Supplementary materials

Table S1. List of the tree, shrub, and grass species in the plots of *A. mangium* monoculture and its mixed-species plantation.

Year	*A. mangium* monoculture		Mixed-species plantation of *A. mangium* with native trees	
	Tree species	Shrub and herb species	Tree species	Shrub and herb species
1995	*Acacia mangium*, *Litsea cubeba*, *Mallotus apelta*, *Melicope pteleifolia*, *Pinus massoniana*, *Tetradium glabrifolium*, *Toxicodendron succedaneum*	*Clerodendrum fortunatum*, *Eurya chinensis*, *Dioscorea bulbifera*, *Ilex asprella*, *Ilex triflora*,		
1997	*Acacia mangium*, *Litsea cubeba*, *Melicope pteleifolia*, *Pinus massoniana*, *Tetradium glabrifolium*, *Toxicodendron succedaneum*	*Eurya chinensis*, *Gardenia jasminoides, Ilex asprella*		
1998		*Clerodendrum fortunatum, Eurya chinensis, Ilex asprella*	*Acacia mangium*, *Podocarpus nagi*, *Michelia macclurei*, *Michelia chapensis*, *Michelia maudiae*, *Cyptocarya chinensis*, *Cryptocarya concinna*, *Machilus chinensis*, *Lindera chunii*, *Cinnamomum burmannii*, *Cinnamomum camphora*, *Lindera communis*, *Machilus salicina*, *Dillenia turbinata Aquilaria cochinchinensis*, *Helicia reticulata*, *Canarium album*, *Canarium pimela*, *Syzygium levinei*, *Syzygium rehderianum*, *Acmena acuminatissima*, *Syzygium cumini*, *Schima superba*, *Polyspora axillaris*, *Schima wallichii*, *Photinia prunifolia*, *Carallia brachiata*, *Garcinia oblongifolia*, *Elaeocarpus apiculatus*, *Pterospermum heterophyllum*, *Sterculia lanceolata*, *Aporosa dioica*, *Sapium discolor*, *Microdesmis cascariaefolia*, *Aporosa yunnanensis*, *Bischofia javanica*, *Cleidiocarpon cavalerei*, *Abarema lucida*, *Ormosia glaberrima*, *Ormosia pinnata*, *Dalbergia odorifera*, *Pterocarpus indicus* , *Dalbergia hainanensis*, *Castanopsis chinensis*, *Castanopsis hystrix*, *Gironniera subaequalis*, *Artocarpus styracifolius*, *Artocarpus lingnanensis*, *Acronychia pedunculata*, *Swietenia mahagoni*, *Chukrasia tabularis*, *Duperreanum pierre*, *Mangifera persiciformis*, *Engelhardtia roxburghiana*, *Schefflera octophylla*, *Heteropanax fragrans*, *Caryota ochlandra*	

2000	*Acacia mangium*，*Melicope pteleifolia*，*Trema orientalis*			
2003	*Acacia mangium*，*Litsea cubeba*，*Melicope pteleifolia*，*Tetradium glabrifolium*，*Toxicodendron succedaneum*			
2007	*Acacia mangium*，*Cinnamomum burmannii*，*Litsea cubeba*，*Litsea glutinosa*，*Litsea rotundifolia*，*Melia azedarach*，*Melicope pteleifolia*，*Psychotria asiatica*，*Rhaphiolepis indica*，*Syzygium hancei*，*Tetradium glabrifolium*，*Toxicodendron succedaneum*	*Wikstroemia indica, Desmos chinensis, Ilex asprella*		
2010	*Acacia mangium*，*Castanopsis hystrix*，*Cinnamomum burmannii*，*Lindera communis*，*Litsea cubeba*，*Litsea glutinosa*，*Melicope pteleifolia*，*Pinus massoniana*，*Psychotria asiatica*，*Tetradium glabrifolium*，*Toxicodendron succedaneum*			
2011	*Acacia mangium*, *Cinnamomum burmannii*, *Lindera communis*, *Litsea cubeba*, *Litsea glutinosa*, *Tetradium glabrifolium*	*Ficus variolos, Camellia sinensis var. assamica, Catharanthus roseus, Clerodendrum fortunatum, Breynia fruticose, Gardenia jasminoides,* Wikstroemia indica, *Ilex asprella, Eurya chinensis*, *Rhodomyrtus tomentosa, Ficus hirta, Glochidion puberum, Ficus pandurate, Melastoma candidum*, *Toxicodendron succedaneum, Cinnamomum burmannii, Psychotria rubra, Lindera communis, Litsea cubeba, Evodia lepta*	*Acacia mangium*， *Cinnamomum camphora*， *Aporosa dioica*，*Cinnamomum burmannii*， *Schima wallichii*，*Vatica mangachapoi*，*Mytilaria laosensis*， *Dallbergia odorifera*， *Elaeocarpus apiculatus*，*Michelia macclurei*，*Magnolia blumei*， *Cryptocarya concinna*，*Castanopsis hystrix*，*Pterospermum heterophyllum*，*Polyspora axillaris*， *Carallia brachiata*， *Tsoongiodendron odorum*， *Ormosia pinnata*， *Acronychia pedunculata*， *Castanopsis chinensis*，*Syzygium hancei*， *Photinia prunifolia*，*Castanopsis chinensis*， *Phoebe chinensis*， *Garcinia oblongifolia*， *Chukrasia tabularis*， *Artocarpus lingnanensis*，*Erychrophloeum fordii*， *Rhodoleia parvipetala*，*Bischofia javanica*，*Acacia auriculiformis*，*Litsea cubeba*，*Melicope pteleifolia*，*Cratoxylum cochinchinense*，*Litsea glutinosa*， *Litsea rotundifolia*， *Prunus salicina*，*Bridelia tomentosa* ， *Dimocarpus longan*	*Clerodendrum fortunatum, Gardenia jasminoides, Ilex asprella, Eurya chinensis, Catharanthus roseus, Melastoma candidum, Breynia fruticose, Mallotus apelta*， *Ficus variolosa*， *ordonia axillaris*，*Canarium album*， *Trema cannabina*，*Syzygium hancei*， *Cratoxylum cochinchinense*， *Michelia macclurei, Litsea glutinosa*, *Psychotria rubra*, *Litsea cubeba*, *Evodia lepta*, *Dalbergia odorifera*, *Glochidion puberum, Schefflera actinophylla, Toxicodendron succedaneum, Cinnamomum burmannii, Cinnamomum camphora, Machilus chekiangensis, Castanopsis chinensis, Carallia brachiata*

2012	*Acacia mangium*，*Cinnamomum burmannii*，*Cryptocarya chinensis*，*Lindera communis*，*Litsea cubeba*，*Litsea glutinosa*，*Litsea rotundifolia*，*Melicope pteleifolia*，*Pinus massoniana*，*Psychotria asiatica*，*Rhaphiolepis indica*，*Tetradium glabrifolium*，*Toxicodendron succedaneum*	*Wikstroemia indica, Desmos chinensis, Eurya chinensis, Ilex asprella, Laurocerasus phaeosticta, Rhodomyrtus tomentosa*		
2015	*Acacia mangium*，*Cinnamomum burmannii*，*Lindera communis*，*Litsea cubeba*，*Litsea glutinosa*，*Litsea rotundifolia*，*Melicope pteleifolia*，*Pinus massoniana*，*Psychotria asiatica*，*Tetradium glabrifolium*，*Toxicodendron succedaneum*	*Viburnum dilatatum*, *Eurya chinensis, Ilex asprella, Laurocerasus phaeosticta, Rhodomyrtus tomentosa*		
2017	*Acacia mangium*，*Cinnamomum burmannii*，*Litsea cubeba*，*Litsea glutinosa*，*Litsea rotundifolia*，*Melicope pteleifolia*，*Psychotria asiatica*，	*Wikstroemia indica, Clerodendrum fortunatum, Eurya chinensis, Gardenia jasminoides, Ilex asprella, Rhodomyrtus tomentosa, Gordonia axillaris, Catharanthus roseus, Ficus pandurate*，*Evodia lepta, Litsea cubeba, Schefflera actinophylla, Psychotria rubra*）	*Acacia mangium*， *Cinnamomum camphora*， *Aporosa dioica*，*Cinnamomum burmannii*， *Schima wallichii*，*Vatica mangachapoi*，*Mytilaria laosensis*， *Dallbergia odorifera*， *Elaeocarpus apiculatus*，*Michelia macclurei*，*Magnolia blumei*， *Cryptocarya concinna*，*Castanopsis hystrix*，*Pterospermum heterophyllum*，*Polyspora axillaris*， *Carallia brachiata*， *Tsoongiodendron odorum*， *Ormosia pinnata*， *Acronychia pedunculata*， *Castanopsis chinensis*，*Syzygium hancei*， *Photinia prunifolia*，*Canarium album*， *Machilus chrysotricha*， *Helicia formosana*，*Tricalysia dubia*， *Syzygium levinei*， *Schefflera heptaphylla*，*Acacia auriculiformis*，*Litsea cubeba*，*Melicope pteleifolia*，*Cratoxylum cochinchinense*，*Litsea glutinosa*，*Pinus massoniana*，*Psychotria asiatica*，*Toxicodendron succedaneum*， *Hopea hainanensis*	*Clerodendrum fortunatum, Gardenia jasminoides, Ilex asprella, Catharanthus roseus, Melastoma candidum, Litsea glutinosa, Potentilla griffithii, Cinnamomum burmannii, Machilus chinensis, Dalbergia odorifera, Schefflera actinophylla, Evodia lepta, Tsoongiodendron odorum, Psychotria rubra, Litsea cubeba, Carallia brachiate, Diplospora dubia*

Note: the species name with underline represents the naturally regenerated species.

Table S2. The sampling time, sampling plot, measured variable, and their objectives in this study.

Sampling time	Sampling plot	Measured variable	Objective
1995, 1997, 2000, 2003, 2007, 2012, 2015	The permanent plot of *A. mangium* monoculture.	The inventory, species name, tree diameter at breast height (1.3 m, DBH), and tree height of all woody species individuals with DBH > 1 cm.	The objective is to study the dynamics of tree community composition and the vegetation biomass in the *A. mangium* monoculture during 31 years of planting.
1986, 1990, 1994, 2002, 2005, 2010, 2015	The permanent plot of *A. mangium* monoculture.	The concentration of soil organic carbon, total nitrogen, and available phosphorus and the ratio of soil organic carbon to total nitrogen, soil organic carbon to total phosphorus, and soil total nitrogen to total phosphorus.	The objective is to study the dynamics of soil nutrient properties in the *A. mangium* monoculture during 31 years of planting.
2005, 2010, 2015	The permanent plot of *A. mangium* monoculture.	The foliar total nitrogen and total phosphorus concentrations of *A. mangium*, *R. tomentosa*, and *D. dichotoma*.	The objective is to study the dynamics of trees, shrubs, and herbs foliar nutrients in the *A. mangium* monoculture at 21th, 26th, and 31st years of planting.
2011, 2017	Three plots of *A. mangium* monoculture and three plots of mixed-species plantation of *A. mangium* with native species	The concentrations of soil organic carbon, dissolved organic carbon, total nitrogen, ammonium nitrogen, nitrate nitrogen, and total phosphorus, soil pH, and soil microbial phospholipid fatty acids.	The objective is to study the differences in soil microbial community structure and soil physiochemical properties between the *A. mangium* monoculture and its mixed-species plantation.
		The stand density, biomass, species richness, mean DBH, mean height, and shrub and herbaceous species richness.	The objective is to study the differences in tree community composition and the vegetation biomass between the *A. mangium* monoculture and its mixed-species plantation.

Table S3. Allometric equations for different species.

Species	Leaf biomass (kg)	Branch biomass(kg)	Stem biomass(kg)	Root biomass(kg)
Acacia mangium	$0.0297*(D^2H)^{0.5732}$	$0.0118*(D^2H)^{0.8272}$	$0.1751*(D^2H)^{0.7466}$	$0.0093*(D^2H)^{0.9400}$
Evodia lepta	$0.0182*(D^2H)^{0.7021}$	$0.0182*(D^2H)^{0.6782}$	$0.0129*(D^2H)^{1.1691}$	$0.0142*(D^2H)^{0.8302}$
Litsea cubela	$0.0167*(D^2H)^{0.7010}$	$0.0101*(D^2H)^{1.0363}$	$0.0423*(D^2H)^{0.8949}$	$0.0189*(D^2H)^{0.8592}$
Cinnamomum burmannii	$0.0434*D^2H - 0.0852$	$0.0369*D^2H + 0.2216$	$0.0443*D^2H + 0.1503$	$0.0274*D^2H + 0.3191$
Litsea glutinosa	$0.0116*D^2H^{0.6233}$	$0.0213*D^2H^{0.7476}$	$0.0738*D^2H^{0.7657}$	$0.0582*D^2H^{0.6354}$
Lindera communis	$0.0394*D^2H^{0.4963}$	$0.0264*D^2H^{0.5805}$	$0.0127*D^2H^{1.0843}$	$0.0561*D^2H^{0.5810}$
		Aboveground		Belowground
Castanopsis chinensis		$0.2926*D^2H^{0.7162}$		$0.1017*D^2H^{0.5941}$
Castanopsis hystrix		$0.2926*D^2H^{0.7162}$		$0.1017*D^2H^{0.5941}$
Ormosia pinnata		$0.4171*D^2H^{0.6201}$		$0.1723*D^2H^{0.5630}$
Magnolia blumei		$0.6355*D^2H^{0.4751}$		$0.0635*D^2H^{0.6628}$
Michelia macclurei		$1.1447*D^2H^{0.5820}$		$0.3663*D^2H^{0.5081}$
Elaeocarpus apiculatus		$0.0938*D^2H^{0.8598}$		$0.0289*D^2H^{0.8469}$
Cinnamomum camphora		$0.3670*D^2H^{0.5171}$		$0.1017*D^2H^{0.6883}$

D and H represent the tree's basic breast diameter (cm) and height (m), and the total biomass was the sum of leaf, branch, stem and root biomass. All allometric equations were established by the Heshan National Field Research Station, according to the method of Fu et al. (2008). The asterisk represents multiplication.

Table S4 Two-way ANOVA analysis of planting year, plantation type, and their interaction on soil physiochemical properties.

Factor	SOC (g kg^{-1})	DOC (g kg^{-1})	TN (g kg^{-1})	NH_4^+-N (mg kg^{-1})	NO_3^--N (mg kg^{-1})	TP (g kg^{-1})	pH	C:N	C:P
Planting year (PY)	0.01(0.92)	16.73(<0.05)	119.71(<0.001)	208.52(<0.001)	67.21(<0.001)	7.54(<0.05)	72.64(<0.001)	288.86(<0.001)	2.93(0.125)
Plantation type (PT)	11.59(<0.05)	10.14(<0.05)	19.30(<0.05)	68.13(<0.001)	1.64(0.237)	12.46(<0.05)	19.38(<0.05)	7.07(<0.05)	29.83(<0.05)
PY × PT	0.05(0.837)	3.20 (0.112)	7.15(<0.05)	67.62(<0.001)	0.14(0.722)	0.15(0.705)	0.71(0.424)	14.82(<0.05)	0.86(0.380)

SOC, soil organic carbon; DOC, soil dissolved organic carbon; TN, soil total nitrogen; NH_4^+-N, soil ammonium nitrogen; NO_3^--N, soil nitrate nitrogen; TP, soil total phosphorus; C:N, the ratio of soil organic carbon to total nitrogen; C:P, the ratio of soil organic carbon to total phosphorus. Values in parentheses are *p*-values, corresponding to *F*-values outside of the parentheses.

Table S5 Two-way ANOVA analysis of planting year, plantation type, and their interaction on relative abundance of soil microbial phospholipid fatty acids (PLFAs) (relative mol%).

Factor	TPLFAs	Bacteria	Fungi	Actinomycetes	AMF	G^+	G^-	Fungi/Bacteria	G^+/G^-
Planting year (PY)	42.75(<0.001)	32.91(<0.001)	60.20(<0.001)	82.28(<0.001)	65.98(<0.001)	26.88(<0.05)	9.63(<0.001)	11.11(<0.05)	1.11(0.32)
Plantation type (PT)	0.01(0.94)	0.16(0.70)	2.36(0.16)	0.52(0.49)	1.41(0.27)	0.02(0.90)	0.03(0.86)	4.00(0.08)	1.26(0.29)
PY × PT	0.82(0.39)	1.11(0.32)	0.52(0.49)	1.23(0.30)	7.33(0.03)	1.17(0.31)	0.37(0.56)	1.78(0.22)	3.88(0.08)

TPLFAs, total phospholipid fatty acids; G^+, gram-positive bacteria; G^-, gram-negative bacteria. Values in parentheses are *p*-values, corresponding to *F*-values outside of the parentheses.

Reference:

Fu SL, Lin YB, Rao XQ, Liu SP (2008) Forest Ecosystem: Heshan Filed Station in Guangdong, Chinese Forestry Press, Beiing