water and kept for two weeks with occasional turning. Earthworms are released at the rate of 1000 numbers per square meter after the heat of pile is reduced. The wastes are converted into fine granular, odorless nutrient rich vermicompost within 60 days.

6. Water management

- Arecanut cannot withstand drought and invariably needs irrigation during dry spells.
- Once areca palms are affected by water stress, it may require two to three years to regain the normal vigour and yield.
- In humid tropics, irrigation at an interval of 10 days is superior throughout rainless period. This works out an irrigation frequency of once in 7- 8 days during November - December, once in 6 days during January - February and once in 4 - 5 days during March - May through basin irrigation. The quantity of water to be applied is about 175-200 lit. per palm per

irrigation.

- To increase the water use efficiency irrigation methods like sprinkler and drip are ideal. Sprinkler and drip irrigation can save about 20 and 44 per cent of irrigation water, when compared to conventional methods of irrigation like flooding and splashing. 5
- Two to three drippers can be placed 50-60 cm away from the basin per palm in such a way that 20 liters of water can be delivered within 45 minutes. During rainy season lateral lines of drip system should be folded and tied to stem of the palm to avoid clogging of drippers or micro tubes.

7. Drainage: It is essential to ensure adequate drainage by providing drainage channels in high rainfall areas to avoid water logging. The channel should be at least 15-30 cm deeper than the depth at which the seedlings are planted. At the beginning of the monsoon, these drains are to be cleaned and deepened to ensure effective drainage.

8. Intercultural operations: Weeding should be done as and when required. The weeds can be incorporated in arecanut basins. Terracing and contour bunding measures should be adopted in undulating lands to prevent soil erosion. In Malnad tracts the main purpose of intercultural operation is to loosen the soil and to rebuild the soil fertility after the heavy rains during monsoon and in Maidan tracts it is to conserve the soil moisture and prevent the hardening of the heavy soils.

9. Arecanut based cropping system: The long pre-bearing period, low returns during the initial bearing stage, fluctuations in market prices, unexpected loss due to pests and diseases and natural calamities are the main reasons which make it essential to take up inter cropping or mixed cropping in arecanut plantation. Crops like banana, pepper, cocoa, elephant foot yam, citrus, betel vine, pineapple etc. were found suitable for mixed cropping in arecanut. As the age of the garden advances, only a few crops can be grown profitably as mixed crop viz., pepper, cocoa, banana, lime and betel vine. Medicinal and aromatic plants also come up very well in arecanut plantation. When more than one mixed crop is grown in an arecanut garden simultaneously, it is called as high density multispecies cropping system. In coastal Karnataka and Kerala, banana, pepper and cocoa can be grown economically along with arecanut.

Banana, pepper and acid lime can be profitably grown together in Maidan parts of Karnataka. Banana can be planted simultaneously with arecanut in the center of four palms.

Besides main crop, two ratoon crops of banana can be taken up and after three years, entire crop is to be replanted. When areca palms attain the age of 6-8 years, rooted cuttings/ grafts of pepper may be planted in the northern side of the palm at 75cm distance.

References

- ICAR-CPCRI publications
- DASD website

Agronomic practices to improve paddy quality for hassle-free procurement

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The success of paddy cultivation depends on timely marketing of the paddy at a remunerative price. The paddy undergoes a series of processing methods before it reaches the consumer. The quality of the final product has a direct correlation to the overall calibre of paddy produced. The paddy to rice value chain directly involves its procurement from farmers, processing and distribution to their consumers. Paddy production, post-harvest operations at farmers level, and its processing and value addition after procurement require a great deal of transformation both in terms of quantity and quality to survive and sustain rice cultivation in our state.

Value chain

Conversion of paddy to rice is an extremely prolonged and labour intensive process that requires a certain degree of expertise to ensure that the final product is of superior quality. The value chain management assumes significance as the consumers are becoming quality conscious and markets turning highly competitive. In majority of areas, the harvesting process is mechanized utilizing combine harvesters. Due to the unavailability of adequate workers to manage post-harvest operations like winnowing and drying, farmers have now resorted to sell the produce directly from the field, which affects the quality of produce.

The Paddy procurement scheme initiated by the Government is a boon to the farmers. The De Centralized Procurement (DCP) and Minimum Support Price (MSP) are the features of the paddy procurement scheme initiated by the Government. The scheme is a great relief for paddy farmers as it guarantees the MSP. It instills confidence in farmers and triggers adoption of modern technologies to enhance the production.

The State of Kerala currently offers the highest rate of procurement price for paddy in the country. The Government of Kerala has established this initiative to support the financial growth of farmers, so that they may continue to sustain growth and profitability. Consequently, a bulk of marketable paddy produced in the state is being readily procured under the scheme. The procurement of paddy is done based on certain norms fixed by the Government of India. These norms enlist the parameters to judge the quality of paddy procured.

Fair Average Quality

Schedule of uniform specifications published by the department of Food and Public Distribution indicate the criteria for assessment of quality of food grains procured. The specifications are based on Bureau of Indian standards IS 4333. The standard ensures that uniform methods are adopted for the tests and helps in fixation of price on a scientific basis. Paddy grains of uniform quality within the prescribed limits as specified below is a prerequisite for better processing.

Moisture content: An average fully matured paddy usually contains 20 - 22% of moisture at the time of harvest. For prolonged storage of paddy the safe acceptable limit of moisture is 15%. Paddy is at its optimal milling potential at the moisture content of 14%. Rapid drying of grain to the moisture content safe for storage and milling is critical. The climatic conditions, weather prevailing at the time of harvest and infrastructure facilities available may pose practical difficulties to achieve proper drying. Harvested paddy respires more quickly and secretes additional heat and moisture. Studies have revealed that inadequate drying results in deterioration of the quality of paddy and increases possibility for development of mycotoxin that leads to severe nutritional loss.

Admixture of lower classes: Having a mixture of varieties in the processing lot lowers milled rice recovery, reduces head rice yield and causes excessive breakage. The richness of rice genetic diversity and the unique pattern of land holding lead to cultivation of multiple varieties. Mixtures of varieties may contain grains of different size and shape that affect the hulling efficiency.

The lack of information on various quality parameters and their management often cause drift between farmers and the procurement parties. In order to get a first hand information on the quality of the paddy grains kept ready for procurement by the farmers, the Regional Agricultural Research Station, Kumarakom had undertaken a two year long study during the 2013-14. The study was

Table 1 – Fair Average Quality norms as per paddy procurement scheme.

	Foreign matter: Organic	Foreign matter: Inorganic	Damaged Sprouted weevilled	Discolored	Immature Shrivelled	Admixture of lower classes	Moisture content
% Max. limit → 1	1	1	4	1	3	6	17

conducted in association with the Kerala State Civil Supplies Corporation and financially supported by the Agricultural Technology Management Agency, Kottayam. For this study grain samples were collected from Kuttanad, Kole and Palakkad rice tracts spread over Alappuzha, Kottayam, Thrissur and Palakkad districts.

Quality variations of paddy grains procured in Kerala

The quality variations observed in the study are summarized in table 2. It is evident from the table that both the organic and inorganic foreign matter content are significantly less than the threshold prescribed, irrespective of the season and districts. The physical contaminants other than discoloured - damaged grains and immature - shriveled grains did not contribute to the poor quality of grains procured. The discoloured grains were identified as the most important parameter contributing to poor quality of paddy grains in the problem soils consisting of Kuttanad and Kole rice tracts. The incidence of damaged and discoloured grains ranged between 0.56 to 21.54 per cent in Kuttanad rice tract of Kottayam District. Most of the samples (98%) collected from January to May are observed to be affected by grain discoloration. However, the incidence was significantly less during the additional crop season (August-December) that falls during the rainy season. Immature and shriveled grains are also reported to have a significant role in decreasing the quality of paddy grains in Kuttanad. The data revealed that 78.7% of samples collected during the puncha season had immature and shriveled grains above the higher limit of 3 percent whereas only 29.7 percent exceeded the critical limit during the rainy season crop. Filling of the grains were less during the puncha season as revealed by a lesser thousand grain weight that ranged between 16.2 and 28.5 g while the corresponding figure for the rainy season crop ranged between 21.4 to 28.1 g for the Uma rice variety. The volume weight which also indicates the filling of grains were less in Kottayam District while in the other districts the figures were on the higher side. The milling recovery ranged between 48.5 and 76 per cent during the puncha season while the range was 64.5 to 76 per cent during additional crop season.

Among the other quality parameters, the moisture content of the paddy grains exceeded the 17 percent moisture limit, only in 6 percent of the samples. The average values for the moisture percent irrespective of districts and season were less than 15 percent.

The data also indicate that there is regional difference in parameters which affect the grain quality in the state. The samples collected from the Palakkad District were superior with respect to the foreign matter content, damaged - discoloured grains and immature- shriveled grains. However, the admixture of lower class varieties were significantly higher for the Palakkad samples. But for this parameter, the grain quality originating from Palakkad can be considered as superior to the other districts.

Grain quality parameters in relation to agronomic practices

Moisture content

Rapid drying of grain to the moisture content safe for storage and milling is critical. The climatic conditions and weather prevailing at the time of harvest, infrastructure facilities available may pose practical difficulties to achieve proper drying. Harvested

Table 2. Quality variations of paddy grains noticed at different agro ecological situations.

Quality parameters (%)	Kottayam Puncha	Thrissur Additional crop	Thrissur Puncha	Alappuzha Puncha	Palakkad Mundakan
Foreign matter(organic) %	0.37	0.36	0.61	0.7	0.0
Foreign matter(inorganic) %	0.34	0.34	0.63	0.78	0.64
Damaged & discoloured %	5.81	3.84	4.01	3.90	0.83
Immature &shriveled %	5.80	4.08	5.51	5.24	1.99
Admixture of lower class %	1.05	0.92	1.29	6.26	10.85
Moisture (%) in storage	14.34	13.67	14.74	13.70	14.50
Thousand grain weight (gm)	23.07	25.48	24.32	22.80	24.84
Volume weight (gm/cc)	0.57	0.57	0.60	0.65	0.62

paddy respires more quickly and secretes additional heat and moisture. Studies have revealed that inadequate drying results in deterioration of the quality of paddy and increases possibility for development of mycotoxin that leads to a severe nutritional loss.

Heaping of harvested paddy grains covered with silpaulin sheets and temporary storage until procurement without any post-harvest operations like drying or cleaning is the general practice of the farmers. Such temporary storage overlaid by silpaulin sheets may cause mould growth and deterioration of quality standards. Aeration of paddy improves the quality.

Admixture of lower classes

Having a mixture of varieties in the processing lot lowers milled rice recovery, reduces head rice yield and causes excessive breakage. The richness of rice genetic diversity and the unique pattern of land holding lead to cultivation of multiple varieties. Mixtures of varieties may contain grains of different size and shape that affect the hulling efficiency. Depending on the size of grains and the color of bran the paddy is categorised.

Agronomic practices can be helpful to reduce the admixture of lower classes of varieties. Use of clean seed can be beneficial. Use of the same variety across a padashekharam can reduce the admixture. Germination of fallen seeds of the previous crop is a source of contamination. Land preparation period is to be staggered in order to provide a resting period of 2 to 3 weeks between the primary and secondary tillage. Such a practice can eradicate the undesirable sprouts including other varieties and weeds. Effective control of weeds and roguing of unwanted varieties will be effective in reducing the admixture including weed seeds.

Discoloured and Chaffy grains

Grain discoloration depending on the intensity not only affects the visual appeal but also reduces the filling of grain and finally the grain weight. Grain discoloration is caused by a complex of biotic and abiotic factors such as pathogenic microorganisms, pests, soil quality, water quality, nutritional deficiency, climatic conditions and agronomic practices. The severity of discoloration affecting the grain property is inversely proportional to milling recovery. To meet this threshold,mills sustain additional costs to discard affected grains thereby reducing the price realized by farmers. Poor quality of paddy can cause financial loss to the farmer by 10 - 15%. Chaffy grains may be due to either nutritional deficiency or pests and diseases. Chaffy grains ultimately add dockage and in excessive quantities result in conversion of paddy to animal feed. As discussed in the former part, the soil and water quality play a major role in deciding the discoloured and chaffy grains in the problem soils consisting of karappadom, kayal, kari and kolelands. These soils are basically acidic and its connectivity to brackish water makes them saline especially during the non-rainyseason. The evapotranspiration process during summer months brings up the salts to the rhizosphere. These soils have excess iron, manganese and aluminum ions that are to be flushed out by application of soil ameliorants and by providing proper drainage. Continuous water stagnation especially after the panicle initiation stage to the grain filling stage affects the root health and absorption of nutrients. Deficiency of secondary and micronutrients like boron and zinc also cause improper filling and chaffy grains. Under such situations foliar nutrition with soluble fertilizers of major and micro nutrients will be beneficial to reduce the chaffy grains and to enhance the filling of grains.

Generally after the panicle initiation stage plant protection activities are focused mainly to control rice bugs and brown plant hoppers. Though incidence of sheath blight especially at the panicle initiation stage and many ear head diseases like neck blast, sheath rot, brown spot and blackening of panicles are rampant causing heavy damage to the crop no prophylactic plant protection measures are taken. Bacterial blight incidence at this stage also decreases the paddy grain quality. So, the post panicle initiation management of rice is very important to enhance the grain quality. Considering the complex nature of correction of nutritional irregularities at soil and plant level, and plant protection measures to manage the ear head diseases, a multi pronged approach is recommended to enhance the grain quality based on field experiments conducted at the Regional Agricultural Research Station, Kumarakom. Foliar application of the micro nutrients zinc, copper and boron

along with major nutrients at panicle initiation stage and foliar application of the fungicide mixture of tebuconazole and trifloxystrobin (0.1 per cent) at the panicle initiation and ear head emergence stage can significantly reduce the grain discoloration and enhance the paddy grain yield.

Immature and shriveled grains

Occurrence of immature and shriveled grains can be reduced by proper nutritional management. The number of vegetative tillers produced and its conversion to productive tillers require timely fertilizer application. The first top dressing consisting of one third nitrogen and potassium has to be applied between 15-20 days after sowing. The second top dressing with next increment of nitrogen and potassium facilitatesactive tillering for which the application of nutrients should be done at 30-35 days after sowing. Application of nutrients beyond this stage may result in delayed tillering and protracted flowering. Flowering beyond the normal flowering stage can upset the maturity of grains resulting in an increased immature and shriveled grains. Final top dressing of fertilizers beyond the panicle initiation stage can also upset the maturity of paddy grains resulting in increased immature and shriveled grains. Under such conditions post-harvest cleaning and drying can alone enhance the quality standards of paddy grains.

Test weight

Test weight is an indicator of the soundness of grain and is considered as a yield attribute. Bureau of Indian Standards through IS 4333 Part IV specifies a method for determination of the mass of 1000 grains. Test weight is specific to each variety of paddy cultivated. Low test weights tend to result from poor grain fill and environmental conditions in the field before harvest. The 1000 grain weight is a very important measure of the grain quality that determines the grain value. A lower test weight equals lower value, while higher test weight fetches best price.

Management strategies to keep up the quality standards

The following agronomic practices starting with land preparation up to the procurement of paddy grains summarized below are effective to boost the quality standards.

- Select appropriate season especially for problem soils.
- Three weeks resting period between primary and secondary tillage.
- Liming along with initial ploughing
- Adopt proper land leveling
- Provision for good drainage prior to sowing.
- Use good quality seed without admixture.
- Seed treatment with biocontrol agents like Pseudomonas/ trichoderma
- Need based fertilizer application based on soil testing.
- Integrated nutrient management incorporating organic, biofertilizers and the limiting macro and micro nutrients.
- First top dressing within 20 days after sowing (DAS).
- For medium duration varieties second top dressing within 35 DAS
- Apply lime one week prior to third top dressing.
- Third top dressing 2-3 days ahead of panicle initiation stage.
- Foliar application of fungicides and micronutrients along with third top dressing.
- Apply a fungicide mix of 0.1 percent tebuconazole and trifloxystrobin together with 1percent potassium nitrate at the ear head emergence stage.
- Adopt plant protection measures against rice bug,brown plant hopper and bacterial leaf
- blight based on regular observation.
- Drain the field at weekly intervals and let in fresh water especially after panicle initiation stage.
- Harvest the crop when the panicles show maturity.
- Dry and clean the paddy grains prior to prolonged storage.
- When grain heaps are covered with silpaulin sheet, aeration is to be assured

Cultivation of paddy that stretches over five months is considered not only strenuous but also risky. For a successful crop and better returns, proactive measures are inevitable. Income of the farmers solely depends on the quality of grain produced. Farmers must be aware of the practices to attain best quality of paddy. Zeal to implement the above recommendations will ensure better crop growth, that results in sound and nutritious grain.

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Water Apple

A thirst quenching fruit

Introduction

Water apple, also known as watery rose apple, scientific name *Syzygium aqueum*, is a succulent plant, native to South East Asian countries and to certain tropical regions of India. Commonly referred to as "Chambakka" or "Pani Seb" in Hindi, "Jambu" or"Jambakka" in Malayalam and "Gulaabijamichettu" in Telugu. This, delicious fruit is popular for its unique thirst satisfying properties.Water apple confers several benefits for human health and have therapeutic applications for treating various ailments, heart conditions and liver disorders. The unique medicinal properties of this fleshy fruit are well-documented in Ayurveda, Siddha and Unani.

Growing Conditions

It belongs to the Myrtaceae family and grows up to a height of 3 to 10 meters. Water apple plants naturally thrive in wet, warm and humid climatic conditions and high soilmoisture content. The degree of soil acidity (pH) suitable for growing water apple is 5.5-7.5. The depth of the water content ideal for the cultivation of water apple ranges between 50-200 cm.

This plant blossoms in the summer months of May to August, with pale green, cream and white flowers in full bloom. From August to November, the fruits are creamy-green in colour (green water apple) and turn a bright pinkish-red once completely ripened. The ripe water apple fruits are bell-shaped, have crimson colored skin on the outside encompassing a white, juicy flesh within. They ooze a mildly pleasant aroma and usually have one or two grey seeds in the interior.

Appearance

It is similar to an elongated apple on the outside. These luscious water apple fruits have an intrinsically crunchy texture and are quite sweet in taste when ripe. However, the unripe green water apple is ideal for use in the preparation of pickles, curries and chutneys.The water apple fruit is ideal for weight loss due to its low calorie content and negligible amounts of saturated fats. In addition, it also provides dietary fibres, to aid in digestion and has no cholesterol, for better heart function. Due to the pleasant aroma, pulpy flavour and innumerable health benefits of this crunchy fruit it is consumed by people of all age groups and would serve as a supplement to the daily diet.

Nutritional Value of Water Apples

The nutrient content in a 100 gram serving of water apple fruit is highlighted below. The information is according to the United States Department of Agriculture (USDA) Nutrient Database:

Water Apple Health Benefits

Water apple is rich in Vitamin C, is an antioxidant,which prevents the damage of cells. The antioxidant property of water apples effectively combats toxins in the body. Vitamin C effectively boosts the immune system to counteract the colds. The lower amount of sodium and cholesterol in the water apple lower the chances of stroke, blood pressure. It contains Niacin which enhances the good HDL cholesterol levels and reduces the amounts of

Nutritional Value Of Water Apples (Amounts Per 100 g Serving)

Liquid Content:	Macronutrients:	Micronutrients:
Water: 93.0 g 90%	**Proteins:** Total Protein: 0.6 g 1% **Carbohydrates:** Total Carbohydrates: 5.7 g 2% Dietary Fiber: 1.5 g 0.5% Starch: 0.0 g Sugars: 0.0 g **Fats:** Total Fat: 0.3 g 0% Saturated Fat: 0.0 g Monounsaturated fat: 0.0 g Polyunsaturated fat: 0.0 g Cholesterol: 0.0 mg Vitamins:	**Vitamins:** Vitamin C: 156 mg 25% Vitamin A: 22 mg 5% Vitamin B1 (Thiamine): 10 mg 2% Vitamin B3 (Niacin): 5 mg 1% **Minerals:** Calcium: 29.0 mg 3% Iron: 0.1 mg 0.1 % Magnesium: 5.0 mg 1% Phosphorus: 8.0 mg 1% Potassium: 123 mg 20% Sodium: 0.0 mg 0% Sulphur: 13 mg 1.5%

Water Apple Jam

Green Water Apple Pickle

harmful triglycerides and bad LDL cholesterol in blood. Dietary fibre in water apple helps the digestive system in the material movement and adds bulk to the stool which is helpful to control irregular bowel function. The abundant water content in water apples makes them perfect to quench thirst and cool the body during peak summer, when people are dehydrated. Watery Rose Apple contains hepatoprotective agents that help in effectively treating liver ailments.Water apples have powerful antihyperglycemic properties, which lower blood sugar levels in patients with diabetes. Hence, water apples can be consumed in moderate amounts by diabetic patients.

Water Apple Recipes:

1.Water Apple Jam:

This fresh& nutritious fruit preserve can entice taste buds and perfectly complement toast, dosas and rotis.

Ingredients:

- 2 medium water apples, ripened
- ¼ cup jaggery
- 3 tsp cinnamon powder
- 2 tsp cardamom powder

Method:

- Rinse the water apples thoroughly in warm water and dice them into small pieces.
- Heat some water in a deep dish vessel on medium flame, and then add the cut water apples along with jaggery, cinnamon and cardamom.
- Cook this mix to obtain a syrup-like consistency, until the fruit completely melts, so that the sweet flavours can get infused in its juice.
- Switch off the stove and allow the thick paste to cool down completely.
- Store this water apple jam in an airtight container for up to one week.

2. Green Water Apple Pickle

This piquant and tangy recipe is easy to prepare and serves as a perfect side dish to sandwiches, parathas and rice.

Ingredients:

- 2 small green water apples (unripe)
- 1 tsp chilli powder
- ½ tsp turmeric powder
- 1 tbsp groundnut oil
- 2 tsp mustard seeds
- 10 – 12 curry leaves, finely chopped
- Salt, to taste

Method:

- Cut the green water apples into small pieces and discard seeds.
- In a pan, heat the oil and add mustard seeds.
- Once they start to sputter, add the curry leaves and sauté for few minutes.
- Now, add the cut green water apple slices to this, along with chilli powder, turmeric powder and salt and cook thoroughly for 10 minutes on medium flame.
- When stored in a clean, dry airtight jar, this green water apple pickle stays fresh for up to ten days.

Conclusion:

Water apples, otherwise known as rose apples or watery rose apples are in fact, a goldmine of essential macronutrients, trace minerals and potent antioxidants. They impart beneficial traits to enhance physical and mental health, apart from being invaluable in remedying several ailments such as diabetes, heart disease and neurodegenerative disorders. In addition, they confer many significant advantages to women in crucial phases of pregnancy and post childbirth. Hence, it is of foremost necessity, to understand the salient nutrition values and marvelous wellness incentives that water apples offer, for overall health.

References:

1. https://www.netmeds.com/health-library/post/water-apple-nutrition-health-benefits-uses-for-skin-and-applications-in-ayurveda
2. https://sanctityferme.com/water-apple/

Geo-spatial approaches for Land Degradation

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Land resources are very important for ensuring food security of our country. Population growth and unscientific land utilization incompatible with its carrying capacity has accelerated land degradation. Land degradation has numerous, environmental, economic, social and ecological consequences. Every ecosystem in earth is affected by some or other form of land degradation. When land is degraded, the ecology is damaged. The loss of top soil has tremendous economic implication. The economic losses may well outweigh the benefits of many development project that give rise to the problem. The information on the extent and spatial distribution of various kinds of degraded lands in India is one of the options available to increase food production for growing population and to restore the fragile ecosystem.

Airborne platforms like balloons and aircrafts have been used to capture photographs of the terrain using either photographic camera or multispectral scanner. Black and white aerial photographs were first used to prepare base maps for a soil survey in Jennings country, Indiana, USA in 1929 and a vast improvement over the use of plane tables to draw base and soil maps was observed. In India, the chief stimulus for the usage of aerial photographs for soil survey has been the establishment of the erstwhile Indian Photo Interpretation Institute (now the Indian Institute of Remote Sensing IIRS) at Dehradun in 1966. Systematic mapping of degraded lands in

India started in late fifties and was mostly confined to mapping eroded lands and salt-affected soils.

For the assessment of land degradation, on a global level at 1:5 million scale FAO/ UNEP/UNESCO (1979) had used direct observations, parametric methods as well as remote sensing techniques. According to this study:

- Remote sensing provides a rapid, relatively inexpensive means to gather land information where no other sources are available or where the quality of available information is low.
- It gives an exact delineation or clear physiographic boundaries.
- It gives the opportunity for repetitive, annually or seasonally multi-spectral examination.
- Interpretation of satellite imagery can be at several levels of intensively / scales.

Spaceborne multispectral data have been used for deriving information on land subject to various kinds of degradation. Globally the major operational usage of space-borne multi-spectral data has been in the land degradation mapping at 1:5 million scales (Food and Agriculture Organization, 1974). In India, the mapping of waste lands of entire country at 1:1 million scales were concluded in 1985 using Landsat MSS data (National Remote Sensing Agency, NRSA 1985). The follow-up of this effort led to district-wise wasteland mapping at 1:50,000 scale using land sat-TM / Indian Remote Sensing satellite (ISRO-1A/1B) Linear image self-scanning Sensor(LLIS-II) DATA (Ministry of rural development and National Remote Sensing Agency,2000). An estimated 63.85 million ha of lands were found to be laying waste. Subsequently, a soil degradation map of entire country was prepared at 1:4 million scales (Sehgal and Abrol, 1994). Besides, landset TM data at 1:250,000 scale has been used in a national-level project titled "Mapping saline / alkaline soils of India" (National Remote Sensing Agency, 2001) for mapping salt affected soils. Recently, NRSC carried out Nation-wide mapping of land degradation using multi temporal data on 1: 50,000. Using 2005-2006 satellite data. According to this study about 69.47 m ha was found under soil erosion affected (water and wind) and 6.78m ha was found under salt affected soils.

Mapping land degradation

The following section provides outline of the procedure involved in mapping land degradation using satellite data which consists of input data, preparatory work and methodology. The methodology normally affected for the mapping at any scale consists of preparation of base map, online visual interpretation of satellite data, development of legend, ground truth collection, analysis of soil samples, classification of degradation classes and finalisation of maps in the light of field information and analytical data. The major steps are described here under:

Input data and its preparation

For delineation and mapping of land degradation classes, multi-temporal geo-rectified data acquired during major cropping seasons like kharif, rabi and zaid season will be used. Such a temporal data set will help to address the season variability of intensity of problem in degraded lands. The satellite data will be geometrically corrected for further processing, like visual interpretation keys, ground truth data collection and land degradation map preparation.

Besides, while mapping land degradation, ancillary data in the form of topographic maps, existing land use land cover data, wasteland data, district maps and any other published relevant material will be used as reference data. Survey of India digital topographic maps at suitable scale will be used for identification of base features and for planning ground truth data collection. Any legacy data sets in the form of maps can also be used for substantiating land degradation process.

Interpretation cues

The methodology involves standard visual interpretation techniques that are followed in every other mapping exercise. The image interpretation key provides a critical reference base for advanced interpretation. It helps the interpreter in evaluating the information in an organized and consistent manner. An image interpretation key for the study area has to be designed prior to interpretation, which can be further refined in course of interpretation. However, for delineation of severity, the interpretation cues vary with the season of data available and local processes. Using these cues the satellite data will be season of data available either on the computer screen or using image prints. After preliminary interpretation of satellite data

sample area will be identified for ground truth data collection.

Ground truth collection

Ground truth field data verification is an important component in mapping and its validation exercise. Utmost care and planning is required for collecting ground data and verification. To facilitate a good ground truth exercise identify and list all the doubtful areas for the ground verification and refer all such areas with respect to the toposheet to know their geographical location and accessibility on the ground. Afterwards prepare field traverse plan to cover maximum doubtful areas in the field. Ensure that each traverse covers, as many land degradation classes as possible, apart from the doubtful areas.

Soil Sample Analysis

The soil samples are to analysed for pH, EC, texture (sand, silt, clay), CEC, exchangeable cations, calcium carbonate %, organic carbon % using standard analytical procedures. These observations are required for signature extrapolation during interpretation.

Map Generation

The land degradation map to be finalize in light of the ground observations, visual interpretation keys, available ancillary and legacy data sets. Once map is finalized they need to be checked for topological and labelling errors. For mapping units having more than one problem, the associated problem need to given the mapping symbol in a separate attribute column. Map will be composed using the major land degradation problem. Edge matching of the features will be carried out to maintain the continuity of classes between adjoining sheets. Final map will be put accuracy evaluation. Base map features will be overlaid and then map will be generated on the layout consisting of theme map, legend, sources of data, index map, agencies involved, project name and year of publication, scale bar, north arrow.

Information collected during the field visit is utilized in checking the final maps. Generally, 5% of the ground truth collected is used for validation of the mapping units. In extreme cases, then finalised thematic maps will also be validated by verifying the mapping units in the field.

Monitoring of land degradation

Repetitive nature of satellite data enable to monitor land degradation process over a period of time in any geographical location. The methodology consists of the geometric correction of multistate satellite data using survey of India topographical sheets at appropriate scale. Then the satellite data will be corrected for sun elevation angle effects and atmospheric influences. Subsequently the data is normalized for their radiometric differences. Once the data set is ready, the ground truth will be collected with respect to current season data by means of studying soil profiles and surface observations. The soil sample will be analysed for various physical and chemical properties. Based on the ground truth and ancillary information, the signature will be established for various land degradation classes. Using the other supporting information and ground truth information signature will be extrapolated to other dates. The changes that have been observed in the satellite date will be verified again on the ground. The NRSC had carried out on monitoring of water logging and sait affected soils in the major command areas in various states

Future Perspective

In spite of tremendous development in the Remote sensor technology and data processing and analysis / interpretation techniques of remote sensing data, there are certain specific issues related to soil degradation studies which could not be addressed with the currently available remote sensing data and require immediate attention. Like qualification of soil loss:, objective assessment of soil loss, quantitative information is required. Mapping salt-affected soils under varying terrain conditions and in the presence of vegetation cover. Detection of water logging due to rising ground water table. And Generation of farm-level information on degraded lands. A pre-requisite for implementation of any reclamation programme seems feasible with high spatial resolution satellite need to operationally use to derive farm-level information on degraded lands.

References

FA0-UNESC0 (1974) Soil Map of the World. UNESCO, Paris.

FAO/UNEP/UNESCO, 1979. A provisional Methodology for Soil Degradation Assessment. FAO, Rome. 83 pp. + maps.

Sehgal, J. and Abrol, I.P. (1994) Soil Degradation in India: Status and Impact. Oxford and IBH Publishing Co., New Delhi, 80.

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SOIL THE NATURAL CAPITAL

Agroecosystems represent the dominant biome on Earth as 25 to 40% of land is devoted to agriculture. Agricultural ecosystems rich in biodiversity ensure food security and improved nutrition by broadening the food base and diversifying diets. Sustainable Agriculture is intricately linked with Soil Health and Below Ground Biodiversity. The Convention

on Biological Diversity (CBD) defined the soil biodiversity as "the variation in soil life, from genes to communities, and the ecological complexes of which they are part, that is from soil micro-habitats to landscapes".

Healthy crops are vital to sustainable food production, to dietary and nutritional security, for the supply of medicines, fuel and fibre and is the key to sustainable agriculture.Over the past several years, crop yield has increased, due to scientifically improved cultivars and improved plant pest and disease management, but about 20 per cent of Earth's vegetated surface shows declining trends in productivity directly linked with loss of soil fertility due to loss of diversity in the agricultural field, homogenization of crops and agricultural intensification. Since the 1900s, some 75 percent of plant genetic diversity has been lost as farmers worldwide have left their multiple local varieties and landraces for genetically uniform, high-yielding varieties. Presently only about 30 crops form the basis of world's agriculture and only three - rice, maize and wheat - contribute nearly 60 percent of calories and proteins obtained by humans from plants (FAO, 1999).

International conventions have focussed on the importance of sustainable production and consumption. Way back in 1992, the Earth Summit and the resultant three Rio Conventions: the Convention

on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD) promoted a sustainable future for coming generations. It was widely recognized that healthy soil constitutes the foundation for sustainable agricultural, essential ecosystem functions and food security.

The International Day for Biological Diversity for 2018 with focal theme 'Our Biodiversity, Our Food, Our Health,' focused on biodiversity as the foundation for our food and health and as a key catalyst to transforming food systems and improving human well-being.

Below Ground Biological Diversity

The soil is home to a complex ecosystem of animals, plants, and microbes and is a reservoir for at least a quarter of global biodiversity. The soil organisms, including bacteria, fungi, protozoa and invertebrates, constitute the Below Ground Biological Diversity (BGBD). It is estimated that one gram of soil contains nearly a thousand fungal hyphae and a million bacterial colonies. The soil organisms are vital for sustainability of the ecosystems, by providing a number of essential functions and regulate soil carbon sequestration and influence plant health through interactions of natural predators and pests. Fungi, protists and bacteria plays an important role in degradation of organic matter and recycling nutrients. Soil rhizobium convert atmospheric nitrogen into organic forms. Termites and ants affect soil structure and porosity of soil where as the friends of farmers-Earthworms increase nutrient availability. Soil biodiversity represents one of the largest carbon stocks on Earth and plays a major role in mitigating climate change.

Threats to Soil Biodiversity

Land degradation and biodiversity loss are among the most pressing environmental challenges. Land-use changes and unsustainable land management leads to land degradation and loss of soil fertility. Extensive tilling, removal of organic matter, excessive irrigation using poor quality water and overuse of synthetic fertilizers and pesticides are all leading to loss of soil fertility, pollution and land degradation and depletion of below - ground biodiversity. Climate vagaries also play a major role in soil erosion. Recent studies in the post flood soils of Kerala after the floods of August 2018, it has been proved that there is an increase in the anaerobic microorganisms and pathogenic fungal species in the flood affected soil than that of non-flooded areas. There is a depletion in soil enzyme activity compared to buffer and non-flooded areas indicating that there is a decrease in beneficial organisms in the soil (nitrogen fixing and phosphate solubilising).

Way forward

All this calls for a shift in the way we handle our production landscapes particularly Agriculture and Fisheries and adopt strategies to mainstream biodiversity in these sectors. Department of Agriculture has already initiated several schemes for building diversity into landscapes and food systems through promotion of Agroforestry, homestead farming, crop rotation, organic farming etc. to name a few. In order to Mainstream biodiversity into Agriculture, policies and action plans are necessary and if managed sustainably, agriculture can contribute to important ecosystem functions. The Kerala State Biodiversity Strategies and Action Plan have identified action plans relevant to conservation of Agrobiodiversity. Mainstreaming the production of indigenous crops in various agricultural schemes to enhance genetic diversity,special package for traditional varieties motivating and assisting land owners for in-situ conservation of Agrobiodiversity, inclusion of data of varietal diversity of at least the major agricultural crops in Agriculture statistics, integratingbiological parameters such as biodiversity assessment of key organisms in Soil Health Card (SHC) are some of the initiatives which can be thought of.

Biodiversity at every level is vital for food security and mainstreaming biodiversity in production landscapes is needed for building a resilient agro ecosystem. Soil is a natural capital as generating three centimeters of top soil takes 1,000 years and when soil organisms begin to disappear, ecosystems will soon start to underperform.

Welsh Onion

An underexploited edible member of Alliums crops

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Introduction

Welsh onion or Japanese bunching onion, botanically known as Allium fistulosum L., belongs to the Alliaceae family and has chromosome number 2n=2x=24. It is commonly known as Mizopurun in Mizoram, India, and is suitable for humid cool climatic conditions. It is widely grown for its tender shoots and pseudostem and is more commonly used in East and Southeast Asian countries. It is believed to have arisen in Asia, most likely in Mongolia, Siberia, or northwestern China.

Edible Uses

Leaves and Pseudostem are edible and can be used as salad, fried, cooked or uncooked. It has a pleasant

onion flavour and can be used in salads, as a cooked vegetable, or to season other dishes. The thin pseudostem ranges from 10 to 25mm diameter, and rarely growup to 45mm. These are commonly used as spring Welch onions as raw or cooked leafy greens. The leaves are available in all seasons. They contain 1.4 percent protein, 0.3 percent fat, 4.6 percent starch, 0.8 percent ash, a small amount of vitamin B1 and moderate amounts of vitamin C.

Medicinal uses

The medicinal properties of the Welsh onion are numerous, and is used in Chinese medicine. It is used to enhance the performance of internal organs and metabolism, as well as to enhance healthy life span. It also improve eyesight, digestion, and perspiration, and speed up healing from common colds, headaches, wounds, and festering sores. The plant has an essential oil rich in sulphur compounds,which is antibacterial, antiseptic, diaphoretic, diuretic, galactagogue, stomachic, vermifuge, and vulnerary.It is used to combat colds, as well as abdominal coldness and fullness. The roots are used to make sedative tea for infants. Internal parasites are thwarted by eating the bulb. The bulb can be used as a poultice to remove pus from sores, boils, and abscesses.

Other Uses

The plant juice is used as a moth repellent. Insects and moles are said to be repelled by the whole plant. White ant infestations in gardens can be reduced or prevented by Welsh onion plants. The diluted juice is used as an aphid remedy in China.Welsh onions are similar to cultivated onions and can be

Figure 1: General view Welch onion plant with foliage leaves and long pseudostem(Source: ICAR-Directorate of Onion And Garlic Research Centre)

used in breeding programs.

Hierarchy of Botanical Classification

Kingdom : Plantae
Order : Asparagales
Family : Alliaceae
Subfamily : Allioideae
Genus : *Allium*
Species : *Fistulosum*

Morphological description

Welsh onion is an evergreen, herbaceous, perennial plant producing 2-6 hollow, cylindrical leaves 25 - 40cm long and a flowering scape 30 - 50cm tall from an underground non-bulbous pseudostem (Figure 1).

Leaves

Welsh onion leaves are round, hollow, and inflated over their entire length of 6 to 20 inches.

Stem

There are two basic forms, multi-stem types and single-stem types. The multi-stem forms divide more freely than the single-stem types. Even when covered in snow, plants always keep their leaves. They can also be grown in the tropics and tolerate high temperatures.

Root

Plants grown in sandy soil had a more root length and longer than those grown in clay-sandy soil. So, the welsh-onion is used to improve the root system of onions through breeding.

Bolting or flowering –

It flowers in July and will be in full bloom for more than a month. Bees and insects help in pollination. Welsh onion is a hermaphrodite that has both male and female organs.

Propagation

Sow seeds in pots, trays, or nursery beds, or directly in the cultivated field. The seed germinates at a variety of temperatures, but it germinates more quickly at higher temperatures. When the seedlings are large enough to accommodate, prick them out into individual pots, trays, or nursery beds.

Plant suckers separation is simple and can be performed at almost any time of year, but the spring is possibly the best. If necessary, the sucker or divisions can be planted directly into their permanent positions, as it is a perennial crop.

Cultivation details

The Welsh onion is a cold-tolerant plant that was developed in the temperate zone and is widely grown. It can be grown successfully at an altitude of 1,000 to 2000 meters in the tropics.

Plant development is aided by high temperatures, but flowering and seed development are only possible when the plants are exposed to low temperatures. Crop and seed formation occur only at higher elevations in the tropics.The plant thrives in climate with annual daytime temperatures of 12-25°C, but it can also withstand temperatures of 6-30°C.

It prefers 850-1,600mm of annual rainfall but can tolerate 700-2,500mm. It prefers temperate conditions in a light, well-drained yet moist soil, but will thrive in a variety of soils, including damp and acidic soils. It prefers a pH of 6.5 to 7.5, but it can also tolerate a pH of 4.9 to 8.5, it tends to be harder and more robust in growth,foliageleaves and pseudostem yields are range from 20 to 45 tonnes per hectare.

Figure: Waste decomposer

WASTE DECOMPOSER

AN EFFECTIVE TOOL FOR WASTE MANAGEMENT IN AGRICULTURE

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National Centre of Organic Farming (NCOF) has developed a waste decomposer culture which is used for quick composting from organic waste, soil health improvement and as plant protection agent. It is a consortium of microorganism extracted from desi cow dung. The waste decomposer is sold in a bottle of 30 grams costing Rs. 20/- per bottle directly through NCOF and Regional Organic Farming Centres (RCOF) to farmers. The waste decomposer is also validated by ICAR. A single bottle decomposes bio-waste of more than 10000 metric tons just in 30 days.

How to prepare waste decomposer solution from the started culture?

1. Take 2 kg jaggery and mixed it in plastic drum containing 200 litres water.
2. Now take 1 bottle of waste decomposer and pour all its contents in a plastic drum containing jaggery solution.
3. Avoid direct contact of contents with hands.
4. Mix it properly with a wooden stick for uniform distribution of waste decomposer in a drum.
5. Cover the drum with a paper or cardboard and stir it every day once or twice.
6. After 5 days the solution of drum turns creamy

Farmers could prepare the waste decomposer solution again and again from the above formed solution. For this, 20 litre of waste decomposer solution is added to a drum with 2 kg of jaggery and 20 litres water is added. Farmers can prepare continuously this solution from this waste decomposer for lifetime.

Salient features of waste decomposer

- Simple and reliable
- Ready to use (within 5 days)
- Longer shelf-life
- Recommended for all crops
- Better crop response
- Low cost (only Rs. 20 per bottle)
- More than 1 lakh metric ton organic manure could produce from 1 bottle

Composting

1. Spread 1 ton of compost as layer on a plastic sheet placed under shade
2. Sprinkle 20 litre of the above prepared solution over the compost layer
3. Spread one more layer of compost above the existing layer
4. Sprinkle 20 litre of the solution over the compost layer
5. Use the solution for 10 compost layers
6. Maintain 60% moisture during entire period of composting
7. Turn over the compost at 7 days interval The compost is ready to use after 30 days

Seed Treatment

1. Wear gloves
2. Content of 1 bottle is thoroughly mixed with 30g jaggery and used to treat 20 kg seeds
3. Leave the treated seeds under shade for 30 minutes
4. After 30 min. the seeds are ready for sowing.

How it Works?

As Manure:

- 18-20 cm thick layers of 1-ton bio-waste such as agricultural waste, kitchen waste, cow dung etc. are piled on the ground.
- Wet the waste with solution of the waste decomposer.
- Again another 18-20 cm thick layer of bio-waste is spread and again wet with waste decomposer solution.
- The above processes are repeated till the piling goes 30-45 cm higher.
- Turn the pile at every 7 days interval for uniform composting and add more solution at every turning.
- Also maintain 60% moisture during the entire period of composting. If required again add the solution

As a Bio-pesticide:

The mass multiplied liquid waste decomposer culture is diluted in the ratio of 1:3 with water and applied as a foliar spray to control pest and diseases. It can control all types of soil borne, foliar diseases, insects and pests. Farmers are investing huge finances in purchasing fertilizer, pesticides, herbicides and other manures to revive the soil quality, but all this can be eradicated by one pocket saving solution.

From where do we get waste decomposer?

Waste decomposer can be directly obtained from the National Centre of Organic Farming, Ghaziabad. But nowadays it is also available online. Below we have mentioned two websites from where you can purchase the waste decomposer

- https://krushikendra.com
- https://www.amazon.in

References:

http://ncof.dacnet.nic.in

Dr. SUSAN JOHN K.
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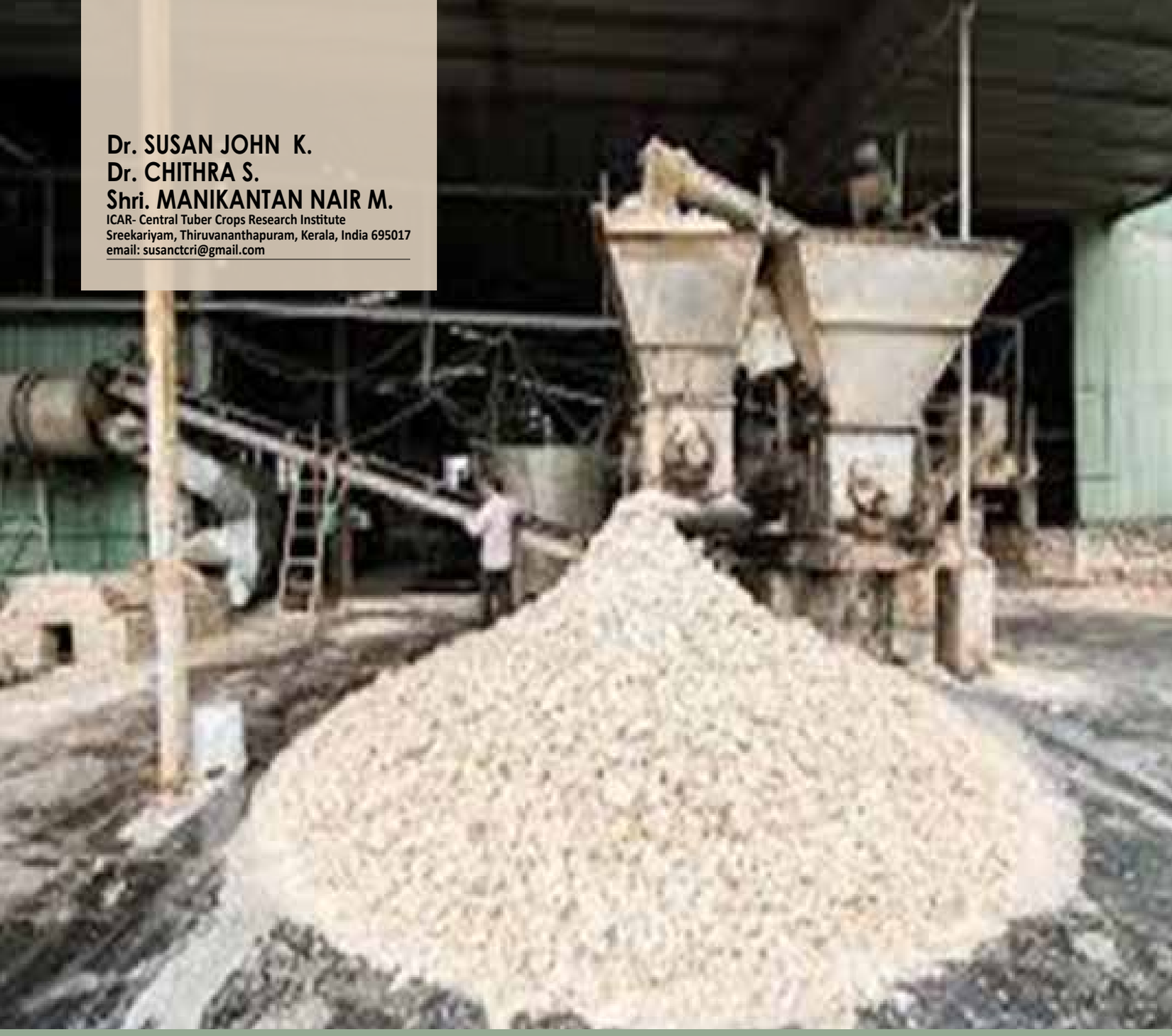


Wealth from Waste

A nutrient rich organic manure from cassava starch factory solid waste (Thippi)

In India, cassava cultivation is confined mostly in southern States viz., Kerala, Tamil Nadu and Andhra Pradesh. In States except Kerala, tubers are used as raw material for starch and sago industries. Among these States, Tamil Nadu utilizes the tubers to the full extent for industrial purposes having about 8-10 large scale starch factories and 150-200 small scale starch and sago production units. These factories are generating nearly 40-60 tonnes of solid waste (thippi) per annum creating serious environmental pollution especially during rainy season causing lot of health issues to the people residing near the factory premises.

Considering the severity of this problem near cassava starch factory premises affecting normal life through the foul smell and leachate from thippi heap polluting nearby water bodies, a research project was formulated for composting the waste to convert it into a nutrient rich organic manure aiming safe disposal of the waste thereby managing the environmental hazard. The physico-chemical and biological analysis undertaken with thippi revealed it as very poor in nutrient content with a C:N ratio of 82:1.

Thippifrom cassava starch factory

Among the nine combinations adopted for composting, vermicomposting of thippi enriched with Glyricidia and cassava leaves, cowdung,Mussoriphos and rock powder for 2 months resulted in the best organic manure having

Thippifrom cassava starch factory

Thippi compost prepared with nine treatment combinations

the highest nutrient content and lowest C:N ratio (8:1).

Thippi compost prepared with nine treatment combinations

Composting Materials

Materials	Quantity
Thippi :	1 ton
Cow dung	: 200 kg
Rajphos/Mussoriphos	: 20 kg
Rock Powder	: 20 kg
Azolla/	:100kg
Glyricidia/	
Cassava leaves	
Earthworms	: 20 kg

Infrastructure required:

1. Cement tanks of $2m^3$ volume
2. Metallic wire mesh lids (to ensure both aeration as well as protection from pests)

Procedure of thippi compost preparation

- Mix the contents well in the tank with adequate moisture content (Should be wet)
- Composting for a period of 45-60 days
- Proper mixing and moistening of the mixture at periodic intervals to maintain moisture content at 40-60% for enabling better decomposition.
- After 2 months, dry the decomposed mixture in shade for one week
- Sieve the well dried compost through 2 mm sieve
- Keep in dry condition

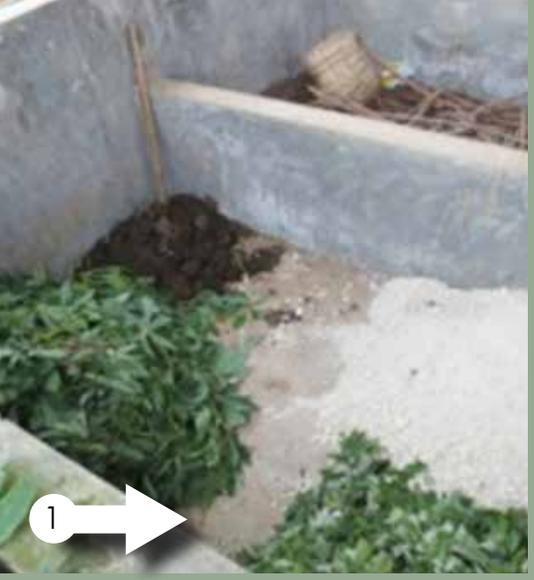
Protocol in the preparation of thippi compost

- Mean N, P, K, Ca and Mg, Fe, Mn, Cu and Zn content in thippi compost was 1.32, 3.82, 0.40, 2.18, 0.96, 1.11, 0.08%, 11.23 and 89.93 ppm respectively which is 3.5, 49,7, 32.5, 8, 185, 100, 2.5 and 12 times than thippi.
- Thippi compost had low bulk density, starch, carbohydrate and cellulose with no fibre and cyanide but high protein suggesting this protocol as a possible alternative for convertingthippi to thippi compost.
- Nutrient release pattern of thippi compost was done for a period of one year and was found that, the maximum release of all nutrients upon application to the soil was during 5-9th month.

Response of cassava to thippi compost

Field experiments conducted for two seasons indicated

- Thippi compost is a good substitute to farm yard manure (FYM), green manuring in situ with cowpea, crop residue, vermicompost and coir pith compost



Protocol In The Preparation Of Thippi Compost

- Thippi compost is a substitute to chemical fertilizers up to 50% of the recommended dose of NPK as per PoP (PoP: 100:50:100 kg/ha)
- Thippi compost is a substitute to application of ZnSO4 andMgSO4@ 2.5 kg/ha.
- Thippi compost application can reduce the bitterness and increase the starch content of cassava tubers.

Economics of thippi compost preparation and its use in cassava

- The quantity of dry thippi from one hectare of cassava cultivation having an yield of 35 t/ha is 770 kg.
- The recovery of thippi to thippi compost is estimated as 95%,
- Production costof thippi compost is Rs. 10/kg.
- B:C ratio of using thippi compost as a substitute to different organic manures, NPK fertilizers, secondary and micronutrients ranged between 1.7-2.55.

Hence, the invention could solve the environmental problem due to the cassava starch factory waste, facilitated safe disposal of the waste and could result in the preparation of a nutritious organic manure from the cassava starch factory solid waste, thippi.

Fig1: CIFT solar hybrid fish dryer with electrical backup system

Biomass Gasifier

An Alternative Thermal Backup System For Solar Dryers

Solar drying system is an improved form of traditional open-airsun drying method in which a simple structure is used to harness the solar thermal energy and the natural flow of wind to obtain the desired drying conditions. This method of drying is cheap, renewable, easy to operate and affordable. However, during off-sunshine hours i.e. night, rainy and cloudy days, it is difficult to operate due to insufficient drying air temperature resulting in improper drying and poor quality dried products. In order to overcome these limitations,solar dryers with different thermal backup systems were developed by CIFTi.e.Electrical, & LPG (Figs. 1

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Fig 3: Biomass gasifier system with blower assembly

& 2). A performance evaluation study of hybrid solar dryer integrated with an electrical backup system was carried out by Murali et al. (2019) using mackerel. Similarly, performance of solar dryer coupled with LPG heat backup system was studied using shrimps by Murali et al. (2020). However, availability of electricity and LPG, and their cost were the major drawbacks with the existing thermal backup systems.

Biomass gasifier unit as a thermal backup system

Biomass gasifier (Fig.3) isan equipmentused to obtain

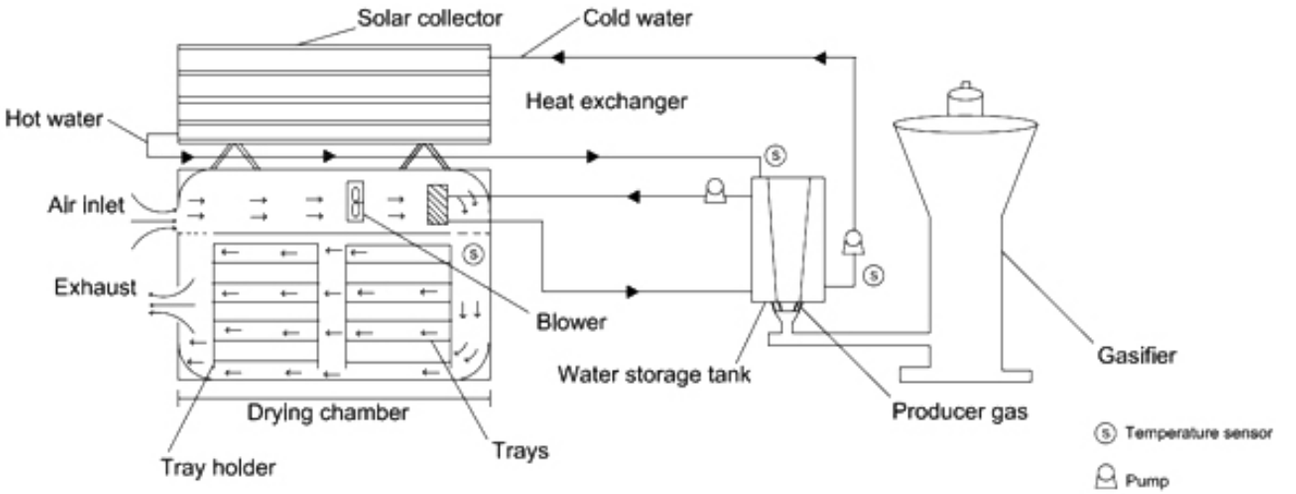

Fig 4: Schematic diagram of solar dryer integrated with biomass gasifier backup unit

producer gas through the gasification process. It is a thermochemical process that can convert any carbonaceous material into producer gas by burning the biomass under restricted air supply(Patra et al., 2016).The producer gas consists of carbon monoxide (CO - 18% to 22%), hydrogen (H2 - 8% to 12%), carbon dioxide (CO2 - 8% to 12%), methane (CH4 - 2% to 4%) and nitrogen (N2 - 45% to 50%). The calorific value of producer gas is about 1000 to 1200 kCal/Nm3. It can be considered as an alternative thermal backup system due to its thermal efficiency, cost effectiveness and being environmentally friendly. One of the most suitable raw materials for the operation of biomass gasifier is coconut shell, because it is readily available and it costs very less or negligible amount. The calorific value of coconut shell is about 17 MJ/kgweight. In addition, output of the gasifier unit, charcoal can be converted into activated charcoal and can be sold in the market to gain the additional benefit(Dhamodaran andBabu, 2011). The activated charcoal is widely used in the water treatment plants.

The producer gas obtained from the biomass gasifier unit can be fired directly and the resultant hot gas can be forced to the drying chamber(Jangsawang, 2017).

It has been reported that the temperature of hot flue gas upon burning of coconut shell is about 150-170°C. On the other side,hot flue gas can be used to heat water and store the energy in the form of sensible heat. The heat energy required can be drawn to the drying chamber from the stored sensible heat with the help of heat exchanger (Fig. 4).Further, biomass gasifier can be operated during unfavourable weather conditions (rainy and cloudy) and off-sunshine hours (during night), thus continuous drying is possible in the low-cost energy efficient gasifier based thermal backup system. The authors suggest that biomass gasifier can be effectively utilized as a thermal backup system for solar dryers in areas where abundant biomass is available at very low or negligible cost i.e. Andaman and Nicobar Islands, Kerala.

References

- Murali, S., Sathish Kumar, K., Alfiya, P. V., Delfiya, D. A., & Samuel, M. P. (2019). Drying Kinetics and Quality Characteristics of Indian Mackerel (Rastrelliger kanagurta) in Solar–Electrical Hybrid Dryer. Journal of Aquatic Food Product Technology, 28(5), 541-554.
- Murali, S., Amulya, P. R., Alfiya, P. V., Delfiya, D. A., & Samuel, M. P. (2020). Design and performance evaluation of solar-LPG hybrid dryer for drying of shrimps. Renewable Energy, 147, 2417-2428.
- Patra, T. K., Nimisha, K. R., &Sheth, P. N. (2016). A comprehensive dynamic model for downdraft gasifier using heat and mass transport coupled with reaction kinetics. Energy, 116, 1230-1242.
- Jangsawang, W. (2017). Utilization of biomass gasifier system for drying applications. Energy Procedia, 138, 1041-1047.
- Dhamodaran, T. K., &Babu, S. (2011). Potential of community level utilization of coconut shell and stem wood for charcoal and activated carbon in Kerala. Journal of the Indian Academy of Wood Science, 8(2), 89-96.

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Butterfly garden

A Garden To Raise Butterflies

Butterflies, the flying flowers, are one of the most beautiful creation of nature, loved by both children and adult. It is very easy to establish a butterfly garden by setting up a habitat loved by them. While designing the butterfly garden we must first know about the life cycle of butterflies.To grow into an adult they go through 4 stages: egg, larva, pupa and adult. Each stage has a different goal - for instance, caterpillars need to eat a lot, and adults need to reproduce. Depending on the type of butterfly, the life cycle may take anywhere from one month to a whole year.

Planning a butterfly garden:

A well designed plan is necessary for setting up an open butterfly garden. Plan a garden in such a way that existing trees are left undisturbed. The plan should describe the plots for flowering tree as per the sunlight requirement. Saplings of annuals are to be maintained so that the entire plant fed by caterpillars can be replanted in the garden again.

Narrow footpaths in the garden will help to prevent trampling of the plants by visitors, while trying to photograph some butterfly. Sunshine is very important in the life of butterflies as they are cold blooded animals and need to bask in sunlight before they start their activities in the morning. While planting large trees in the gardencare must be taken that they should not create shadow in entire garden. Ensure a small shady area for visitors with resting facilities.

Features of designing butterfly garden:

1. Selection of site

Select the site of any size which get adequate sunlight,but protected from wind. To protect the site from wind, windbreaks can be erected but the amount of sunlight received should not be decreased. While designing the garden tall and shelter providing plants are planted at the back followed by nectar plants and then open sunny area.

2. Nectar plants

Butterflies collect nectar from different plants. But there are a few highly preferred plants like butterfly weed, butterfly bush, marigold, zinnia, cosmos, globe amaranth, lantana, aster, purple coneflower, day lily etc.

Butterfly weed

Zinnia

Globe Amaranth

Cosmos

Lantana spp

Aster

Different species of butterflies are attracted to different colours, so include plans with yellow, orange, white, red, blue, pink and purple flowers in the garden. Selection of nectar plants should be such that it blossoms at different time in order to provide nectar throughout the season.

3. Host plants

These are the plants on which the female butterfly lay egg and it is the source of feed for the caterpillar. The caterpillars prefer specific host plants, so knowledge about the host plants each species prefers is needed.

Host plants most preferred are Pagoda plant, Cuphea, *Gloriosa superba,* Hibiscus, Ixora, Rattle weed, *Jasminum spp., Carrisaca randus, Aegle marmelos, Musanda,* Curry leaves, Rutagraveolens etc.

4. Shelter

Butterflies need protection from rain, wind, extreme temperature and predators. It is necessary to plant wide range of shrubs and trees for this purpose.

5. Minerals and water

Butterflies require minerals and water. They absorb moisture and minerals from moist area around water. This is called as mud puddling. Bird bath or a small container can be buried in soil. Fill it with wet sand and place few twigs and rocks on the top of sand.

6. Basking sites

Butterflies need sunlight to warm their blood and flight muscles. So, by placing rocks of various shape and colours in various place of the garden where sunlight exposure is high. These spots can be enjoyed by butterflies as their basking sites.

7. Supplementary feeding

Supplementary feeding in butterfly garden is important during drought years. Not all butterflies are attracted solely to flower nectar, some readily feed on honeydew, tree sap, over ripe or rotten fruits,dung and mud. Such butterfly feeders can be purchased locally or home made. One of the preferred syrup is 1 to 10 ratio of Sugar to water.

Tips for maintaining butterfly garden

- Select the place where ample sunlight is received
- Select the plants suitable for landscape
- Water, mulch and fertilize the plants to produce maximum growth and flower production
- Avoid use of pesticides in garden
- Identify the butterfly species in your garden and plant local species accordingly for greater enjoyment of butterfly.
- Choose plants of different heights and growth habits which helps to create microclimate which in turn appeals to greater diversity.

Published by **George Sebastian** Principal Information Officer Farm Information Bureau Owned by Department of Agriculture, Government of Kerala and Published at Farm Information Bureau, Kowdiar P.O, Thiruvananthapuram-3. Editor: **Sreekala S.**