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Appendix 1: Structured questionnaire used to interview land managers

QUESTIONNAIRE		
Section A: Farm information		
	A1	How many years have you been farming?
	A2	Have you been farming continually? Yes=2; no=1
	A3	How many years on this specific farm?
	A4	How many generations has this farm been in your family?
	A5	How many years has your family been on the farm?
	A6	What is the size of the total area (ha) of your farm?
	A7	How many ha's do you own?
	A8	How many years have you owned the farm?
	A9	How many ha do you hire? n/r=0
	A10	How many years have you been hiring? n/r=0
	A11	How many ha's do you have in partnership? n/r=0
	A12	How many ha's do you have in undivided shares? n/r=0
	A13	How many ha of natural veld do you have? n/r=0
	A14	How many ha's of perennial crops? n/r=0
	A15	How many ha of other cultivated lands? n/r=0
	A16	How many ha's of other land use? n/r=0
	A17	How many veld types can you name on your farm? n/r=0
A18. How important are the following topographic features for ostriches farming? (select which are applicable): n/r=0; not important=1; occasionally important=2; very important=3	A18a	river floodplain
	A18b	flats
	A18c	foothills
	A18d	mountainous areas
	A18e	cultivated areas
	A19	What is the average annual rainfall on your farm (mm)?
	A20	Is this your own observation? Yes=2, no=1, n/r=0
	A21	Over what period did you observe this? n/r=0
A22. What type of livestock do you keep on the natural veld? yes=2, no=1, n/r=0	A22a	none
	A22b	sheep
	A22c	cattle
	A22d	goats
	A22e	ostriches

	A22f	game
A23. Over the last 5 years, from which farming activity does your largest income derive from? (in order of priority 1-15; n/r=0)	A23a	sheep
	A23b	cattle
	A23c	goats
	A23d	ostriches
	A23e	game
	A23f	lucerne hay
	A23g	lucerne seed
	A23h	lucerne pellets
	A23i	vineyard
	A23j	vegetable seed
	A23k	cash crops
	A23l	egg incubation
	A23m	dairy
	A23n	tourism
	A23o	grain
A24. Which factors do you think may contribute to receiving a higher income from ostrich farming and which factors are not important? (please score according to importance); makes no difference=0, helps but not crucial=1, would contribute significantly=2, crucial=3	A24a	larger property
	A24b	Better breeding and selection practices
	A24c	Better fodder supplement
	A24d	Better mineral supplement
	A24e	Pen-breeding system
	A24f	Better veld condition
	A24g	More water
	A24h	Better farmer knowledge and skill
	A24i	More ostriches
	A24j	Less ostriches
	A24k	better prices for ostriches
	A24l	bio-security measures
	A24m	more research
	A24n	stable market
	A24o	better prices for fuel, mielies and electricity
	A25	Are you diversifying your income? Yes=2, no=1, n/r=0
A26. What factors prohibit you from diversifying any further? Yes=2, n/r=0	A26a	limited water supply
	A26b	theft
	A26c	limited funds
	A26d	too small property
	A26e	other
	A27	Do you have new plans for the management or use of your natural veld in the next 5 years? Yes=2; no=1, uncertain=0

		What do you use your natural veld for? Nothing=5, improve veld with management practice=4, utilise veld for cattle=3, utilise veld for small stock=2, utilise veld for ostriches=1, n/r=0
	A28	
A29. What is the structure of the farm business? Yes=2; no=1		
	A29a	trust
	A29b	cc
	A29c	partnership
	A29d	company
	A29e	privately owned by the owner
A 30. How many vehicles, related to the business do you own? What is the latest model (age) for each category? n/r=0		
	A30a	Bakkies
	A30b	Newest model
	A30b1	Age
	A30c	Tractors
	A30d	Newest model
	A30d1	Age
	A30e	Trucks
	A30f	Newest model
	A30f1	Age
	A30g	Harvesters
	A30h	Newest model
	A30h1	Age
	A30i	Platsnyers
	A30j	Newest model
	A30j1	Age
	A30k	Quad bikes
	A30l	Newest model
	A30l1	Age
	A30m	Motorcycles
	A30n	Newest model
	A30n1	Age
	A30o	Digger loader
	A30p	Newest model
	A30p1	Age
	A31	What is the total number of staff (all permanent labourers, domestic and managers) members on the farm?
	A32	Total number of farmwork labourers?
A33. What are the farmwork labourers' skill-level? yes=2, no=1, n/r=0		
	A33a	unskilled
	A33b	semi-skilled
	A33c	skilled
	A33d	fully skilled
	A34	Total number of domestic workers?
A35. What are the domestic workers' skill-level? Yes=2, no=1, n/r=0		
	A35a	unskilled
	A35b	semi-skilled
	A35c	skilled
	A35d	fully skilled
	A36	Total number of Managers?

A37. What are the managers' skill-level? Yes=2,
no=1, n/r=0

- A37a unskilled
- A37b semi-skilled
- A37c skilled
- A37d fully skilled
- A37e fully skilled - tertiary

Section B: Environmental Attitude

Strongly disagree=1; Disagree=2; Neutral=3;
Agree=4; Strongly agree=5

- B1 I think that any conservation efforts are futile; it is too late to make a difference.
- B2 I don't think climate change is a reality and intend to do business as usual.
- B3 I believe that we are only stewards of the land and are responsible for leaving it in a healthy condition for generations to come
- B4 I believe there is no balance between conservation and utilisation – economic sustainability is the most important consideration
- B5 It is possible to improve my farming methods to have less impact on the environment.
- B6 I need more interaction with Nature Conservation to assist me with better veld management decisions
- B7 I believe that my farming venture would benefit if I became involved with the ostrich biodiversity project.
- B8 I would be interested in possibly becoming a partner with the ostrich biodiversity project to look at alternative practices that benefit both the environment and my business.

Section C: Conservation Knowledge

Yes=2; Unsure=1; No=0

- C1 Were you aware, prior to this interview, that the Little Karoo forms part of 3 globally important hotspots for plants and animals?
 - C2 Were you aware that 25 vegetation types in the Little Karoo are endangered?
 - C3 The reasons why the Little Karoo's lower laying vegetation types should be conserved are clear to me.
 - C4 Do you read books on the ecology or the natural environment of the Little Karoo?
 - C5 Do you know what the responsibility of CapeNature is?
 - C6 Prior to this interview, have you heard about the Ostrich Biodiversity Management Project?
 - C7 Do you know that there are government prescribed stocking rates?
 - C8 Do you think that people in this area are becoming more aware of the conservation importance of the vegetation of the Little Karoo?
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Section D: Conservation Behaviour

Strongly disagree=1; Disagree=2; Neutral=3; Agree=4; Strongly agree=5	D1	I have undertaken soil conservation measures for reducing soil erosion in the last 5 years.
	D2	I have undertaken nature conservation activities for any plants or animals in the last 5 years (e.g. surveys, re-introductions, restoration, monitoring).
	D3	I formally monitor my veld condition, using a recognised method
	D4	I operate ecotourism activities on my farm.
	D5	I like to regularly attend conservation workshops and or meetings.
	D6	It is necessary to have an environmental management plan for my farm.
	D7	I regularly report interesting plants/animals to Nature Conservation.
	D8	I implement healthy waste management on my farm and encourage my workers to do the same.
	D9	I implement alien clearing activities on my farm.

Section E: Willingness

Collaboration willingness: Very high=5; high=4, Moderate=3; Low=2; very low=1; never heard of them=0	E1a	Nat. Dept. Environmental Affairs
	E1b	Dept. Land Affairs
	E1c	Dept. Water Affairs
	E1d	SAPD
	E1e	CapeNature
	E1f	Dept. Agriculture, Forestry & Fisheries
	E1g	LandCare
	E1h	Dept Environ. Affairs & Dev. Plan
	E1i	Oudtshoorn municipality
	E1j	Eden District municipality
	E1k	Gouritz Biosphere Reserve
	E1l	Cape Leopard Trust
	E1m	WESSA
	E1n	Agri Klein Karoo
	E1o	Agricultural Research Council
	E1p	Oudtshoorn Research Farm
	E1q	Rhodes University
	E1r	University of Stellenbosch
	E1s	Farmers' Association
	E1t	A neighbouring Conservancy
E1u	SAOBC	
E1v	Ostrich Biodiversity Project	
E1w	A neighbouring farmer	
E1x	Private consultant	
E2a	Offering landowners various types of incentives (e.g. financial, motivational, property or rights-based) is a good idea for promoting conservation on private land.	
Willingness to participate in conservation: Strongly disagree=1; Disagree=2; Neutral=3; Agree=4; Strongly agree=5		

	E2b	Protection of plants and animals that occur outside of protected reserves should be the responsibility of private landowners.
	E2c	CapeNature or another government organisation should bear the costs for the conservation and management of endangered veld types on my farm
	E2d	I have heard about CapeNature's stewardship programme
	E2e	I would be interested to know more about the stewardship programme
	E2f	I would like to participate in a stewardship programme, regardless of any incentives
	E2g	I am only interested in stewardship if substantial incentives are offered
Incentives: Very interested=5; interested=4; neutral=3; possibly interested=2; Not at all interested=1	E3a	Tax deduction or rate rebates for conservation land and activities
	E3b	Assistance with fencing and land management
	E3c	Subsidy for conservation work, i.e. erosion control or alien clearing
	E3d	Access to scientific information and support
	E3e	Public / community recognition (e.g. certificates, photos and magazine article)
	E3f	Free access to all CapeNature Reserves
	E3g	Eco-tourism support and incentives
	E3h	Law enforcement support
	E3i	Assistance with farm environmental management plans and maps

Section F: Ostrich Farming

F1. Where did you learn to farm with ostriches?
Yes=2, no=1, n/r=0

- F1a father
- F1b family
- F1c own experience
- F1d research farm
- F1e tertiary education

F2. What type of ostrich farming practice did you implement? Yes=2, no=1, n/r=0

- F2a breeding birds
- F2b slaughter birds
- F2c hatchery
- F2d chicks
- F2e feathers
- F3 What are the reason/s for this type of farming practice?

F4. What type/s of ostrich farming do you intend to carry on with in the next 5 years?
Yes=2; no=1, unsure=0

- F4a breeding birds
- F4b slaughter birds
- F4c hatchery
- F4d chicks
- F4e feathers

F5. What type of ostrich product(s) do you produce or focus on? Indicate their importance according to income; 1=most, 4=least; 0=n/r

- F5a skin
- F5b meat

	F5c	feathers
	F5d	chicks
F6. How many birds do you farm with (before the Avian Flu' struck) – before February 2011?	F6a	breeding birds
	F6b	slaughter birds
F7. What type of breeding bird practice do you implement? Yes=2, no=1, no breeding birds=0	F7a	pen-breeding
	F7b	flock breeding
	F7c	group breeding
	F7d	Reasons for this type of breeding practice?
F8. Where do you keep your breeding ostriches? Yes=2, no=1, no breeding birds=0	F8a	veld
	F8b	croplands/drylands
	F8c	pens/camps
	F8d	Reasons for keeping ostriches there?
F9. Where do you keep your slaughter birds? yes=2, no=1, n/r=0;	F9a	croplands
	F9b	drylands
	F9c	feedlots
F10. What factors do you consider when putting ostriches into a natural veld camp? Yes=2, no=1, n/r=0	F10a	consider nothing
	F10b	veld must be in good condition
	F10c	veld must be flat
	F10d	water availability
	F10e	amount of birds/size of camp and period
	F10f	No ostriches must be on the veld
F11. During which months of the year are the ostriches in the veld? Yes=2; no=1	F11a	January
	F11b	February
	F11c	March
	F11d	April
	F11e	May
	F11f	June
	F11g	July
	F11h	August
	F11i	September
	F11j	October
	F11k	November
	F11l	December

Section G: Veld Stocking Densities

	G1	How do you decide how many ostriches to stock on the veld?
		In your opinion, what do you think is the correct stocking density for ostriches on <u>your</u> natural veld (how many HA per ostrich)? n/r=NR; no idea=N; there should be no ostriches on the veld, because they cause too much damage=0
	G2	The average recommended stocking density of ostriches on natural veld determined by the Department of Agriculture is 22.8h/ostrich. How economically profitable do you think this figure is? n/r=0; very unprofitable=1; satisfactory=2; very profitable=3
	G3	
G4. In your opinion, what do you estimate the overall condition of your natural veld to be? Pristine=3; good=2; poor=1; n/r=0	G4a	Hill tops
	G4b	Slopes
	G4c	Valley/flats
G5. What is the average condition of natural veld in ostrich camps on hill tops, slopes and valleys in percentage: n/r=not applicable		
	G5a. Hill tops	
	G5a1	pristine
	G5a2	good
	G5a3	poor
	G5b. Slopes	
	G5b1	pristine
	G5b2	good
	G5b3	poor
	G5c. Valley/flats	
	G5c1	pristine
	G5c2	good
	G5c3	poor

Section H: Personal information

H1	Gender: Male=2, female=1
H2	How old are you?
H3	Cultural group: White Afrikaans=1; White English=2
H4	What language do you primarily use at home? Afrikaans=1; English=2
H5	Marital Status: single=1, Married=2, Divorced=3
H6a	Number of children?
H6b	Number of children in Preschool; n/r=0
H6c	Number of children in Public Primary school; n/r=0
H6d	Number of children in public High School; n/r=0
H6e	number of children in University; n/r=0
H6f	number of children Independent; n/r=0
H7	Landowner highest level of education completed? Highschool=1; N6 Certificate= 2; Diploma=3; Partially

University Degree=4; University Degree=5; Honours Degree=6; Masters Diploma=7

H8	Have you got a formal qualification in Agriculture? yes=2; no=1;
H9	Where does your spouse come from? Locally=1; out of town=2; n/r=0
H10	How long has she been on this farm?
H11	Does she live on the farm on a full-time basis? Yes=2; n/r=0
H12	What is her involvement with farming? Fulltime=3; part-time=2; own business/career=1; n/r=0
H13	What is her highest level of education completed? n/r=0; Highschool=1; diploma=2; degree=3

Table 1: The key variables that were selected containing demographic and personal data that may have an influence on the attitudes and behaviour of land managers towards the environment ($n=23$)

Question	Demographic variable measured	Percentage	Max/min	Mean	Median
For how long have you been farming? (A4)	Years of farming experience	n/a	52/4	26	24
What is the size of your farm (total area)? (A9)	Average size of the farms in hectares	n/a	10 100/40	1806	450
In which year were you born? (H6)	Age of land manager (years)	n/a	77/33	50	49
Level of education completed? (H11)	Who has a tertiary qualification	83	n/a	n/a	n/a

Table 2: Summary tables of demographic information relating to the land managers interviewed (a–p). All values given are % of respondents ($n=23$ unless otherwise stated)

a) Gender

Question (H1)	Male	Female
Gender	100	0

b) Cultural group and language

Question (H3)	White, Afrikaans	White, English
Cultural group & language	83	17

c) Age

Question (H2)	<30 years	31–40 years	41–50 years	>51–60 years	>60 years
How old are you?	0	26	35	22	17

d) Years farming experience

Question (A1)	<10 years	11–20 years	21–30 years	31–40 years	41–50 years	>51 years
How many years have you been farming?	4	26	48	9	9	4

e) Farm size

Question (A6)	<50 ha	100–500 ha	600–1000 ha	1500–2500 ha	5000–12 000 ha
What is the size of the total area (ha) of your farm?	4	48	13	22	13

f) Priority farming activities (percentages do not add to 100 in some columns due to rounding)

Question (A23) Over the last 5 years, which farming activity does your largest income derive from? (in order of priority)

Farming activity	Priority 1	Priority 2	Priority 3
sheep	0	9	9
cattle	0	17	22
goats	0	4	0
ostriches	91	4	4
Lucerne hay	4	26	9
Lucerne seed	4	17	26
Lucerne pellets	0	4	0
vineyard	0	0	13
vegetable seed	0	9	4
cash crops	0	0	4
egg incubation	0	4	0
tourism	0	4	4
grain	0	0	4

g) Generations on farm (percentages do not add to 100 in some columns due to rounding)

Question (A4)	1 st	2 nd	3 rd	4 th	5 th	6 th	7 th
How many generations has this farm been in your family?	22	7	26	13	13	13	4

h) Ostrich farming education

Question (F1)	Father	Other (family, research farm, etc.)
Where did you learn to farm with ostriches?	65	35

i) Tertiary education (percentages do not add to 100 in some columns due to rounding)

Question (H7)	High School	N6 Certificate	National Diploma	Incomplete Bachelor's degree	Completed Bachelor's degree	Honours degree	Masters Diploma
Landowner highest level of education completed?	17	4	48	4	17	4	4

j) Formal qualification in Agriculture

Question (H8)	Yes	No
Have you got a formal qualification in Agriculture?	35	65

k) Ostrich farming practice. Note: Land managers were engaged in >1 ostrich farming practice.

Question (F2)	Breeding birds	Slaughter birds	Hatchery	Chicks
What type of ostrich farming practice did you implement?	96	100	78	100

l) Ostrich breeding practices of the 96% (22) land managers who farmed with breeding birds.

Note: Land managers were engaged in >1 breeding practice.

Question (F7)	Pen-breeding	Flock breeding	Group breeding
What type of breeding bird practice do you implement?	41	68	14

m) Reasons for chosen breeding practice (percentages do not add to 100 in some columns due to rounding)

Question (F7d)	NA (no breeding ostriches, or no reason given)	Economic benefit	No economic benefit	Sufficient natural land	Conservation reason	Historical practice	Less management burden
Reasons for this type of breeding practice?	30	4	13	4	9	9	30

n) Determining stocking density. Not all land managers provided an answer.

Question (G1)	NA (no answer given)	Camp size	Carrying capacity	Number of ostriches	Historical practice
How do you decide how many ostriches to stock on the veld?	37	26	26	4	7

o) Ostrich stocking rate: ha/ostrich

Question (G2)	NA (no opinion)	No ostriches	21–50 ha/ostrich	11–20 ha/ostrich	<10 ha/ostrich
In your opinion, what do you think is the correct stocking density for ostriches on your natural veld (how many hectares per ostrich)?	22	9	9	4	56

p) Recommended agricultural stocking rate (22.8 ha/ostrich)

Question (G2)	Very unprofitable	Satisfactory	Profitable
The average recommended stocking density of ostriches on natural veld determined by the Department of Agriculture is 22.8h/ostrich. How economically profitable do you think this figure is?	87	13	0

Table 3: The five-point Likert items that were retained after scale refinement to measure the attitude of land managers towards the environment (EA). Shown are the percentage of land managers' ($n=23$) responses by score, and the mean and median scores of each item. Positively worded items were scored 1 = strongly disagree and 5 = strongly agree, negatively worded items (indicated by an asterisk) were reverse-scored so that a score of 5 reflects the most conservation-orientated response.

Item	1	2	3	4	5	Mean score	Median score
I don't think climate change is a reality and intend to do business as usual*	0	9	17	43	30	4	4
It is possible to improve my farming methods to have less impact on the environment	4	17	9	52	17	4	4
I need more interaction with Nature Conservation to assist me with better veld management decisions	4	13	22	57	4	3	4
I would be interested to know more about the stewardship programme#	4	9	13	65	9	4	4
I would like to participate in a stewardship programme, regardless of any incentives#	4	9	26	52	9	4	4

#These items were originally included in the Willingness-to-Collaborate scale (under 'willingness to engage in conservation') but were found during scale refinement to be relevant to, and internally consistent with, items on the EA scale. They were thus included in the EA scale for analyses.

Table 4: The three-point Likert items that were retained after scale refinement to measure the conservation knowledge (CK) of land managers ($n=23$). Shown are the percentage of land managers' ($n=23$) responses by score, and the mean and median scores of each item.

Item	No (0)	Unsure (1)	Yes (2)	Mean score	Median score
The reasons why the Little Karoo's lower lying vegetation types should be conserved are clear to me	13	13	74	2	2
Do you read books on the ecology or the natural environment of the Little Karoo?	57	4	39	1	0
Do you know what the responsibility of CapeNature is?	22	9	70	1	2
I have heard about CapeNature's stewardship programme#	57	0	43	1	0

#This item was originally included in the Willingness-to-Collaborate scale (under 'willingness to engage in conservation') but was found during scale refinement to be relevant to, and internally consistent with, items on the CK scale. It was thus included in the CK scale for analyses.

Table 5: The key five-point Likert items that were retained after scale refinement to measure the conservation behaviour (CB) of land managers ($n=23$). Shown are the percentage of land managers' ($n=23$) responses by score, and the mean and median scores of each item. Scores ranged from 1 = strongly disagree to 5 = strongly agree.

Item	1	2	3	4	5	Mean score	Median score
I have undertaken nature conservation activities for any plants or animals in the last 5 years (e.g. surveys, re-introductions, restoration, monitoring)	0	13	17	57	13	4	4
I formally monitor my veld condition, using a recognised method	4	39	22	30	4	3	3
I like to regularly attend conservation workshops and or meetings	9	39	13	26	13	3	2
It is necessary to have an environmental management plan for my farm	0	9	26	52	13	4	4
I implement healthy waste management on my farm and encourage my workers to do the same	0	4	4	65	26	4	4

Table 6: The five-point Likert item (E2a) that was used to measure land managers' interest in incentives for promoting conservation on their land ($n=23$). Shown are the percentage of land managers' ($n=23$) responses by score, and the mean and median scores of each item. Scores ranged from 1 = strongly disagree to 5 = strongly agree.

Item	1	2	3	4	5	Mean score	Median score
Offering landowners various types of incentives (e.g. financial, motivational, property or rights-based) is a good idea for promoting conservation on private land	0	0	4	65	30	4	4

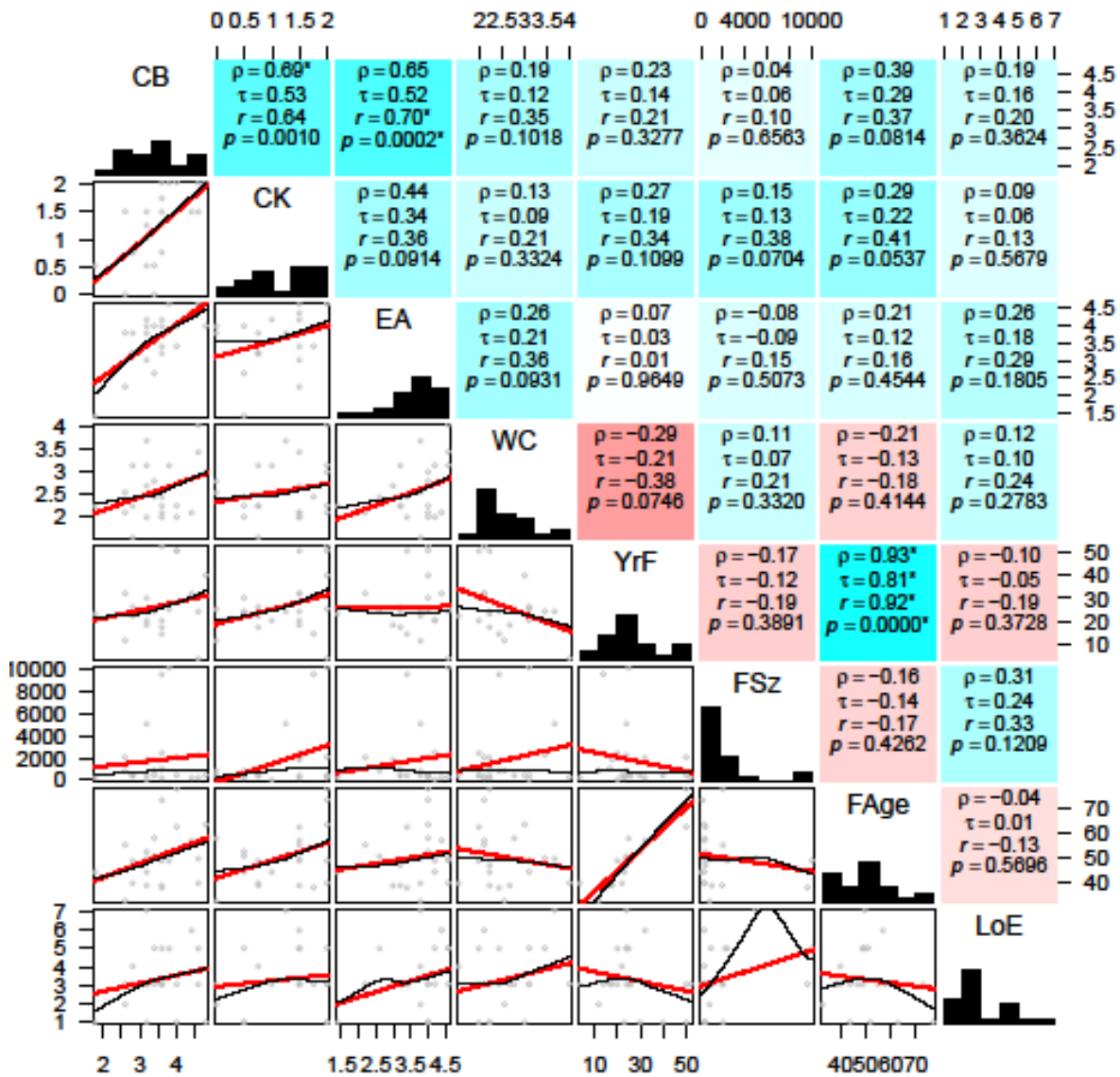
Table 7: The five-point Likert items (E3a-E3i) that were used to assess how interested land managers ($n=23$) are in different types of incentives. Shown are the percentage of land managers' ($n=23$) responses by score, and the mean and median scores of each item. Conventional scoring used (1 = not at all interested, 5 = very interested).

Item	1	2	3	4	5	Mean score	Median score
Tax deduction or rate rebates for conservation land and activities	4	9	9	48	30	4	4
Assistance with fencing and land management	4	4	4	48	39	4	4
Subsidy for conservation work, i.e. erosion control or alien clearing	0	4	4	57	35	4	4
Access to scientific information and support	4	4	9	57	26	4	4
Public / community recognition (e.g. certificates, photos and magazine article)	48	0	22	30	0	2	3
Free access to all CapeNature Reserves	4	4	17	57	17	4	4
Eco-tourism support and incentives	13	4	4	65	13	4	4
Law enforcement support	0	9	9	57	26	4	4
Assistance with farm environmental management plans and maps	9	4	4	61	22	4	4

Table 8: Summary statistics on the degree to which land managers were willing to collaborate (WC) with key organisations (ordered-categorical items). Only items retained after scale refinement are shown. See the footnote (*) for a description of the type of organisation. Organisations are listed in order of land manager preference (based on the sum of the ‘high’ and ‘very high’ categories). Shown are the percentage of land managers who responded to each category (item scores are indicated in parenthesis beneath each category), and the mean and median scores for each item/organisation.

Items from questionnaire (E1a-E1x)	Never heard of (0)	Very low (1)	Low (2)	Moderate (3)	High (4)	Very high (5)	Mean score	Median score
LandCare (NPLGo*)	0	0	0	26	43	30	4	4
CapeNature (COo)	0	0	0	35	30	35	4	4
Stellenbosch University (AI)	0	4	4	43	39	9	3	3
Cape Leopard Trust (COo)	22	9	4	26	22	17	3	3
Gouritz Biosphere Reserve (COo)	22	0	13	30	13	22	3	3
Nat. Dept. Environmental Affairs (NPLGo)	0	4	0	65	13	17	3	3
Dept. Environ. Affairs & Development Planning (NPLGo)	0	0	9	61	26	4	3	3
Rhodes University (AI)	4	9	13	43	22	9	3	3
WESSA (COo)	43	4	4	22	17	9	2	2

*The key organizations are categorized and indicated in parenthesis as follow: conservation-orientated organisation (COo), academic institution (AI), national, provincial or local government organisations (NPLGo).



CB, conservation behavior; CK, conservation knowledge; EA, environmental attitudes; WC, willingness to conserve; YrF, years farming; FSz, farm size; Fage, farmer's age; LoE, farmer's level of education

Figure 1: Summary of pairwise relationships between key variables in the data set. Latent variables shown in the first four columns/rows of the pairs-plot matrix. The red trace is a least-squares regression line, the black trace a loess (or scatterplot) smoother. The symbols ρ and r denote Spearman's and Kendall's rank-based correlation coefficients, respectively; r is Pearson's product-moment correlation coefficient; p is the p -value from an (exact) test of the statistical significance of Pearson's correlation coefficient.