A CHECKLIST OF CROPS AND LIVESTOCK FOR THE HAMAKUA REGION

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This is a checklist of some crops and livestock that may be suitable for the Hamakua region. This is not meant to be an exhaustive checklist and is only meant to serve as a general guideline for crop or livestock selection. Therefore, the reader is advised to contact the *UH Cooperative Extension Service* for further information on specific growing requirements for any crop or livestock listed. In some instances, more research information is needed regarding the adaptability of a specific crop to the Hamakua region. Also market outlook for agricultural products and commodities change frequently, and potential growers are advised to study the current market outlook for crops and livestock.

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VEGETABLES

CROP:	SOIL	RAIN-FALL	SOLAR RADI-ATION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Ginger	Deep, good soil	high	Better with maximum light.	Better at ~1000' and lower elevations.		Adapted for this region; sugar lands may have nematodes and bacterial wilt. Severe bacterial outbreak occurring. Lack of proper soil fumigants.	US export potential could be expanded. Currently China, Thailand, and Indonesia shipping very cheap ginger. Hawaii ginger still besr quality.
Taro (leaf, corm)	Good soil.	high	Better with maximum light.	Better at ~1000' and lower elevations.		Better with irrigation. Production on unirrigated areas, may be suitable . Phytophora leaf blight and root aphids may cause problems.	Export potential with Chinese taro; need to develop processing market.
Sweet Corn	Most soils suitable for mechanical planting	med.-high	Better with max. light.	Better at ~1000' and lower elevations.		Better with irrigation; leaf rusts and corn blight may cause problems.	Local market limited; potential for winter mainland market?
Watermelon & Zucchini	Most soils.	low	Maximum light	Watermelon:Less than 1000' Zucchini: Higher elevation.		Probably summer only, poor in winter; virus problems.	Local market limited.
Beans & Soybeans	Good soil.	med.	Better with max. light.	Better at ~1000' and lower elevations.		Soybean will not dry and mature in the field. Downy mildew will be a problem, only grown in summer so must be rotated with a suitable winter crop.	Local market limited
Peas (edible pod)	Good soil.	low-med.	Better with max. light.	Better at lower elevation.		Leaf blight may cause problems.	Local market limited.
Tomato	Most soils; better if free from bacterial wilt.	low.	Better with max. light.	Higher elevation.		Potential under shelter at higher elevations; new breeding lines or grafting for bacterial wilt possible. Whitefly is a major problem.	Local market limited.

VEGETABLES (continued)

CROP:	SOIL	RAIN-FALL	SOLAR RADIA-TION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Sweet pepper, eggplant	Most soils.	low	Better with max. light.	Better at lower elevations.		Peppers can be grown under shelter; new breeding lines or grafting for bacterial wilt is possible. Many areas on Hamakua Coast have bacterial wilt.	Local market limited.
Onion	Good soils.	low.	Better with maximum light.	Higher elevation.		Consider growing under shelter.	Local market limited. Some export potential
Cucumber	Most soils.	med	Better with maximum light.	Better at lower elevations.		Viral problems.	Local market limited.
Lettuce--Romaine	Good soil.			Greater than 1000'		Late fall, winter and early spring; may be appropriate under shelter.	Local market limited
Lettuce--Leafy varieties.	Good Soil.			All ranges		May be appropriate under shelter at higher elevations; consider varieties with seasons.	Local market limited.
Lettuce--Head	Good soil.			Greater than 1500'		Late fall, winter and early spring. Unsuitable under shelter (too warm).	Local market limited.
Mustard cabbage, choi sum, pak choy	Good soil.			All ranges			Local market limited.
Palm heart (*Bactris gasipes*)	Most soils	75+	Light to moderate shade in nursery, full sun later	<1000'?		(1) Produces suckers or can be sustainable. (2) Harvestable in about 18-24 months	Good potential for gourmet niche; fresh market; need to work on marketing for industry to expand

General Narrative Statement:

In general, many vegetables can be produced on sugar land with good, well drained soil (most rocky lands are unsuitable for vegetables.) However, high rainfall is not desirable for outdoor vegetable production; ginger and taro are exceptions.

Supplemental irrigation is necessary for most crops; ginger and possibly taro and sweet corn may be produced without supplemental irrigation in areas of high rainfall. Although many vegetables can be produced under the conditions described, a successful farm enterprise is highly dependent on the motivation and skill of the farmer as well as resources available to the farmer. Large volume buyers like the military commissary, cruise ship industry want to buy local products but producer must be able to supply quality products year-round.

Windbreaks may be required for crops sensitive to winds.

FRUITS & NUTS

CROP:	SOIL	RAIN-FALL	SOLAR RADIA-TION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Macadamia	Any soil with good drainage.	80 to 150" per year	Adequate	150'-2200'	Winter low above 59-65 F	Clonal requirements, requires windbreak, avoid areas with poor drainage/excessively wet soil.	World market price low because of foreign production.
Papaya	" "	" "	" "	Below 500'		(1) May need nematicide for soil conditions. (2) Ringspot virus established in most areas. (3) Powdery mildew and leaf curl mites may be problems with some varieties. (4) Irrigation required during dry seasons.	Market soft because of foreign imports to US.
Guava	" "	" "	" "	Below 1800'			Market soft.
Passion Fruit	" "	" "	" "	Below 750'		Trellising is necessary but very costly.	Limited market.
Kukui nut	" "	" "	" "	Wide range			Niche market, kukui nut oil selling retail for $175 gallon; marketing critical for expansion.
Banana	" "	" "	" "	Below 1000'	Above 60°F	Good windbreaks.	Limited market, competition keen.
Avocado	Must have excellent drainage.	" "	" "	Below 1500'		Because of high rainfall, need varieties with high oil content and Phythopthora resistance.	Very limited.
Citrus: -Tangerine -Navel orange -Tangelo		" "	" "	500'-1000'		(1) Low solar radiation could cause poor color development, and less than optimum sugar content.. (2) Irrigation required in dryer areas.	Very limited.
Dragon fruit (Pitaya)	Not particular	23-50"	Prefer some shade	Up to 2000'?	Max 100F	(1) Excess rain causes flower drop (2) Red an yellow fruit types (3) Fruits in 2 yrs, full production in 5th year	Good potential; propagation material difficult to obtain

General Narrative Statement:

Citrus -- Virus problem, poor quality.

Avocado -- Root rot. May have postharvest disease problems for export.

Papaya --Kapoho solo does not do well. Sunrise and Sunset and similar varieties are good; sweetness drops during winter months, especially at higher elevations.

Banana -- Nematode in cane land; black leaf streak. Needs wind breaks.

Coffee -- Environment affects quality; Honokaa coffee has tested very well.

Passion fruit -- High cost in trellising.

POTTED NURSERY PLANTS

Crop	Soil	Rain	Solar Radiation	Elev	Temp*	Required Conditions	Market Situation
Potted Palms & Dracaenas for export	Container mixes	NA	2-4000 fc	to1000'	65-85	BN Certification for export. Shadehouse structure, certified benches, irrigation, soilless media.	Primarily US market. Q37 & Free Trade Regs may impact.
Landscape Plants	Soil with good drainage Container mixes	>75" spread year round	Full Sun	To 1000'	65-85	Irrigation "Ground cover" or other weed control.	Local sales, other islands. Affected by developments, state & county capital improvement activity.
Stock Plants: Dracaena	Soil with good drainage	>75" spread year round	Full Sun	To 1000'	65-85	Vehicular access	Sales primarily to local nurseries
Flowering, Miscellaneous plants	Container mixes	NA	Variable	Variable	Variable	Structure, irrigation, benches	Primarily local sales
Orchids: Potted Dendrobium	Orchid mixes	NA	7000 fc	to 1000'	65-85	Orchid certification for export. Structure, irrigation, benches	There may be continued export potential
Orchids: Potted Phalaenopsis	Orchid mixes	NA	3-4000 fc	To 1000'	65-85	Orchid certification for export. Structure, irrigation, benches	There may be continued export potential
Orchids: Oncidium	Orchid mixes	NA	3-4000 fc	To 1000'	65-85	Orchid certification for export. Structure, irrigation benches	There may be continued export potential

*average annual minimum to average annual maximum.

CUT AND LEI FLOWERS

CROP:	SOIL	RAIN-FALL	SOLAR RADIA-TION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Anthuriums	Black Cinders, organic mixes	*150+	2000 foot candles	500-2000	55-85°F	Shadehouse needed and windbreak.	Good due to low supply locally.
Dendrobiums	Gravel, cinder, artificial mixes	50 to 80"*	5000 to 8000 foot candles	Sea level to 1000'	60 to 90°F	Shadehouse needed.	Good
Cymbidium	Cinder, Artificial mixes	+150"*	2500 to 7000 foot candles	1500' to 3000'	50 to 80°F	Structure needed.	Saturated
Vandas	Hapu'u, gravel	50 to 80"*	5000 to 8000 foot candles	500'	60-90°F	Windbreak needed.	Possible room for expansion.
Protea	Soil with good drainage.	50 to 80"*	5000 to 8000 foot candles	1000' to 3000'	50-80°F	Windbreak needed. Low rainfall, not excessive.	Possible room for expansion.
Roses	Soil with good drainage.	50 to 80"**	2500 to 7000 foot candles	2000'	50-90°F	Greenhouse structure needed.	Saturated, only local market is feasible.
Chrysan-themums	Soil with good drainage.	50 to 80"**	5000 to 8000 foot candles	1500'	60-90°F	Structure needed.	Saturated.
Red Ginger Heliconia Bird of Paradise Pink Ginger	Soil with good drainage. (Tropicals could be grown on marginal soils.	150"*	5000 to 8000 foot candles	500' to 1500'	60-90°F	Windbreak needed. Shade needed for pink ginger.	Unstable,
Tuberose	Soil with good drainage.	50 to 100" **	5000 to 8000 foot candles	2000'	60-90°F	Windbreak needed	Saturated in the summer -- not in the winter.
Plumeria	Marginal soil with good drainage.	50 to 80"*	5000 to 8000 foot candles	500'	60-90°F	Low wind areas desirable.	
White ginger	Most soils OK	75+	high	<2000'	60-90 F	Best with windbreak	For year round production, will need supplementary lights

General Narrative Statement:

-Flower crops are high labor and high maintenance crops. Flower crops requiring shade are high input crops in terms of initial investment required as opposed to field type crops.

-Flowers generally are high return per unit in terms of production and income.

-Most cut flower crops can be grown and harvested from for 5 to 8 years before needing to replant.

-Lei flowers: opportunity for individuals to supply lei shops, florists, visitor industries, etc. with year round supply of flowers or leis.

* Irrigation desirable

** Irrigation required

CUT FOLIAGE

CROP:	SOIL	RAIN-FALL	SOLAR RADIA-TION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Ferns--Leather leaf	Good drainge	*150+	~4000 foot candles		60-90°F	Grown under shade cloth.	Possible room for minor expansion. Generally, need to be supplemented with other crops.
Green Ti	Soil and good drainage	*150+	8000 to 10,000 foot candles	Sea level to 1000'	60-90°F	Sensitive to wind.	Possible room for minor expansion. Generally, need to be supplemented with other crops.
Maile	Cinder--Good drainage	*150+	~4000 foot candles	Elevation, 500' to 2000'	50-80°F	Grown under shade cloth or other shaded areas.	Possible room for minor expansion. Generally, need to be supplemented with other crops.
Other Cut Foliage: Eucalyptus Podocarpus Banksia Sentimental Aparagus				All will take high elevation for best quality.			Possible room for minor expansion. Generally, need to be supplemented with other crops.

TIMBER TREES

Crop	Soil	Rain	Solar Radiation	Elev	Temp*	Required Conditions	Growth Rate	Market Situation
Acacia koa, koa	Clay, lava rock, well drained, N-fixer	40 – 150		2000 - 7000	Cool		Slow	Excellent
Calophyllum inophyllum, kamani	Sand, clay, or lava rock	40+		<500	warm	Coastal areas	Slow	Excellent
Cedrela odorata, Spanish cedar	Deep well-drained			<2000			Medium	Good
Cordia subcordata, kou	Sand or clay			<500	warm	Coastal areas	Slow	Excellent
Elaeocarpus angustifolia, blue marble	Clay						Medium	Fair
Eucalyptus deglupta, rainbow gum	Clay, lava rock, well-drained	80+		<2000	warm		Fast	Good
Eucalyptus microcorys, tallowwood	Clay, lava rock, well-drained	50-150		<3000			Fast	Good
Flindersia brayleyana, Queensland maple	Clay, lava rock, well-drained	60+		<6000	Warm to cool		Slow	Fair
Khaya senegalensis, dry zone mahogany	Clay	40+		<2000		Drought tolerant	S`low	Excellent
Pterocarpus indicus, narra	Clay, N fixer	60+		<2000			Medium	Excellent
Samanea saman, Monkeypod	Clay, N fixer	50+		<1500			Medium	Fair
Senna siamea, pheasantwood	Clay, well-drained	40+		<2000		Drought tolerant, not wind tolerant	Medium	Excellent
Swietenia macrophylla, Honduran mahogany	Clay, Deep, well-drained	70+		<1500	warm	Wind tolerant	Medium	Good
Swietenia mahogani, West Indian mahogany	Clay, Deep, well-drained	40+		<1500	warm	Wind tolerant	Slow	Good
Tectona grandis, teak	Clay, sand, well-drained	50+		<1500	Warm		Medium	Excellent
Thespesia populnea, milo	Clay, sand, or lava rock	40+		<600	warm	Coastal areas, wind tolerant	Medium	Excellent
Toona ciliata, toon, Australian redcedar	Deep, well-drained	60+		<6000	Warm to cool	Does not tolerate lava rock soils	Medium	Good
Tristania conferta, brushbox	Clay, lava rock, well-drained			<6000	Warm to cool		Medium	fair

MISCELLANEOUS

CROP:	SOIL	RAIN-FALL	SOLAR RADIA-TION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Coffee	Any soil with good drainage.	80 to 150" per year	Adequate	150'-2200'		(1)Rains during flowering may cause extended fruiting season. (2)Irrigtion required since fruit development occurs during dry summer months.	Excellent quality reported from Honokaa area.
Tea	Well drained acidic soil	72-100"	Sunny	Best quality at higher elevations 2500-4000		(1) USDA & UH has identified four selections in plantings in Waimea, propagating now but slow. (2) Planting material limited. (3) Much research needs to be done on propagation, cultural and processing. (4) Does not like windy conditions (5) Lower elevations may have more pest problems and lower quality.	Must be developed as a high-end gourmet, organic, or "sustainable farming" product; niche market. There are several destructive pests in other tea producing areas not currently in Hawaii; must keep out. There are two "steering" groups to facilitate development of industry.
Noni	Any soil with good drainage		High	Sea level to 1800'		Not recommended for large commercial production for most areas along Hamakua coast because of nematodes, weeds, and wind.	Good now, long term unknown; needs marketing program.
Vanilla	Best to grow in containers		Med	<1800?		(1) Can be grown on trees but not recommended; best to grow in light shade or greenhouse. (2) Must be hand pollinated; labor intensive	Must be grown for niche, gourmet market.
Cacao	Well drained	40-100"	25-50% shade for young trees; full sun at maturity	<1500"?	70-90 F	(1) Dependent on building of local factory (2) Labor intensive	Prices dependent on world production; must rely on gourmet, niche market. Vietnam has planted large acreage, Brazil has witches broom tolerant varieties now.

HAMAKUA PASTURE GRASSES

CROP:	SOIL	RAINFALL	SOLAR RADIATION	ELEVATION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Pasture: Star grass California grass Kikuyu grass Pangola Guinea Legumes: Greenleaf Desmodium Glycine Stylos Ekoa		120" to 200"	Low to Moderate	500' to 600'	60°F to 80°F	High level of management.	Fair for raising beef.
Pasture: Signal Star grass California grass Kikuyu grass Pangola Guinea Legumes: Greenleaf Desmodium Glycine Stylos Ekoa	Pasture, legumes and some other crops may be affected by residual herbicides remaining in the soil over those areas that have received large applications of herbicides over a long period of time.	100" to 200"	Low to Moderate	200' to 900'	60°F to 80°F	High level of management.	Fair for raising beef.
Pasture: Star grass Kikuyu grass Pangola Limpo Signal Legumes: Greenleaf Desmodium Glycine White clover Trefolis		150" to 250"	Low to Moderate	900' to 1600	55°F to 75°F	High level of management.	Fair for raising beef.

HAMAKUA PASTURE SUMMARY

Commodity	Comments
Grasses	All grasses listed are in the C4 category. (Tropical) Other grasses that can be considered are Green Panic, Joy Grass, Dwarf Napier and Pearl Millet. All grasses do very well if rainfall is adequate.
Dairy	The Dairy Industry is interested in moving to the Big Island because of potential lands available for pasture usage. The areas listed maybe a little too wet for dairying but can be utilitized for dairy heifer grow out programs or pasturing of far off dry cows. The logistics of shipping milk to Oahu seems to be profitable.
Cattle Feed	The making of silage or greenchop as cattle feed. Because of excessive rainfall in the area designated the making of hay will be difficult. Feeding of fresh forage product or making of a silage would be worth looking into. As a rule of thumb pastures of 1500' elevation and above are usually for continuously year-round grazing. Pastures under this elevation are considered seasonal. The harvesting time of the product will be critical. Silage operations are more economical on large acreage and cost of equipment, distance to market, maintenance and operations are high.
Sheep	Interest in hair sheep increasing.
Cow-calf operations	Beef cattle will be okay for this area. With more intensive pasture management practices, animal density can be increased with more interest I locally produced grass fed beef, a stocker industry will have to be developed.
Swine	Market is available, industry is more than 100,000 pounds of pork short.
Goats	Lot more interest in the smaller ruminant. Goats are bringing huge returns on the local market for meat and cheese.

AQUACULTURE FINFISH, SHELLFISH AND PLANTS

CROP:	SOIL	RAINFALL	SOLAR RADI-ATION	ELEVA-TION	TEMP. RANGE	OTHER REQUIRED CONDITIONS	CURRENT MARKET SITUATION
Tilapia, Rainbow Trout, Channel Catfish, Malaysian Prawns, Ornamental Fish, and Aquarium Plants	Clay loam soils for excavated pond construction, or just plain flat topography for onland tank construction.	Any amount provided stream, spring, county, or a similar source of water.	Ambient is fine.	Sea level to the tree line.	50 to 90°F	Shade houses in rainy areas	Good local and interisland potential, if price is right, and shipping costs low.