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Cultivation of *Artemisia annua*

- Links to the Market -

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MIGRATION OF THE CROP

Country/Region	Period of Expansion	Method of Cultivation/Collection
CHINA	168 BC to 1980s	Leaf Collection from Wild Stands
VIETNAM	1970s	Small plantations
EUROPE, AMERICAS, AUSTRALASIA	1980s	Experimental plots Varietal improvement
EAST AFRICA	1994-2006	Smallholder and Commercial Cultivation
DRC, ETHIOPIA, MADAGASCAR, NIGERIA, SOUTH AFRICA, ZAMBIA, ETC.	2000 plus	Smallholder Backyard Cultivation

Wild Artemisia plants, Chongqing, China

Cultivated Artemisia hybrid, Arusha, Tanzania

CULTIVATION STRATEGIES

CULTIVATION ISSUES	END USE	
	HERBAL INFUSION	EXTRACTED ARTEMISININ
Location	Immaterial	Close to factory
Scale of Cultivation	Immaterial	Large scale
Varietal preference	Immaterial	High yield
Producers	Smallholders	Smallholders or commercial growers
Production system	Low cost, simple	High cost, complex
Quality control	Almost impossible	Essential
Efficacy	Unproven	Highly effective, assuming correctly used
Risks	Difficult to ensure full dose, high risk of recrudescence, high risk of drug resistance	Difficult to achieve sustained and affordable supply of ACTs
Conclusion	Not recommended without further research	Encourage expansion Subsidy needed to ensure affordability

Chinese herbalist with dried Artemisia leaves, Szechuan

Kenyan smallholder plot, intercropped Artemisia

Commercial Artemisia plantation, Thika, Kenya

CONDITIONS FOR ADOPTION

Altitude	**1,000-1,500 masl**
Climate	**Temperate, Sub-Tropical**
Rainfall	**Reliable for planting/transplanting 700-1,000mm**
Soil	**Good drainage, moderate fertility pH over 5.5**
Day Length	**Short daylength triggers flowering**
Land Availability	**Labour-intensive cultivation Needs little land**
Labour Availability	**High demand for transplanting, weeding, harvesting**
Profitability	**Competitive with returns from other cash crops**
Processing Facility	**Easy access, Sufficient capacity**

Artemisia intercropped with food crops, Szechuan, China

Artemisia intercropped with Ginkgo, Szechuan

Field of Artemisia and Ginkgo, Szechuan

Artemisia and Ginkgo farmers, Szechuan

SUPPLY OF ARTEMISIA SEED

Wild Stands	**China**	**0.01-0.3 % artemisinin**	
Seed Selection	**China, Vietnam**	**0.4-0.6 %**	
Hybridisation	**Mediplant Switzerland**	**F1 2.0-2.5 tph 1.0-1.5 %**	**F2 1.5-2.0 tph 0.8-1.2 %**
Micropropagation Vegetative propagation	**India, Brazil, Tasmania, China, US**	**Small scale only Not commercial**	
Risks in current seed supply	**Few Sources**	**Seed shortage Dependency Price**	

Wild Artemisia plant, An Yue, China

Artemisia cuttings for vegetative propagation, Arusha

Hybrid seedlings in commercial nursery, Arusha, Tanzania

Mother nursery for vegetative propagation, Chongqing

CULTIVATION PRACTICES

Germination Method	F1 Seed Pelleted, Plugs/Trays, Transplant	F2 Seed Broadcast, Raised beds, Transplant
Land Preparation	Weed free field, friable seedbed	
Planting Date	Start of rains, Dry period for harvesting	
Planting Density	10,000-30,000 plants per ha	
Nutritional Needs	Nitrogen and Phosphate required	
Water Requirements	Young plants very susceptible to water stress	
Weed Control	Young plants susceptible to weed competition	
Pest and Disease Control	Few pests – honeymoon period!	
Harvesting	Just before flowering	
Drying	Air dry in field	
Threshing	Stick or tractor	
Storage	Below 13% moisture content	

F2 seedling nursery, Tengeru, Tanzania

Artemisia showing premature flowering, Tengeru

Densely planted Artemisia, Mwandet, Tanzania

Harvested Artemisia crop, Thika, Kenya

Low density crop, affected by drought, Arusha

Field drying of Artemisia, Thika, Kenya

SUPPORT FOR LEAF PRODUCERS

Input Supply	**Seedlings** **Production inputs**
Extension and Training	**Grower's Manual** **GAP Guidelines**
Research and Monitoring	**Agronomic trials** **Monitoring and Evaluation**
Credit Provision	**Source - Company or Bank** **Individual or Group Lending**
Leaf Collection	**Collection Centre Management** **Payment Procedure**
Price Formula	**1st payment on delivery** **2nd payment on checking** **3rd payment after testing**
Grower's Contract	**Rights and Obligations of Grower** **Rights and Obligations of Buyer**

FUTURE NEEDS OF LEAF PRODUCERS

Seed Supply	**High Yielding Varieties, Location Specific, Competing Producers**
Agronomic Trials	**Research station trials, On farm trials**
GAP Guidelines	**Completion of Guidelines**
Extension and Training	**Farmer training, Grower manuals**
Finance	**Credit source for growers** **Pre-finance for buyers** **Subsidy for ACP distribution**
Market Access	**Competing buyers of leaf** **Supply linked to funded demand** **Market guarantees**
Co-ordinated Expansion	**Producer – Producer Links** **Producer – Processor Links** **Processor – ACT Provider Links**

Mature Artemisia crop, Happy Farmers, Thika, Kenya