Policy Brief No. 3

July 2025

KENYA FORESTRY RESEARCH INSTITUTE

Commercialization, Economic Opportunities, and Value Chain Development of *Neltuma juliflora* (formerly *Prosopis juliflora*) Products in Kenya

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Executive Summary:

Neltuma juliflora (formerly *Prosopis juliflora*), an alien invader with rapid growth that occupies about 2 million hectares of Kenya's land surface area (KFS, 2023). Although initially planted to combat desertification, *N. julifora* has become a significant environmental and socio-economic concern due to its intensive invasion. However, its potential for commercialization provides an opportunity to transform it into an environmental management and economic growth asset.

This policy brief presents a business case for structured commercialization and value chain development of products such as charcoal, biochar, briquettes, timber, animal feed, honey, and medicinal products from *N. julifora*.

Recent studies have revealed that *N. julifora* plays a significant role in contributing to household incomes in arid and semi-arid regions. As an example, Prosopis charcoal can generate between Ksh 1.5 million per family per year, whilst Tana River County can generate between Ksh 60 million and Ksh 300 million per year from its sales (Elyas *et al.,* 2022). To make optimal use of these possibilities, this policy brief suggests paradigm shifts from eradication to management for use. This entails applying policy intervention to promote commercialization, catalyze investment, facilitate public-private partnerships, and encourage development of community-owned enterprises. These initiatives will generate green jobs, improve livelihoods in rural areas, and contribute to Kenya's green development agenda.

Background Information:

Neltuma juliflora was introduced to Kenya in the 1970s as part of afforestation efforts aimed at controlling desertification and for fuelwood production in arid and semi-arid regions. Although initially beneficial, *N. juliflora* has become invasive out-competing local vegetation, resulting in ecological and socio-economic challenges. These challenges include; loss of biodiversity, reduced pastureland for pastoralists, and land degradation, which threatens agricultural productivity and food security (Mwangi & Swallow, 2008). *Neltuma juliflora* invasion is prevalent in arid and semi-arid regions, with Turkana and Isiolo counties recording the highest invasion levels (5.1%), followed by Baringo, Kajiado, Kilifi, and Tana River at about 3.6% each. Other invaded counties include; Mombasa (3.3%), Garissa (2.2%), Mandera (1.6%), Wajir (1.6%), and Lamu (1.6%). (National Prosopis Strategy, 2021). In addition to its environmental impact, Prosopis has direct adverse effects on human and animal health. *N. juliflora* thorns cause injuries to both animals and people leading to infections.

Though *N. juliflora* is invasive, if well managed the species has economic potential in production and commercialization of various products including; high-value charcoal, alternative animal feed, beekeeping, and medicinal uses. Kenya can leverage these benefits through structured utilization schemes that create green jobs, support livelihoods, and contribute to the country's economic growth.

Purpose of the Policy Brief

This policy brief highlights the economic opportunities within the *Neltuma juliflora* value chain and advocate for a shift from eradication to sustainable utilization as a control strategy. It proposes key policy interventions to enhance commercialization and value addition of *N. juliflora* products, ensuring their economic viability. The policy brief also emphasizes importance of fostering public-private partnerships to support investment and development in the *N. juliflora* value chain, transforming the species from an ecological challenge into a valuable economic resource.

Analysis, Discussion, and Considerations

Neltuma juliflora presents a wide range of opportunities that can significantly contribute to economic development while reducing its invasive impact. Various sectors, including energy, construction, agriculture, and medicine, can benefit from the structured commercialization of Prosopis-based products. A successful Prosopis value chain will provide resources for industries, create employment opportunities, and mitigate environmental degradation. These following key-value chains demonstrate the diverse applications of Prosopis and potential of the species to transform livelihoods in the impacted regions

Various products from *Neltuma juliflora (formerly Prosopis juliflora)*

Value Chains of Prosopis Products

1. Firewood, Charcoal, Biochar, Charcoal Briquettes

- The calorific value of Prosopis wood is approximately 5,000 kcal/kg, one of the highest values among biomass fuels (FAO, 2023).
- Prosopis serves as a substitute for native forest tree species in producing high-quality charcoal, thereby reducing deforestation.
- The high-carbon content of Prosopis pyrolysis product biochar enhances soil health, and enables resilience to climate change.
- Prosopis residual in charcoal briquettes offers a cost-effective method for utilizing energy and promoting environmental friendliness as a replacement for ordinary charcoal.

2. Timber & Construction

- Prosopis wood is termite-resistant, hard, and can be used in construction of buildings, fencing, and furniture.
- According to the study, 50% of the Prosopis wood harvested in Kenya is for poles and homes, substituting the indigenous trees.

3. Animal Feed

- Prosopis pods contain 40-60% sugars, 10-15% protein, and 15-30% fiber, making them a suitable supplement to livestock feed (Sawal *et al.,* 2004).
- Processing Prosopis feed, such as milled pod flour, feed pellets, and silage, enhances the digestibility and utilization of nutrients by animals.
- Inclusion of up to 30% Prosopis pod flour in feed increases weight gain and milk production in cattle and goats.
- Prosopis leaf meal can serve as an additional protein source for ruminants, thereby supplementing livestock diets and livelihoods in dry regions.

4. Honey & Wax Production

- Prosopis flowers are rich in nectar, promoting beekeeping and honey production activities.
- Prosopis-based honey production in Garissa County totals 1,500-2,000 kg per month.

5. **Medicinal and Non-Timber Forest Products**
   - Leaves, bark, and gum of Prosopis have medicinal values that are utilized to treat wounds, infections, and gastrointestinal disorders (Rocha, 1990).

Policy Implications

1. **Utilization as a Control Strategy:**
   - Shift from eradication to economic exploitation of *Neltuma juliflora.*
   - Promote Prosopis as a feed source for livestock.
   - Leverage Prosopis utilization to create green jobs in sustainable industries such as biochar production, charcoal briquettes, and agroforestry e.g. apiculture.
2. **Legislation and Policy Development:**
   - Develop national and county policies to regulate Prosopis harvesting, processing, and trade.
   - Introduce tax incentives, subsidies, or financing options to encourage private investment in Prosopis value chains.
   - Establish legal frameworks to promote climate-smart employment in Prosopis-based industries, contributing to green growth and sustainable livelihoods.
   - Community-Driven Management Approaches
   - Support Charcoal Producer Associations (CPAs) and Community-Based Organizations (CBOs) in managing Prosopis resources.
   - Establish Community Participatory Management Teams (CPMTs) to oversee local Prosopis utilization.
   - Empower local communities to participate in value chain development, enhancing rural employment opportunities in sustainable Prosopis enterprises.
4. **Research, Training, and Development:**
   - Encourage research institutions to develop innovative processing techniques and protocals for various Prosopis products.
   - Provide technical and financial support for local Prosopis processing industries.
   - Develop capacity-building programs to train communities, youth, and women in sustainable Prosopis utilization and creation of green job.
5. **Framework for Equitable Benefit-Sharing Mechanisms:**
   - Ensure fair revenue distribution among local communities, government agencies, and private investors.
   - Establish clear guidelines for revenue-sharing and economic benefits from Prosopis exploitation.
   - Promote inclusive participation in Prosopis value chains, ensuring gender-responsive and youth-inclusive employment opportunities in emerging green industries.

Conclusion

Use-based management of *Neltuma juliflora* offers a win-win solution to its invasiveness and in the process will; create employment-providing of green jobs, improve livelihoods, and enhance contribution of Kenya's Forestry Sector to the country's GDP. With adoption of the planned Prosopis utilization program, Kenya will; mitigate environmental risks associated with the species, capitalize on its economic potential, and generate employment opportunities through provision of green jobs. In this way, *Neltuma juliflora* will be re-oriented from a green resource to an economic product where both people and the environment benefit.

Recommendations

- Focus on research, and policymaking to develop knowledge, foster innovation, and promote sustainable commercialization.
- Promote community management of *Neltuma juliflora* by providing training and capacity development programs to local associations.
- Develop sustainable wood and charcoal production based on efficient kiln technologies and sustainable forestry.
- Invest in developing marketing and processing industries, as well as organized markets, for *N. julifora* products.
- Strengthen partnership, monitoring, and evaluation systems to enable effective management of *N. julifora* resources.

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