

From Neglect to Necessity: The Untold Story of the World's Overlooked Legumes

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Walk into any grocery store and you'll find the usual suspects - chickpeas, soybeans, lentils and green peas lining the shelves. But tucked away in traditional farms and forest edges around the world grows an extraordinary group of legumes that most people have never heard of. These overlooked plants - winged beans, velvet beans, sword beans, lima beans and adzuki beans, among others - carry remarkable nutritional profiles, medicinal promise and ecological benefits. The question is: why have we been ignoring them for so long?

Underutilized Legumes



Winged bean
(*Psophocarpus tetragonolobus*)



Sword bean
(*Canavalia gladiata*)



Lima bean
(*Phaseolus lunatus*)



Vegetable soybean
(*Glycine max*)



Yard long bean
(*Vigna unguiculata* ssp. *sesquipedalis*)



Velvet bean
(*Mucuna pruriens*)



Adzuki bean
(*Vigna angularis*)



Scarlet runner bean
(*Phaseolus coccineus*)



Jack bean
(*Canavalia ensiformis*)



Rice bean
(*Vigna umbellata*)



African yam bean
(*Sphenostylis stenocarpa*)



Moth bean
(*Vigna aconitifolia*)



Tepary Bean
(*Phaseolus acutifolius*)



Potato bean
(*Apios americana*)



Lablab bean
(*Dolichos lablab*)



Underutilized legumes are nutrient-rich, climate-resilient crops that can ensure food and nutritional security for a sustainable future.

Why do they matter?

The importance of underutilized legumes is hard to overstate, especially as the world grapples with food insecurity, climate change and the collapse of agricultural biodiversity. They contribute to nutritional security by offering rich sources of plant-based protein, vitamins and minerals for communities that can't afford or access conventional legumes. Many are climate-resilient, thriving in poor soils and drought-prone regions where conventional crops fail. They fix atmospheric nitrogen naturally, reducing dependence on synthetic fertilizers and improving soil fertility. For smallholder farmers, they can open new income streams where traditional crops have limited markets.

What makes these legumes "Underutilized"?

Underutilized legumes occupy a paradoxical position in the global food landscape. Rich in nutritional, ecological and agronomic value, they nonetheless remain overlooked by mainstream agriculture and food systems. Their marginalization is not a reflection of inherent limitations but rather the product of structural barriers - the absence of organized commercial markets, inadequate access to improved seed systems, insufficient policy support, limited public awareness, unfamiliar culinary applications and prevailing industrial and economic constraints. Together, these factors confine crops of significant potential to local or subsistence use, perpetuating a cycle of neglect that is increasingly difficult to justify in the face of growing global food and climate challenges.

Meet the neglected stars

The Winged Bean - A One-Species Supermarket

Perhaps the most remarkable of the lot, the winged bean (*Psophocarpus tetragonolobus*) originates from Papua New Guinea and is aptly nicknamed the "one-species supermarket." Every single part of this plant is edible - the young pods, mature seeds, tender leaves, flowers and even its underground tubers. With a protein content of around 29 grams per 100 grams of seeds, it rivals soybean. Its flowers can be boiled to extract a natural food-safe colouring agent, its high-protein foliage serves as livestock fodder and its seed oil is comparable in quality to soybean oil. Rich in vitamin C (30% of daily value), iron, folates and calcium, the winged bean is a nutritional powerhouse hiding in plain sight.

Research on rats fed processed winged bean diets found improved levels of high-density lipoprotein (HDL, the "good" cholesterol) and enhanced antioxidant enzyme activity in the liver, kidney and colon - suggesting real cardiovascular and protective health benefits for human consumers too.

The Velvet Bean - Nature's Parkinson's Medicine?

Mucuna pruriens, the velvet bean, carries one of the most extraordinary stories in underutilized crop research. Originating in southern China and distributed across Africa and parts of India, this climbing legume has traditionally been used as forage, green manure and a snakebite antidote in tribal communities.

What makes it scientifically fascinating is its unusually high concentration of L-DOPA (3,4-dihydroxyphenylalanine) (levodopa), the same compound used to treat Parkinson's disease. Beyond neurological applications, it fixes nitrogen efficiently, enriches soil, reduces oxidative stress and in Indonesia, its seeds are fermented into a traditional food called Benguk tempe.

The Lima Bean - Nature's Clever Defender

Also called the butter bean or Madagascar bean (*Phaseolus lunatus*), the lima bean originated in Guatemala. What sets it apart ecologically is its sophisticated two pronged defense against herbivores. When attacked by pests, the jasmonic acid pathway is triggered, causing the plant to release herbivore-induced plant volatiles (HIPVs) that attract predatory mites natural enemies of the attacking insects. Simultaneously, it releases hydrogen cyanide (HCN), a direct chemical deterrent. Research in wild lima bean populations in Mexico confirmed that plants treated with jasmonic acid showed significantly fewer dead shoot tips, produced more inflorescences and bore more fruits than untreated control plants demonstrating that this defensive response actively benefits plant survival and yield.

The Sword Bean - Future Fuel?

Canavalia gladiata, the sword bean, has its origins in southern and central India and is known by names like "beng" or the scimitar bean. Beyond its anti-diabetic and anti-inflammatory properties and the presence of canavanine a compound with documented antimicrobial and anti-cancer activity the sword bean is emerging as a surprisingly viable biofuel source. Research from Nigeria demonstrated that seed oil extracted from sword bean, when subjected to transesterification using methanol and calcium oxide as catalyst, yielded biodiesel with fuel properties largely meeting international ASTM standards. At optimal

conditions, yields reached as high as 95.2%, with flash point, density, kinematic viscosity and acid value all falling within acceptable ranges. In a world hungry for renewable energy alternatives, the sword bean could become as important in the fuel tank as on the dinner plate.

The Adzuki Bean — The Climate-Resilient Nutritionist

The adzuki bean (*Vigna angularis*), originally from China and widely distributed across Asia, is perhaps the most well-known of the five featured here, though still far from mainstream status globally. Nutritionally, it is dense in folate (51% of daily value), copper, manganese and a full suite of essential amino acids including glutamic acid, aspartic acid and leucine. Its dietary fiber is composed entirely of complex carbohydrates that support healthy digestion, lower LDL cholesterol and act as a natural diuretic supporting kidney function.

Agronomically, the adzuki bean fixes nitrogen better than many conventional legumes, tolerates water stress and moderately saline conditions and thrives in poor soils - making it ideal for climate-smart agriculture. Its one weakness is sensitivity to cold temperatures. Scientists have addressed this by demonstrating that foliar application of abscisic acid (ABA) at the flowering stage significantly reduces oxidative damage under low-temperature stress, protecting yields. This opens promising pathways for expanding adzuki cultivation into cooler regions.

Underutilized legume	Bioactive compounds	Health benefits
Winged Bean	Isoflavones, saponins, polyphenols	Bone health, hormonal balance, antioxidant activity
Adzuki Bean	Saponins, flavonoids, anthocyanins, dietary fibre	Antidiabetic, hypolipidemic, anti-obesity, gut health
Lima Bean	Polyphenols, phytosterols, saponins, resistant starch	Cholesterol-lowering, anti-cancer, blood sugar regulation
Velvet Bean	L-Dopa, flavonoids, alkaloids, tannins	Neuroprotective, anti-Parkinson's, stress relief
Sword Bean	Canavanine, flavonoids, phenolics	Antimicrobial, anti-inflammatory, antioxidant

The Problem with "Underutilized"

If these plants are so extraordinary, why aren't they everywhere?

The reasons are systemic. There is limited awareness among farmers and consumers alike. Commercial demand is low, which discourages investment in improved varieties and processing infrastructure. Culinary unfamiliarity creates resistance, since most people simply don't know how to cook winged beans or velvet beans. Seed availability is patchy and policy frameworks rarely prioritize minor crops. And then there are antinutritional factors compounds like phytates, tannins, lectins, saponins and cyanogenic glycosides present in many of these legumes that can cause digestive discomfort or reduce nutrient absorption when consumed raw or improperly prepared. Simple processing methods such as soaking, boiling, fermenting, germinating, or autoclaving effectively eliminate these compounds, but the knowledge needs to reach farmers and cooks.

The Path Forward

Research institutions around the world are paying increasing attention to these crops. Globally, organizations like ICRISAT in Hyderabad, the World Vegetable Center in Taiwan, CIAT in Colombia and IITA in Nigeria are leading germplasm conservation and breeding efforts. In India, institutes like IIPR, NBPGR, IIVR, BSI and ICAR-IIHR are developing improved varieties suited to local conditions. Government programs including the National Food Security Mission, the National Mission on Agricultural Extension and Technology and the Mission for Integrated Development of Horticulture offer funding frameworks that could be leveraged to promote underutilized legumes.

Promising varieties are already in the pipeline. Winged bean varieties like IIHR Selection-21 and Kashi Annapurna mature early and yield well. Non-irritant velvet bean varieties like Arka Aswini and Arka Charaka have been developed for safer handling. Lima bean variety Swarna Poshan and sword bean variety SBS 1 are adapted to local Indian agroclimatic conditions.

Strategies for mainstreaming these crops must include building consumer awareness through extension programs, creating culinary innovation labs that develop familiar and appealing food products, strengthening seed systems, integrating these crops into climate-smart agriculture frameworks and investing in market development and value addition.

Conclusion

The story of underutilized legumes is ultimately a story about human choices - which crops to cultivate, which foods to eat, which plants to study. For too long, the choice has been to narrow our agricultural biodiversity to a handful of dominant crops, leaving behind an extraordinary wealth of plant resources. As the world faces deepening nutritional deficits, rising climate pressures and the urgent need for sustainable food systems, the wisdom of that choice deserves to be questioned.

The winged bean, the velvet bean, the lima bean, the sword bean, the adzuki bean and dozens more like them are not simply curiosities or heritage plants. They are answers to some of the most pressing agricultural and public health questions of our time. It is time to move them from the margins of our fields and diets to where they have always deserved to be at the centre.

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