sustainability

Supplementary materials

Table S1. List of candidate variables for the multivariate analysis. PCA = Principal Component Analysis.

Variable	Description	Unit	Included in the PCA?
farm.area	Farm area	hectares	Yes
age	Main household age	years	Yes
n.prod	Number of crops	no. of crops	Yes
n.pract	Number of agroecological practices adopted	no. of practices	Yes
n.CTA	Number of extension projects from the local NGO (CTA) in which households were engaged	no. of projects	Yes
n.policies	Number of public policies in which households participated	no. of public policies	Yes
n.consum	Number of food items consumed by the family	no. of food items	No

Table S2. Description of agroecological practices and principles.

List of agroecological practices and principles	
practice	**Description**
compost	Composting of organic residues
repelent_plant	Presence of plants used to repel pests
onfarm_trees	Presence of on-farm trees scattered around the house, around or within the fields
biofert	Use of biofertilisers originated from organic material
crop_rotation	Presence of crop rotation systems
alt_pesticide	Use of alternative pesticides originated from organic material
AFS	Presence of Agroforestry System
no_transgenics	No use of transgenic seeds and crops
alt_feeding	Alternative on-farm feed production (e.g. sugar cane, tree residues, grasses, banana, fruits)
manure	Use of animal manure as plant fertilisers
diversification	Presence of more than ten crops in the farming system
med_plants	Cultivation and use of medicinal plants
intercropping	Presence of intercropping systems (e.g. maize and beans)
mowing	Predominance of mowing instead of uprooting weeds
no_fire	No use of fire to manage the fields
no_chemicalfert	No use of chemical fertilisers
race_seeds	Use of at least one variety of local seeds varieties
forest_conserv	Presence and conservation of forest patches on the farm
Homeop	Use of homeopathy for humans, animals, soil and/or plants
water_conser	Conservation of water springs present on the farm
family_colaboration	Most family members actively contribute to farm management
gender_equity	Recognition of the women`s work importance
group_participation	Participation in social organisations, such as farmers unions, associations, and cooperatives
labour_exchange	Labour exchange with other farmers in the community
popular_culture	Participation and organisation in events to celebrate and reinforce the local culture.

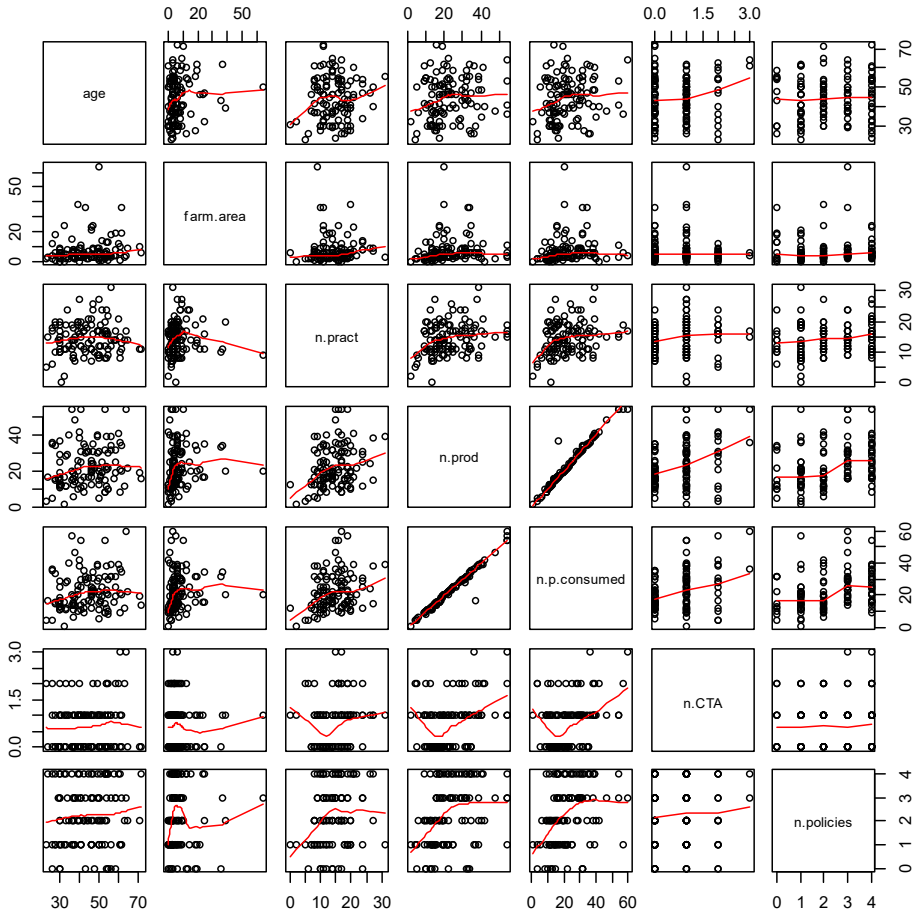

Figure S1. Matrix of scatterplots with candidate variables for the multivariate analysis.

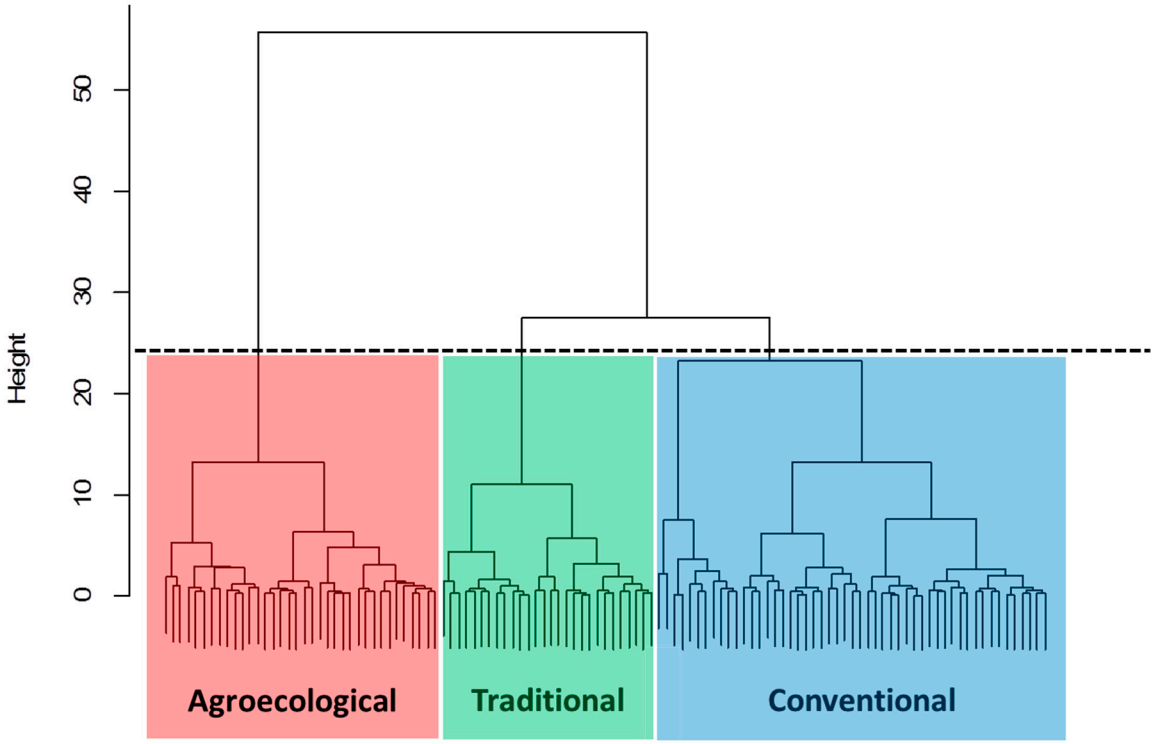

Figure S2. Cluster Dendrogram used to select the number of clusters. The dashed line displays the cut-off point that gave the three-cluster solution. The height shown in the vertical axis indicates the level of dissimilarity between merged clusters in different points of the dendrogram.

Table S3. Detailed criteria and indicators for characterizing the six main farm types identified in the participatory typology.

	Variables	**Agroecological**	**Traditional**	**Conventional**	**Part-time Farmers**	**Large scale Farmers**	**Landless Farmers**
	General characteristics	Farmers with high level of autonomy and strong connection with nature. They have diversified production systems, make little use of external inputs, adopt innovative farming practices and are part of social organisations in the region.	Traditional family farmers still hold peasant characteristics, such as cultivation of diversified home-gardens for self-consumption and focus on family labour, which contributes for their autonomy and food sovereignty. However, pesticides and artificial fertilisers are also often used.	The focus of this farm type is coffee production for the market. Farms are less diversified, with high use of inputs. A large proportion of food for self-consumption is commonly purchased.	Farmers in this type have parallel jobs to their farming activities. Usually, the main farming activity is coffee production for the market, which may be combined with other crops.	Large farm size, high coffee productivity with high use of external inputs and hired labour.	In this type, farmers don`t have the ownership of the land, although they work as farmers in somebody else`s land. They do not have autonomy to manage the land. They are submissive to the landlord orders.
	Variations within the farm type	Agroecological farmers are a very diverse group. They diversify their production according to local conditions and knowledge. A group of agroecological farmers don`t make any use of chemical fertilisers, and therefore, are considered organic.	They diversify their production, however, some farmers still adopt traditional practices such as fire and intensive "capina" combined or not with the use of pesticides. Some farmers are stopping practices recognised nowadays as harmful for the environment.	Although conventional farmers are more market oriented than the other family farmer types, they also preserve peasant characteristics. Within this type, some farmers may adopt some agroecological practices	There are different types of partial farmers. For instance, the people who own and work on a farm and at the same work in the cities, as masons or retailers. There are also the so-called "embarcados": men who stay 15 days on sea, and 15 days farming.	The level of entrepreneurship can vary. Some large farmers still work directly on their farm, while others can be considered business men. Although the focus is coffee and pasture, other crops are grown as well, such as sugar cane and (transgenic) maize.	Landless farmers can work for other farmers as hired workers who are paid per day/week of work, or as "sharecroppers" who live and work on a portion of land owned by the land lord. As a compensation for the use of the land, the share cropper hands over a proportion of the production to the land lord.
S	Size of the farm	Small to medium	Small to medium	Small to medium	Small to medium	Medium to large	N/A
S	Inputs and Equipment	No chemical pesticides use. Artificial fertilisers are used in small quantities if necessary.	Small or moderate use of pesticides and artificial fertilisers.	High use of artificial fertilisers and pesticides. Use	Small, moderate or high use of artificial fertilisers and	High use of artificial fertilisers and pesticides. Presence of expensive	The inputs and equipment is commonly provided by the landlord.

		Use of on-farm or external manure. Low level of mechanisation, some farmers adapted to family farming.	Use of on-farm or external manure. No or low level of mechanisation.	of imported and/or on farm manure. Use of machinery can vary according to the level of assets.	pesticides. Use of imported manure when necessary. Low level of mechanisation.	equipment and machinery.	
F	Production Orientation	Focus on food sovereignty of the family. Coffee is often sold as the main cash crop. The production surplus of milk, fruits and vegetables can also be sold.	Diversified production for self-consumption and coffee as cash crops for the market.	Highly market oriented.	Highly market oriented.	Highly Market-oriented	Market oriented. Production for self-consumption is subordinated to the landlord agreement.
S	Distance to town	Variable	Variable	Variable	Closer to town	Variable	Variable
S	Main household Age	Variable	Usually > 50 year	Variable	Variable	Variable	Variable
F	Main income sources	Agriculture (different products), sometimes in combination with ecotourism and other activities.	Agriculture (coffee and milk) and retirement.	Agriculture, mainly coffee.	Agriculture (coffee) and off-farm activities.	Agriculture (coffee and milk) and marketing agricultural products.	Mainly Agriculture. Can also have off-farm jobs in the city.
F	Resource endowment	Low to medium	Low to medium	Low to medium	Low to medium	High	Low
F	Land ownership	Land access through governmental policies, "collective land acquisition"[1], heritage or acquired through their savings.	Land access from heritage or through their savings.	Land access through governmental policies, heritage or through their savings.	Land access through governmental policies, heritage or through their savings.	Land access usually from heritage, through their savings or occupation in the past (e.g. "uso capiao", donation)	N/A
F	Labour	Mostly family labour. Exchange of labour days with other farmers is common.	Mostly family labour. Part of the labour may be hired.	Mostly family labour. Part of the labour may be hired.	Partly family labour, partly hired.	Mostly hired labour (e.g., sharecroppers, daily employees)	Farmers sell their labour force
F	Participation in social organisations	Actively engaged in social organisations, such as family farmer´s unions, cooperatives, and catholic groups of reflection.	Often affiliated to the farmers union, but little actual participation. Commonly part of the catholic groups of reflection.	Can be affiliated to the family farmers union, but little actual participation. Often part of the catholic groups of reflection.	Variable.	No participation.	Can be affiliated to the family farmer and rural workers union, but little actual participation. Often part of the catholic groups of reflection.
F	Forest conservation	Forest patches are preserved. If no forest is present, farmers try to establish trees and fence	Forest patches are preserved. If no forest is present,	Forest patches are preserved. If no forest is present,	Little forest area on the farm and little conservation efforts.	Variable. Forest is sometimes present in small patches, more or	Conservation efforts dictated by the landlord.

		water bodies on the farm.	conservation efforts vary.	conservation efforts vary.		less according to the Brazilian Forest Law.	
F	Pastures	Presence of trees and low grazing intensity. Alternative feed is provided with banana, tree residues, maize and silage.	Little (or no) presence of trees; low to medium grazing intensity. Additional feed with sugar cane and grasses.	No presence of trees. Low to medium grazing intensity. Additional feed is commonly purchased.	Usually not present as animals require a daily care.	Intensive production; high number of animals; animals are partly kept in the stable; feed is commonly purchased.	Dictated by the landlord.
F	Coffee fields	Presence of trees and annual crops; less intensive uproot weeding; frequent mechanical mowing; good soil cover.	Little (or no) trees; bare soil; frequent and intensive weeding (chemical or coastal mechanical). Annual crops are intercropped with coffee.	Annual crops can be present. No trees; bare soil; frequent and intensive weeding (chemical or coastal mechanical). In some cases uproot weeding is replaced by mowing.	No trees; bare soil; frequent and intensive weeding (chemical or coastal mechanical). In some cases the uproot weeding is being replaced by mowing.	High productivity; no trees; bare soil; frequent an intensive uproot weeding; annual crops are intercropped if land is shared with a sharecropper.	Introduction of annual crops in between the coffee lines for self-consumption.
F	Homegarden	Complex homegarden with trees, shrubs, fruits, vegetables and small animals, such as chickens, ducks and pigs.	Complex homegarden with fruits, vegetables and small animals, such as chickens, ducks and pigs. Trees and shrubs may also be present.	Small homegarden with only few vegetables and fruits.	Usually not present.	Usually not present.	If the landlord agrees, share croppers tend to create a small homegarden for self-consumption.

[1] collective land acquisition = purchase of a large piece of land by many farmers who share the land among themselves.

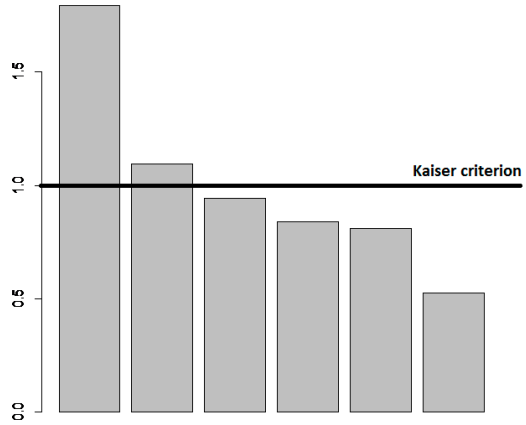

Figure S3. Eigenvalues of the PCA.

Table S4. Correlation matrix between the principal components (PC`s) and the variables used in the multivariate analysis.

Variables	PC1	PC2	PC3
age	−0.37554	**0.583439**	−0.25941
farm.area	−0.18688	**0.80019**	0.218673
n.pract	**−0.58626**	−0.18811	0.103478
n.prod	**−0.80057**	−0.04888	0.010233
n.CTA	**−0.58919**	−0.19782	**−0.61927**
n.policies	**−0.53567**	−0.1917	**0.65817**

Table S5. Proportion of farmers in each farm type participating of CTA-ZM projects. Proportions are significantly different among all farm types according to Fisher's test ($p<0.001$). CTA-ZM stands for the local non-governmental organisation: Centre for Alternative Technologies of Zona da Mata.

Number of CTA projects	Conventional (%)	Agroecological (%)	Traditional (%)
0	66.7	0	58.8
1	27.0	65.7	41.2
2	6.4	28.6	0
3	0	5.7	0

Table S6. Proportion of farmers in each farm type accessing public policy benefits. Proportions are significantly different among all farm types according to Pearson`s Chi-squared test ($p<0.01$).

Number of public policies	Conventional (%)	Agroecological (%)	Traditional (%)
0	7.9	0	29.4
1	33.3	14.3	17.7
2	25.4	17.1	23.5
3	17.5	28.6	17.7
4	15.9	40	11.8

Table S7. Means, standard errors, statistical test and p-values for the five variables used to characterise family farmers in the Zona da Mata, Brazil.

Variable	test	p-value	Conventional	Agroecological	Traditional
Number of crop products	ANOVA	2.00e-16***	16.4 ± 7.2 a	34.3 ± 10.2 c	22.6 ± 7.9 b
Number of agroecological practices	Kruskal-Wallis	4.18e-06***	12.7 ± 4.5 a	18.4 ± 5.1 b	13.5 ± 4.4 a
Age of the household head	Kruskal-Wallis	7.18e-06***	40.4 ± 9.9 a	45.6 ± 10.1 b	55.7 ± 9.5 c
Farm area (ha)	ANOVA	2.27e-15***	4.4 ± 4.1 a	5.62 ± 3.1 a	21.6 ± 14.9 b
Number of crop products consumed	ANOVA	3.79e-15***	16.1 ± 7.3 a	33.6 ± 11.2 c	22.1 ± 8 b

Table S8. Results from the ad-hoc and post-doc tests for five selected variables. * Significant at p < .05; ** Significant at p < .01; *** Significant at p < 0.001.

				p-values		
Variables	**Ad-hoc test**	**p-value**	**Post-doc test**	**agroecological -conventional**	**traditional-conventional**	**traditional-agroecological**
n.prod	ANOVA	2.00e-16***	Tukey	0***	0.01977*	0.00001***
n.pract	Kruskal-Wallis	4.179e-06***	Dunn	0***	0.3985	0.0006**
Age	Kruskal-Wallis	7.177e-06***	Dunn	0.0110*	0***	0.0028**
farm.area	ANOVA	2.27e-15***	Tukey	0.65266	0***	0***
n.p.consumed	ANOVA	3.79e-15***	Tukey	0***	0.03426*	0.00005***

Table S9. Proportion of farmers adopting each agroecological practice per farm type.

		%		
Practices	**Description**	**Agroecological**	**Traditional**	**Conventional**
popular_culture	Participation and organisation in events to value and reinforce the local culture.	28.6	5.9	4.8
repelent_plant	Presence of plants used to repel pests	45.7	11.8	12.7
composting	Composting of organic residues	31.4	17.6	9.5
alt_pesticide	Use of alternative pesticides originated from organic material	51.4	23.5	14.3
onfarm_trees	Presence of on-farm trees scattered around the house, around or within the fields	57.1	41.2	20.6
AFS	Presence of agroforestry system	42.9	35.3	19.0
biofert	Use of biofertilisers originated from organic material	54.3	35.3	25.4
no_transgenics	No use of transgenic seeds and crops	88.6	41.2	41.3
gender_equity	Recognition of the women`s work importance	62.9	47.1	34.9
no_chemicalfert	No use of chemical fertilisers	22.9	0.0	11.1
water_conser	Conservation of water springs on the farm	74.3	47.1	46.0
group_participation	Participation in social organisations, such as farmers unions, associations, and cooperatives	82.9	64.7	46.0
Homeop	Use of homeopathy for humans, animals, soil and/or plants	45.7	52.9	28.6
med_plants	Cultivation and use of medicinal plants	82.9	70.6	55.6
family_colaboration	Most family members actively contribute to farm management	74.3	52.9	50.8
diversification	Presence of more than ten crops in the farming system	94.3	64.7	61.9
manure	Use of animal manure as plant fertilisers	100.0	94.1	73.0
alt_feeding	Alternative on-farm feed production	74.3	76.5	55.6
no_fire	No use of fire to manage the fields	85.7	64.7	71.4
intercropping	Presence of intercropping systems (e.g. maize and beans)	85.7	70.6	69.8
crop_rotation	Presence of crop rotation systems	48.6	23.5	36.5
labour_exchange	Labour exchange with other farmers in the community	65.7	58.8	63.5
mowing	Predominance of mowing instead of uprooting weeds	77.1	70.6	76.2
race_seeds	Use of at least one variety of local seeds varieties	80.0	88.2	77.8
forest_consev	Presence and conservation of forest patches on the farm	57.1	47.1	65.1