Appendix 1

Table A1.1 Rules for conversion of land uses/covers under Scenario I: Cash crops

Qualitative rules identified from the narrative scenarios	Quantitative rules that detail the original land use/cover to be converted
Farmers are encouraged to increase coffee production on farmland – arable land	44% (27,500 ha) of flat, arable land at future coffee-producing altitudes (1500-2300m) was converted to coffee plantation.
Farmers are encouraged to increase coffee production on farmland – (pasture) and new coffee plantations may stabilize local climate	25% (7,000 ha) of flat, pasture at future coffee-producing altitudes (1500-2300m) was converted to coffee plantation.
Intensively managed khat plantations are established on former farmland	21% (13,000 ha) of flat, arable land at below- and above-future coffee altitudes (<1500m and >2300m) was converted to khat plantation.
Intensively managed khat plantations are established on former farmland	13% (3,600 ha) of flat, pasture at below- and above-future coffee altitudes (<1500m and >2300m) was converted to khat plantation.
Fast-growing trees (mainly monocultures of eucalyptus plantations) primarily target degraded areas or marginal land	85% (9,800ha) of steep, arable land was converted to eucalyptus plantation.
Tree plantations are mostly monocultures of eucalyptus, but also other fast-growing trees	85% (5,400 ha) of flat, pasture of medium heterogeneity (5%-20%) and at above-future coffee altitudes (>2300m) was converted to eucalyptus plantation.
Tree plantations are mostly monocultures of eucalyptus, but also other fast-growing trees	85% (2,800 ha) of steep, pasture was converted to eucalyptus plantation.
To ensure that sufficient food is still grown (and not only cash crops), the most fertile land should be used for farming	Flat, arable land of low heterogeneity (< 5%) and at high altitude (>2300m) remains the same as in the baseline.
To ensure that sufficient food is still grown (and not only cash crops), the most fertile land should be used for farming	Flat, pasture with low heterogeneity (<5%) and at above-coffee altitudes (>2300m) remains the same as in the baseline.
To ensure that sufficient food is still grown (and not only cash crops), the most fertile land should be used for farming	Cultivated and grazed wetlands remain the same as in the baseline.
Forest degradation slowed down because farmland can provide important tree-related ecosystem services	Farmland woody vegetation remains the same except those affected by settlement expansion.

Table A1.2 Rules for conversion of land uses/covers under Scenario II: Mining green gold

Qualitative rules identified from the narrative scenarios	Quantitative rules that detail the original land use/cover to be converted
Large areas of smallholder arable land conducive for coffee investment has been transferred to capital investors for the expansion of largescale intensive coffee plantations.	75% (47,400 ha) of flat, arable land at future coffee producing altitudes (1500-2300m) was converted to coffee plantation.
Large areas of farmland woody vegetation were converted into intensively managed shade coffee plantations, often using non-native shade tree species.	60% (2,800 ha) of farmland woody vegetation in flat areas at future coffee producing altitudes (1500-2300m) was converted to coffee plantation.
Large areas of natural forest conducive for coffee investment has been transferred to capital investors for the expansion of largescale intensive coffee plantations.	50% (74,400 ha) of forest at future coffee producing altitudes (1500-2300m) was converted to coffee plantation.
Endemic trees and shrubs might be lost, including wild coffee and traditional shade tree species	Forest remains in altitude ranges not suitable for future coffee producing (<1500m, and >2300m).
Endemic trees and shrubs might be lost, including wild coffee and traditional shade tree species	Farmland woody vegetation in steep areas and on altitudes not suitable for coffee (<1500m, and >2300m) remains as farmland woody vegetation.
The landscape is largely transformed to a coffee production zone, with monocultures of high yielding improved coffee cultivars.	45% (12,600 ha) of flat, pasture at future coffee producing altitudes (1500-2300m) was converted to coffee plantation.
Local farmers are left to farm marginalized areas unsuitable for largescale coffee plantation such as on steep hills	Flat, arable land but on low altitude (<1500m) and very high altitude (>2300m) remain as arable land as in the baseline.
Local farmers are left to farm marginalized areas unsuitable for largescale coffee plantation such as on steep hills	Flat, pasture but on low altitude (<1500m) and very high altitude (>2300m) remain as pasture as in the baseline.
As intensified coffee plantations have expanded into farmland, very little land is left for crop production.	Steep, arable land remain arable land as in the baseline.
As intensified coffee plantations have expanded into farmland, very little land is left for crop production.	Steep, pasture remain as in the baseline.

Table A1.3 Rules for conversion of land uses/covers under Scenario III: Biosphere reserve

Qualitative rules identified from the narrative scenarios	Quantitative rules that detail the original land use/cover to be converted
The landscape consists of a core zone of unused natural forest, a buffer zone for low intensity production of local coffee, wild honey and other forest products.	Forests were maintained as in the baseline.
The landscape consists of an outer area to a core and buffer zones of forests with a mosaic of cropland, pastures, and tree plantations.	Flat and steep arable land with high woody vegetation was maintained as in the baseline.
Livestock production and communal grazing are maintained	Flat and steep pasture with high woody vegetation was maintained as in the baseline.
People grow Fruits and vegetables in their home gardens	1/3rd (33% or 24,670 ha) of flat, arable land with low and medium heterogeneity was converted to fruits and vegetables.
Diversified landscape: diversification involving crops, forest products and ecotourism	1/3rd (25% or 2,706 ha) of steep, arable land with low and medium heterogeneity was converted to fruits and vegetables.
Sustainable resource management and improved soil and water conservation can revert environmental degradation	1/3rd (33% or 1,800 ha) of steep, arable land with low and medium woody vegetation remaining from fruits and vegetables was converted to farmland woody vegetation.
Forest cover and trees in farmland mitigate negative aspects of climate change	1/3rd (33% or 11,200 ha) of flat, arable land with low and medium woody vegetation remaining from fruits and vegetables was converted to farmland woody vegetation.
Farmland biodiversity recovered and high forest biodiversity	1/3rd (33% or 7,600 ha) of pasture with low and medium woody vegetation were converted to farmland woody vegetation.

Table A1.4 Rules for conversion of land uses/covers under Scenario IV: Food first

Qualitative rules identified from the narrative scenarios	Quantitative rules that detail the original land use/cover to be converted
Large scale land consolidation, including clearing of woody vegetation and cropland expansion	Flat, arable land remain as in the baseline.
Farming has been mechanized as much as possible with government owned tractors being available for hire to work with the large stretches of cropland in the flat areas	Farmland woody vegetation on flat areas (3,900 ha) was converted to arable land.
Modern agriculture almost completely replaced traditional small scale farming	Flat, pasture (27,900 ha) was converted to arable land.
Flat areas including drained wetlands are dominated by large cereal fields	Grazed and cultivated wetlands were converted to arable land.
Hills and steeper slopes used for intensified fruits and vegetables, commercial bee keeping and beef fattening	50% (5,600 ha) of steep, arable land was converted to fruits and vegetables.
Hills and steeper slopes used for intensified fruits and vegetables, commercial bee keeping and beef fattening	50% (360 ha) of steep, farmland woody vegetation was converted to fruits and vegetables.
Hills and steeper slopes used for intensified fruits and vegetables, commercial bee keeping and beef fattening	50% (5,600 ha) of steep, arable land was converted to pasture.
Hills and steeper slopes used for intensified fruits and vegetables, commercial bee keeping and beef fattening	50% (360 ha) of steep, farmland woody vegetation was converted to pasture.
Hills and steeper slopes used for intensified fruits and vegetables, commercial bee keeping and beef fattening	Steep, pasture (around 3,290 ha) remain as in the baseline.
Remaining patches of natural forest are put under strict protection	50% (74,400 ha) of forest remain as forest under strict protection.
Growing coffee is unviable in most parts of southwestern Ethiopia	No coffee plantation, those available was converted to arable land.

Table A1.5 Percentage of LULC changes by scenarios (in %).

LULC	Scenarios			
	Cash Crop	Mining the green Gold	Biosphere reserve	Food First
Arable land	-17.1	-17.0	-14.1	30.9
Coffee plantation	12.0	48.8	0.0	-0.3
Cultivated wetland	-0.3	-0.1	-0.3	-4.9
Eucalyptus Plantation	6.3	0.0	0.0	0.0
Farmland woody vegetation	-0.2	-1.0	8.1	-1.7
Forest	-0.1	-26.5	0.0	-17.7
Fruits and vegetables	0.0	0.0	8.6	2.1
Grazed wetland	0.0	0.0	0.0	-0.9
Khat	5.9	0.0	0.0	0.0
Pasture	-6.9	-4.5	-2.6	-7.9
Settlement	0.1	0.1	0.1	0.1
Towns	0.6	0.6	0.6	0.6

Table A1.6 LULC changes by kebele groups for Cash crop scenarios (in %).

LULC	Kebele groups			
	Pasture-cropland	Khat-Cropland	Woody vegetation	Accessible-wealthy
Arable land	-33.9	-45.7	-16.7	-24.6
Coffee plantation	14.7	20.0	12.3	20.1
Cultivated wetland	-0.5	-0.4	-0.2	-0.6
Eucalyptus Plantation	11.6	11.2	5.0	4.7
Farmland woody vegetation	-0.3	-0.4	-0.1	-0.2
Forest	-0.1	-0.1	-0.1	-0.8
Fruits and vegetables	0.0	0.0	0.0	0.0
Grazed wetland	0.0	0.0	0.0	0.0
Khat	13.7	11.9	2.4	2.5
Pasture	-5.5	3.1	-2.7	-3.8
Settlement	0.0	0.3	0.2	-0.6
Towns	0.3	0.0	0.0	3.3

Table A1.7 LULC changes by kebele groups for Mining green gold scenario (in %).

LULC	Kebele groups			
	Pasture-cropland	Khat-Cropland	Woody vegetation	Accessible-wealthy
Arable land	-33.2	-22.0	-14.5	-23.4
Coffee plantation	50.6	40.6	60.8	72.1
Cultivated wetland	-0.3	-0.2	-0.1	-0.5
Eucalyptus Plantation	0.0	0.0	0.0	-0.2
Farmland woody vegetation	-2.1	-1.7	-0.7	-1.0
Forest	-7.8	-12.2	-41.2	-41.4
Fruits and vegetables	0.0	0.0	0.0	0.0
Grazed wetland	0.0	0.0	0.0	0.0
Khat	0.0	0.0	0.0	0.0
Pasture	-7.5	-4.7	-4.4	-8.3
Settlement	0.0	0.3	0.2	-0.6
Towns	0.3	0.0	0.0	3.3

Table A1.8 LULC changes by kebele groups for Biosphere reserve scenario (in %).

| LULC | Kebele groups | | | |
	Pasture-cropland	Khat-Cropland	Woody vegetation	Accessible-wealthy
Arable land	-19.8	-29.0	-10.7	-18.4
Coffee plantation	0.0	0.0	0.0	-0.1
Cultivated wetland	-0.5	-0.4	-0.2	-0.6
Eucalyptus Plantation	0.0	0.0	0.0	-0.2
Farmland woody vegetation	14.4	13.3	6.3	10.6
Forest	0.0	0.0	0.0	-0.6
Fruits and vegetables	11.9	20.2	5.8	8.4
Grazed wetland	0.0	0.0	0.0	0.0
Khat	0.0	0.0	0.0	0.0
Pasture	-6.3	-4.3	-1.4	-2.0
Settlement	0.0	0.3	0.2	-0.5
Towns	0.3	0.0	0.0	3.3

Table A1.9 LULC changes by kebele groups for Food first scenario (in %).

LULC	Kebele groups			
	Pasture-cropland	Khat-Cropland	Woody vegetation	Accessible-wealthy
Arable land	39.8	32.3	32.3	43.5
Coffee plantation	-0.2	-0.2	-0.5	-1.2
Cultivated wetland	-5.9	-5.9	-4.2	-4.4
Eucalyptus Plantation	-0.1	0.0	0.0	-0.2
Farmland woody vegetation	-3.8	-3.8	-0.9	-1.2
Forest	-23.7	-18.5	-23.3	-32.6
Fruits and vegetables	3.2	4.0	1.8	1.7
Grazed wetland	-1.1	-1.1	-0.2	0.0
Khat	-0.1	0.0	0.0	0.0
Pasture	-8.0	-7.0	-5.1	-8.3
Settlement	-0.5	0.3	0.2	-0.6
Towns	0.4	0.0	0.0	3.3

Table A1.10 Narrative scenarios with key indicators.

Indicators/main crops	Scenarios			
	"A. Gain over grain"	"B. Mining green gold"	"C. Coffee and conservation"	"D. Food first"
Food crops (mainly maize, wheat, barely, teff, sorghum)	Remain in very limited space such as cultivated wetlands	Little food is produced on marginalized areas	Food crops are grown interspersed with pasture and tree plantations	Food crops expanded over the landscape mainly by large-scale farming
Local cash crops (mainly coffee, khat, fast-growing trees, mainly eucalyptus)	Farmers increase cash crops by reducing food crops	Not widespread, limited to unsuitable areas for large-scale coffee plantation	Traditional coffee remains in forest, coffee plantations are not favoured.	Coffee is not grown, other cash crops remain on steep slopes and hills
Large-scale coffee plantations	No large-scale coffee plantations	Landscape mainly consists of monocultured large-scale coffee plantation by investors	No large-scale coffee plantations, but traditional coffee remains in natural forests	No coffee plantations due to climate change
Livestock production and communal grazing	Pasture for livestock remains in very limited areas such as grazed wetlands	Pasture for livestock remains in very limited areas such as grazed wetlands	Pastures for livestock and communal grazing are well maintained	Remains on steep slopes
Woody vegetation	Mostly maintained, no clearing of woody vegetation	Woody vegetation conducive for coffee cultivation is converted to plantations by investors	Woody vegetation is maintained; landscape is diversified with mosaic of forest and farmland	Woody vegetation is cleared for cropland expansion