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# *Value Addition in Vetiver for Sustainable Production, Utilization and Income Generation*

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## **ABSTRACT**

**Vetiver (*Chrysopogon zizanioides*) is a perennial aromatic grass of the Poaceae family, widely valued for its fragrant roots, essential oil and versatile biomass. The crop has considerable potential for sustainable utilization because its roots, leaves and processing residues can be converted into a range of traditional, commercial and value-added products. Vetiver roots are primarily used for the production of essential oil through steam distillation, with the oil being widely utilized in perfumes, cosmetics, soaps, personal-care products and aromatherapy due to its distinctive, long-lasting earthy fragrance and fixative properties. Traditionally, dried vetiver roots are also used for mats, screens, curtains, handicrafts, sachets and other household products. In India, value-added products such as baskets, mats, jewellery boxes, pen holders, mobile holders, wall hangings, hats and footwear demonstrate the potential of vetiver-based crafts. Furthermore, distillation residues and spent biomass can be utilized for compost, organic manure, mulching, biochar, briquettes and pellets, thereby reducing biomass waste and promoting resource recovery. The utilization of vetiver roots and by-products through diverse value-added applications provides opportunities for waste reduction, additional income generation and sustainable production. Thus, vetiver represents a promising multipurpose crop with significant potential in a circular and sustainable bioeconomy.**

## **VETIVER – THE WONDER GRASS WITH MANY USES**

Vetiver (*Chrysopogon zizanioides*) is an aromatic perennial grass which is widely used for its long root system from which the essential oil is extracted. It is native to the Indian Subcontinent and is now cultivated in several tropical and sub-tropical parts of the world such as India, Haiti, Indonesia and Madagascar.

Vetiver is known as khus or khus-khus in India. It has a deep and extensive root system, aromatic qualities and biomass. Apart from essential oil, the vetiver roots, leaves and other plant residues may be used for many traditional and value-added activities, thus having potential for sustainable use and income generation of the crop.

## **THE ROOT OF VETIVER: A SOURCE OF FRAGRANCE AND ESSENTIAL OIL**

The roots are the most valuable part of vetiver, as they contain aromatic compounds that give vetiver its unique earthy and woody aroma. Once harvested, the roots are washed, dried and then steam-distilled primarily to produce the vetiver essential oil.

The perfume and fragrance industry is an important use of vetiver oil because of its long-lasting, fixative fragrance. It is also utilized in cosmetics, soaps, personal-care products and aromatherapy. Vetiver oil, which is a unique and natural fragrance, is an important high-value product derived from the plant.

## **VETIVER IN TRADITIONAL AND HOUSEHOLD USES**

Vetiver has been traditionally valued for its pleasant fragrance, cooling properties and household uses. The dried roots are used as mats, screens, curtains and handicrafts, and vetiver garlands are used for their refreshing scent in traditional and decorative applications. In summer, the vetiver screens are moistened and used to naturally cool the interior of buildings and to provide a nice scent. Traditionally, the roots are also used in containers of drinking water and earthen pots to create a slight scent and refresh. Vetiver roots and leaves are used in natural air fresheners, perfumes and bathing cosmetics. Vetiver is traditionally linked to the properties such as cooling, relaxing and overall well-being.

## **VETIVER BEYOND FRAGRANCE: INDUSTRIAL AND COMMERCIAL USES**

In addition to being used as an ingredient for essential oils, vetiver finds its use in other sectors such as the fragrance, personal-care and wellness industries. The unique, long-lasting earthy fragrance of vetiver oil makes it popular for use in perfumes, cosmetics and soap. It's also used in personal care items like fragrances, creams, lotions, and other cosmetics. Vetiver oil is used in aromatherapy for its unique scent and various products that incorporate it for wellness. In addition, there are potential applications for vetiver-derived compounds in pharmaceutical formulations, but these applications rely on proper safety and regulatory assessments. The wide applications enhance the market value of Vetiver and its essential oil.

## **THE USE OF VETIVER WASTE FOR WEALTH CREATION**

Vetiver distillation residue can be transformed into useful products instead of being discarded. The spent roots and biomass can be composted to produce organic manure and used as mulching material to help conserve soil moisture and add organic matter. The remaining solids after drying can be used as biochar, which is an additional soil amendment and biomass-based

product. The fibrous nature of the vetiver residue can further be tapped for the production of briquettes and pelleted as renewable fuels. The strategies enable the utilisation of vetiver waste for beneficial products, and facilitate waste reduction, resource recovery and further livelihood generation.

### **VALUE-ADDED PRODUCTS FROM VETIVER BY-PRODUCTS**

Vetiver is a multipurpose aromatic grass widely valued for its extensive root system and characteristic fragrance. Traditionally, vetiver roots have been used not only for the extraction of high-value essential oil but also for the preparation of several functional, decorative and household products. The roots possess a unique combination of aromatic, fibrous, flexible and durable properties, making them suitable for various traditional crafts and value-added applications.

One of the important traditional uses of dried vetiver roots is the craft of Lavancha, which is practised in different parts of India. In this craft, mature roots are carefully harvested, cleaned and dried before being processed into different articles. Depending on the skill of the artisan and the intended product, the roots may be twisted, woven, bundled or moulded into different shapes. It is a natural cooling agent that reduces body heat. It is used in the production of skincare products and fragrances. When added to drinking water, it aids digestion.

Products prepared from vetiver roots include baskets, mats, pen holders, mobile holders, wall hangings, hats, footwear, decorative articles and other household products. These products are attractive because of their natural appearance and pleasant fragrance, while their fibrous structure provides sufficient strength and flexibility for weaving and shaping.

Vetiver mats and screens represent another important traditional application. Vetiver roots are woven or arranged into mats and screens that can be used in homes, particularly during hot weather. When water is sprinkled over the mats or screens, the natural fragrance of the roots is released and the surrounding air becomes pleasantly aromatic. In addition to their fragrance, the screens can help create a cooler and more comfortable indoor environment by reducing the intensity of hot air entering through doors and windows. Thus, vetiver screens combine traditional knowledge, functional utility and natural fragrance without relying on synthetic air fresheners.

Dried vetiver roots can also be used directly as aromatic materials. Small bundles or pieces of dried roots may be placed in sachets, cupboards, rooms, vehicles and storage spaces to provide a mild and long-lasting natural fragrance. This is particularly valuable because the characteristic vetiver aroma remains in the dried root even when essential oil is not extracted. Therefore, roots that are unsuitable for oil extraction or obtained as a secondary product can potentially be utilized for aromatic applications, improving overall resource efficiency. Spent or distilled vetiver roots are frequently repurposed in zero-waste products to weave fragrant mats, screens, blinds, and handicrafts that continue to emit a pleasant natural scent.

Another promising area of value addition is the utilization of spent vetiver roots after essential-oil extraction. Conventionally, the roots remaining after distillation may be treated as waste or used for low-value purposes. However, researchers have explored the conversion of these residues

into biochar through pyrolysis. Biochar produced from spent vetiver roots can potentially be used as a soil amendment and may contribute to improved soil properties, nutrient retention and carbon management. This approach supports the principles of waste minimization and circular bioeconomy by converting an extraction residue into a useful agricultural input.

### **FEW PRODUCTS FROM VETIVER**



Vetiver oil



Vetiver soap



Vetiver mats



Vetiver screen



Vetiver curtains



Vetiver pen holders





Vetiver handcrafted products



Vetiver garland



Vetiver is used to purify and cool the water



Vetiver basket



Vetiver footwear

Overall, vetiver roots offer considerable opportunities for diversification beyond essential-oil production. Traditional crafts, aromatic products, cooling screens and biochar production can provide additional sources of income for farmers, artisans and rural entrepreneurs. Promoting these value-added products can enhance the economic importance of vetiver cultivation while simultaneously encouraging sustainable utilization of root biomass. Thus, integrating traditional knowledge with modern processing technologies can help establish vetiver as a versatile crop with significant potential for livelihood development, handicraft enterprises and environmentally sustainable value addition.

## **CONCLUSION**

Vetiver (*Chrysopogon zizanioides*) is a multipurpose, versatile crop with high potential for sustainable use other than essential oil production. The aromatic roots are used as a raw material in perfumes and cosmetics, soaps, personal care products and aromatherapy and dried roots are used for mats, screens, curtains, sachets and many handicrafts. Other value-added products like baskets, jewellery boxes, pen holders, mobile holders, wall hangings, hats and footwear are also examples of other possibilities of increasing the economic value of vetiver biomass. Most importantly, the residues left over from essential-oil extraction should not be considered as “waste”. Spent roots and other biomass can be used for compost, organic manure, mulching, biochar, briquettes and pellets, which aids in resource recovery and minimising biomass waste. The utilisation of essential oil production, traditional craft and biomass-based products can thus be helpful to generate extra incomes and to utilize the available resources more intelligently. In nut shell, the transition towards a circular economy in vetiver production can enhance the contribution of vetiver in the sustainable bioeconomy by making use of roots, residues and other biomass into useful and value-added products.