Supporting Information

Goldstein et al. 10.1073/pnas.1201040109

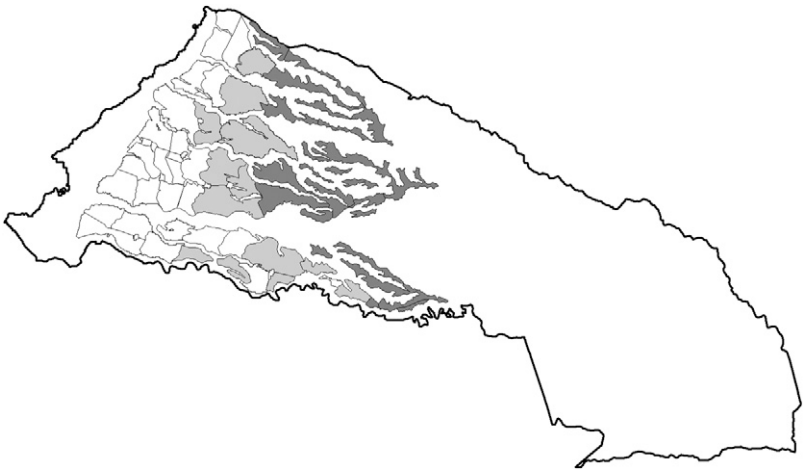

Fig. S1. Map of study region showing agricultural field boundaries including the three field groupings used to create the land-use planning scenario maps: low-elevation fields, which currently receive irrigation water (white); mid-elevation fields, which currently do not receive reliable irrigation water but could if improvements were made to the irrigation system (medium gray); and upper-elevation fields that would remain dependent on precipitation (dark gray).

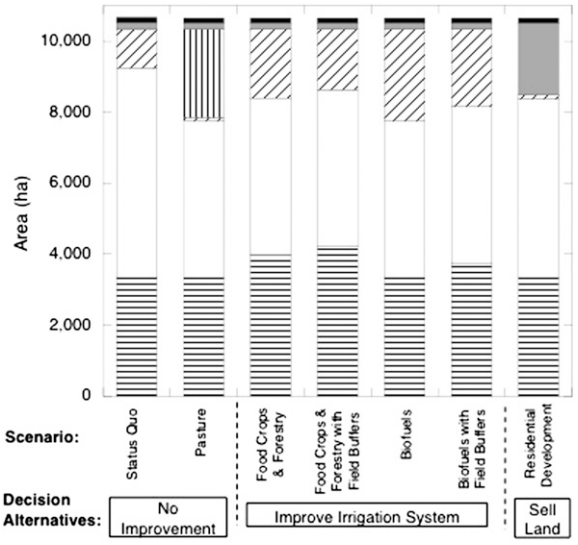

Fig. S2. Distribution of land area in general groupings of land use/land cover (LULC) types for each planning scenario. LULC groupings are as follows: native forest and shrubland (horizontal line fill); exotic forest, shrubland, and grassland (white); crop production (diagonal line fill); pasture (vertical line fill); developed lands (gray); and other (black).

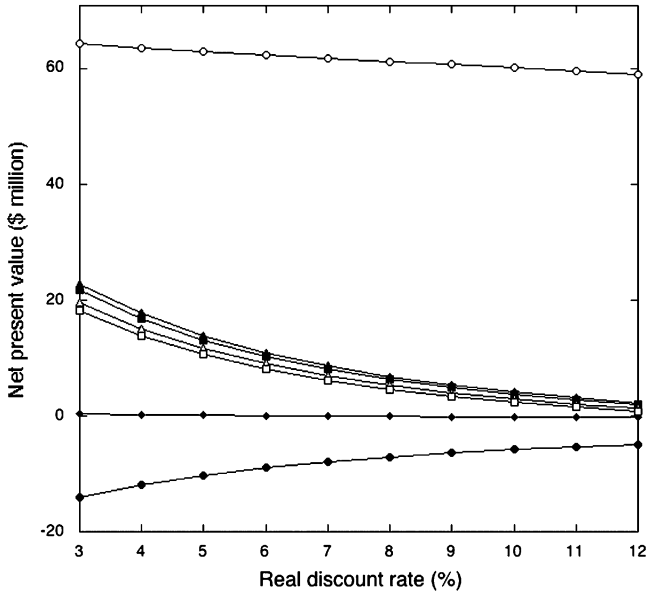

Fig. S3. Sensitivity of financial-return projections for each planning scenario to changes in the real discount rate used to calculate net present value over the model's 50-y time horizon: Status Quo (closed circles), Pasture (diamonds), Food Crops and Forestry (closed triangles), Biofuels (closed squares), Food Crops and Forestry with Field Buffers (open triangles), Biofuels with Field Buffers (open squares), and Residential Development (open circles).

Table S1. Land use/land-cover type assigned to each of the three groups of agricultural fields for creating the planning scenarios

		Land use/land cover type for each group of agricultural fields*		
Decision alternative	Scenario name	Lower fields	Middle fields	Upper fields
No improvement to irrigation system	Status Quo	Corn for seed production	Fallow	Fallow
	Pasture	Pasture	Pasture	Pasture
Improve irrigation system	Food Crops and Forestry	Vegetable crops	Vegetable crops	Native forestry plantings
	Food Crops and Forestry with Field Buffers	Vegetable crops with field buffers	Vegetable crops with field buffers	Native forestry plantings
	Biofuels	Sugarcane (irrigated)	Sugarcane (irrigated)	Sugarcane (unirrigated)
	Biofuels with Field Buffers	Sugarcane (irrigated) with field buffers	Sugarcane (Irrigated) with field buffers	Sugarcane (unirrigated) with field buffers
Sell land	Residential Development	Housing development	Housing development	Fallow (not buildable)
Full restoration (extension to the analysis undertaken in the planning process)	Full Restoration Scenario	Native forestry plantings	Native forestry plantings	Native forestry plantings

*See Fig. S1.

Table S2. Input values for the carbon storage model

Land use/land cover type	Aboveground biomass (t dry mass/ha)	Root-to-shoot ratio	Dead organic matter (tC/ha)	Final carbon input value (tC/ha)
Undefined	0	0.0	0.0	0
Native shrubland/sparse ohia (native shrubs)	90	0.3	0.5	60
Uluhe shrubland	24	1.8	0.0	34
Closed ohia forest (native shrubs)	180	0.2	2.1	113
Open koa-ohia forest (uluhe)	150	0.2	2.1	93
Open ohia forest (uluhe)	135	0.2	2.1	85
Water	0	0.0	0.0	0
Wetland grasses and sedges	0	1.1	0.0	0
Active agriculture	0	0.0	0.0	0
Alien shrubs and grasses	38.5	1.1	0.0	41
Alien trees and shrubs	90	0.3	0.5	59
High-intensity developed	0	0.0	0.0	0
Low-intensity developed	15	1.8	0.0	21
Alien grassland	17	1.9	0.0	25
Alien shrubland	60	0.3	0.0	40
Christmas berry shrubland	60	0.3	0.0	40
Koa haole shrubland	60	0.3	0.0	40
Alien forest	180	0.2	2.1	113
Closed kukui forest	60	0.3	2.1	40
Kiawe forest and shrubland	60	0.3	2.1	42
Kiawe-koa haole forest and shrubland	60	0.3	2.1	42
Uncharacterized forest	180	0.2	2.1	113
Uncharacterized shrubland	60	0.3	0.0	40
Very sparse vegetation to unvegetated	0	0.0	0.0	0
Vegetable crops	0	0.0	0.0	0
Sugarcane (irrigated)	0	0.0	0.0	0
Sugarcane (unirrigated)	0	0.0	0.0	0
Residential development	15	1.8	0.0	21
Pasture	0	1.9	0.0	0
Native forestry	220	0.2	2.1	134
Agricultural field buffers	60	0.3	0.0	40

The carbon fraction of biomass was assumed to be 50%.

Table S3. Nitrogen export coefficients by land use/land cover type used in the water-quality model

Land use/land cover type	Nitrogen export ($kg \cdot ha^{-1} \cdot y^{-1}$)
Undefined	0.1
Native shrubland/sparse ohia (native shrubs)	1.8
Uluhe shrubland	1.8
Closed ohia forest (native shrubs)	1.8
Open koa-ohia forest (uluhe)	1.8
Open ohia forest (uluhe)	1.8
Water	0.1
Wetland grasses and sedges	1.8
Active agriculture	11.1
alien shrubs and grasses	1.8
Alien trees and shrubs	1.8
High-intensity developed	13.8
Low-intensity developed	7.5
Alien grassland	2.5
Alien shrubland	1.8
Christmas berry shrubland	1.8
Koa haole shrubland	1.8
Alien forest	1.8
Closed kukui forest	1.8
Kiawe forest and shrubland	1.8
Kiawe-koa haole forest and shrubland	1.8
Uncharacterized forest	1.8
Uncharacterized shrubland	1.8
Very sparse vegetation to unvegetated	0.1
Vegetable crops	8
Sugarcane (irrigated)	2.5
Sugarcane (unirrigated)	2.5
Residential development	7.5
Pasture	3.1
Native forestry	1.8
Agricultural field buffers	1.8

Table S4. Land-rental rates and estimated real estate prices for bulk sale of irrigated and unirrigated agricultural lands used in the financial return model

Category	Rate (dollars/ha)
Feed/seed corn and other nonfood crops	247
Vegetables	642
Sugarcane (irrigated)	618
Sugarcane (unirrigated)	124
Pasture	25
Native forestry	124
Fallow fields	0
Bulk land sale (irrigated)	43,243
Bulk land sale (unirrigated)	24,711

Real property taxes were \$7.05 ha^{-1} for agricultural lands with a tax category dedication and \$528.80 ha^{-1} without this dedication; this designation was determined on a field-by-field basis. Net return for each field was calculated by subtracting real property tax from the land rental rate. A real discount rate of 6% was used in calculations, with sensitivity analysis to 3–12%.