

TECHNICAL NOTE

USDA NATURAL RESOURCES CONSERVATION SERVICE PACIFIC ISLANDS AREA

Forestry/Agroforestry Technical Note No. 11

MIXED AGROFOREST SPECIFICATION

Mixed Agroforests are forests that contain a collection of plants representing high diversity in species, canopy structure and arrangement with the following intent relating to NRCS planning & assistance:

- Mixed Agroforests must address identified Resource Concerns, and solve resource problems. Their principal purpose is to provide common forest ecosystem services or objectives such as increasing the planting of native species, controlling noxious and invasive plant species, long-term erosion control, improving water quality, and increasing carbon sequestration.
- Mixed Agroforests are not commercial production systems and require much lower levels of management and inputs than cropland systems, including commercial orchards. Any non-timber forest products obtained from Mixed Agroforests represent secondary benefits for subsistence needs of NRCS Cooperators.

The following specifications apply to establishing or enhancing Mixed Agroforests in PIA under the Standards Tree/Shrub Establishment (612) or Multi Story Cropping (379):

1. Mixed Agroforests shall be established and managed on fields designated as Forestland. Conversion of Cropland, Pastureland, or weedy lands to Mixed Agroforests is eligible. However, existing forests containing at least a 20% stem count of native trees, shrubs or vines shall not be converted to Mixed Agroforests. Existing forests that have less than a 20% stem count of native trees, shrubs or vines may be converted to Mixed Agroforests, but all native plants must be retained as part of the final system during site preparation work.
2. The maximum Program-eligible area for planting Mixed Agroforests is four (4) acres. This value shall be reduced by the quantity of pre-existing Mixed Agroforest acreage on the entire farm.
3. Mixed Agroforests are small-scale tree and shrub plantings with high diversity in: The number of genera; the planting arrangement of different genera, and; canopy structure (height) at maturity, and may include tree, shrub and vine quantities (i.e. stem counts) comprised of:
 - a. Up to but not exceeding 50% that produce non-timber forest products - any amount of timber-producing trees are allowed.
 - b. A minimum of 20% as native species (may be timber producing), including pre-existing stems.
 - c. Six genera or more depending on field size (Table 1), with equal quantities of tree (tall stature i.e. average height greater than 12' at maturity) genera and shrub/vine (short stature i.e. average height of 12 feet or less at maturity) genera to encourage species and structural diversity.
4. Individual plant genera that produce non-timber forest products may be planted in pure or contiguous clumps not to exceed five trees or 20 shrubs/vines. Different clumps of the same genera shall be separated by the maximum space feasible given overall species selection and Mixed Agroforest acreage.

Mixed Agroforest Specification

5. Tree, shrub and vine species selected for Mixed Agroforests must have lifespans of at least 15 years. After allowing for mortality specified in the applicable Jobsheet Operations and Maintenance section, individual trees, shrubs and vines will remain alive 15 years after planting - regular or periodic harvesting of non-timber forest products will not destroy these plants during the 15-year period.
6. The maximum Program-eligible quantities of any one genera will not exceed the amounts provided in Table 2. These values shall be reduced by the quantity of pre-existing plants of the same genus already on the entire farm.
7. Plantings of non-native trees and shrubs/vines that produce non-timber forest products and that exceed the criteria for Mixed Agroforests detailed in this document are considered cropland systems in PIA, and shall not be Program-eligible.

Table 1. Guidelines for minimum species and structural diversity.

Mixed agroforest size (ac)	Minimum number of tall-stature genera	Minimum number of short-stature genera
0.25	3	3
0.50	3	3
0.75	3	3
1.00	3	3
1.25	3	3
1.50	3	3
1.75	3 or 4	4 or 3
2.00	4	4
2.25	4 or 5	5 or 4
2.50	5	5
2.75	5 or 6	6 or 5
3.00	6	6
3.25	6 or 7	7 or 6
3.50	7	7
3.75	7 or 8	8 or 7
4.00	8	8

Mixed Agroforest Specification

Table 2. Maximum quantities of common non-native Mixed Agroforest species that produce non-timber forest products in PIA. Additional species may be approved by the PIA State Forester.

Scientific name(s)	Common name(s)	Stature	Minimum planting spacing	Maximum quantity of trees, shrubs or vines	Maximum area (acre equivalent)
<i>Anacardium occidentale</i>	cashew	Tall	30	12	0.25
<i>Annona cherimoya</i> , <i>A. muricata</i> , <i>A. squamosa</i>	cherimoya, soursop, sugar apple	Tall	15	48	0.25
<i>Artocarpus altilus</i> , <i>A. mariannensis</i> , <i>A. hererophylla</i>	breadfruit, jackfruit	Tall	30	12	0.25
<i>Averrhoa carambola</i>	starfruit	Short	15	48	0.25
<i>Azadiracta indica</i>	Neem	Tall	20	27	0.25
<i>Bactris gasipaes</i>	peach palm	Tall	12	76	0.25
<i>Bambusa spp.</i>	clumping bamboo	Tall	15	48	0.25
<i>Brousonettia payprifera</i> (assume coppice mgt.)	paper mulberry	Short	5	125	0.10
<i>Canaga odorata</i>	ylang-ylang	Tall	20	27	0.25
<i>Citrus spp.</i>	citrus	Short	15	48	0.25
<i>Cocus nucifera</i>	coconut	Tall	25	17	0.25
<i>Coffea Arabica</i>	coffee	Short	7.5	125	0.15
<i>Dimocarpus longan</i>	longan	Tall	30	12	0.25
<i>Durio zibethinus</i>	durian	Tall	25	17	0.25
<i>Ficus carica</i>	fig	Tall	20	27	0.25
<i>Garcinia mangostana</i>	mangosteen	Tall	25	17	0.25
<i>Litchee chinensis</i>	lychee	Tall	30	12	0.25
<i>Macadamia integrifolia</i>	macadamia nut	Tall	30	12	0.25
<i>Mangifera indica</i>	Mango	Tall	30	12	0.25
<i>Metroxylon sagu</i>	sago palm	Tall	25	17	0.25
<i>Moringa olifera</i>	malunggai, kalamunggai	Short	7.5	125	0.15
<i>Morinda citrifolia</i>	noni	Tall	20	27	0.25
<i>Musa spp.</i>	banana, plantain	Short	7.5	125	0.15
<i>Myrciaria cauliflora</i>	jaboticaba	Tall	20	27	0.25
<i>Nephelium lappaceum</i>	rambutan	Tall	30	12	0.25
<i>Nephelium ramboutan-ake</i>	pulasan	Tall	30	12	0.25
<i>Piper nigrum</i>	black pepper	Short	5	125	0.10
<i>Pachira aquatica</i>	Malabar chestnut	Tall	25	17	0.25
<i>Persea americana</i>	avocado	Tall	25	17	0.25
<i>Punica granatum</i>	pomegranate	Tall	15	48	0.25
<i>Syzigium malaccense</i>	mountain apple	Tall	20	27	0.25
<i>Tamarindus indica</i>	tamarind	Tall	25	17	0.25
<i>Theobroma cacao</i>	cacao	Short	10	109	0.25