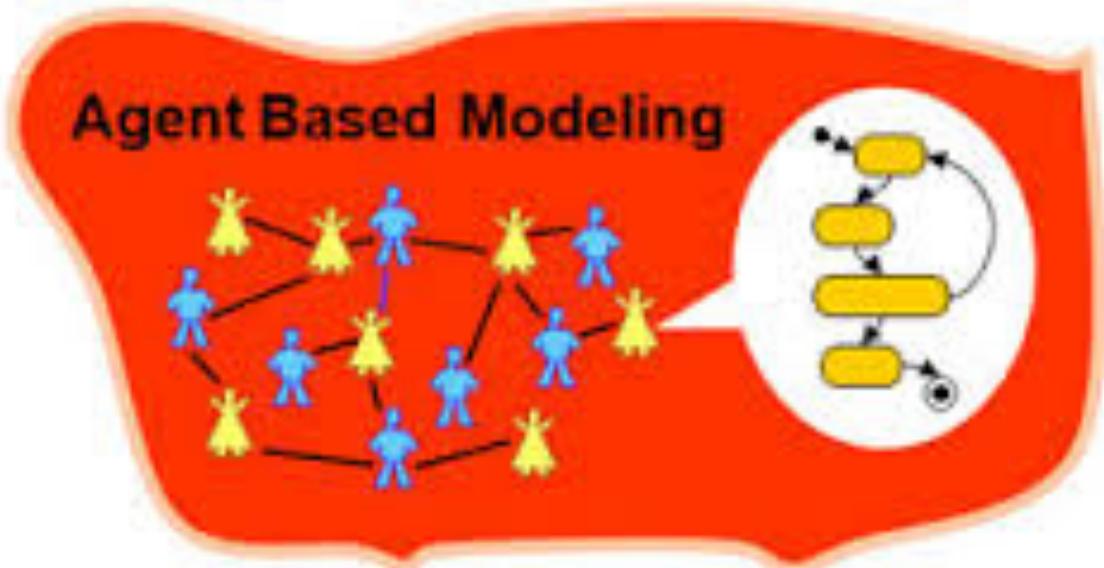


LARGE-SCALE BEHAVIORAL MODELS OF LAND USE CHANGE

PETER VERBURG, ZIGA MALEK, JASPER VAN VLIET
INSTITUTE FOR ENVIRONMENTAL STUDIES (IVM)



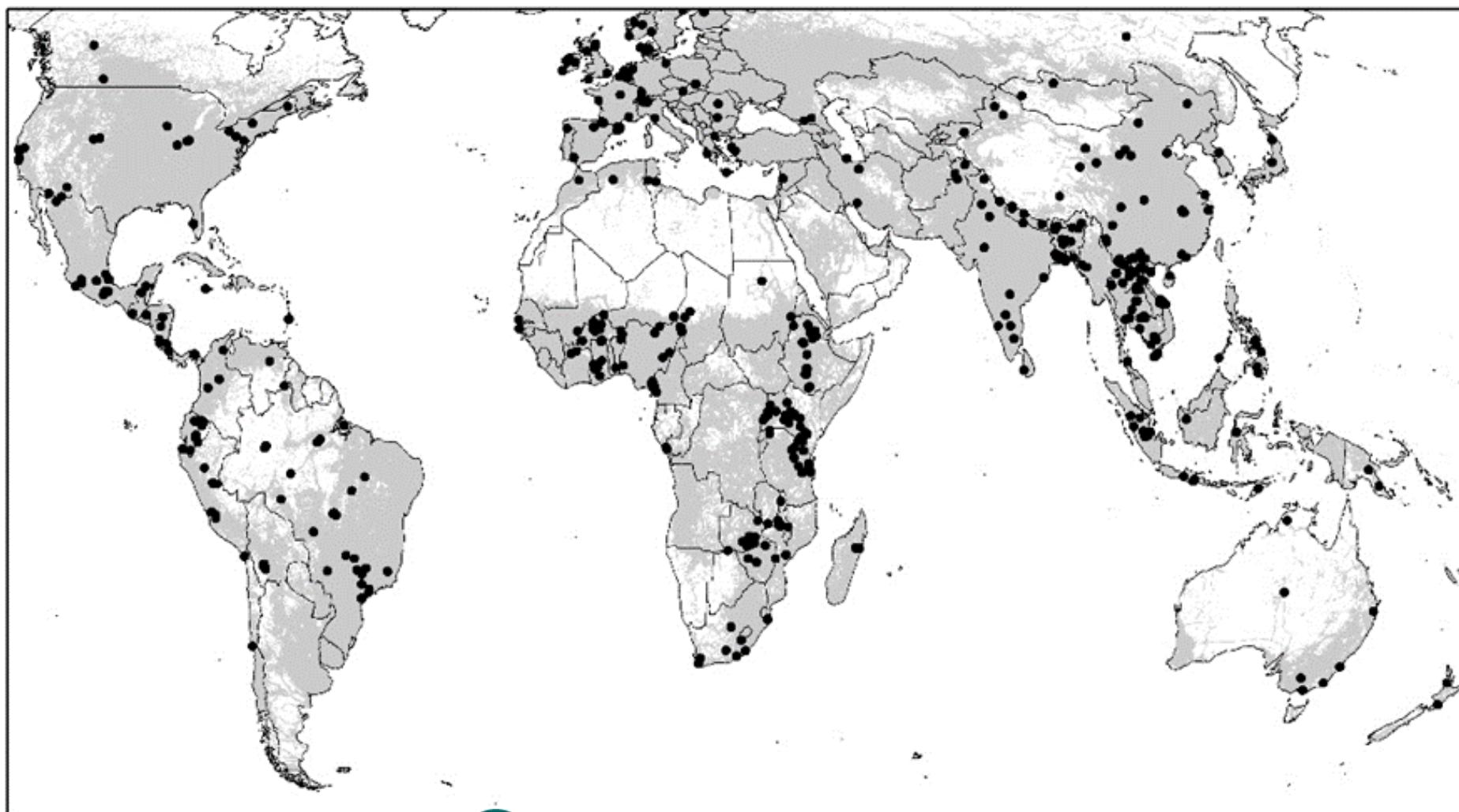
AGENT-BASED MODELLING



How to parameterize behaviors:

- agent-typologies
- theoretical behaviors
- questionnaires
- choice experiments
- participatory methods / role-playing games

META-STUDY: 559 LOCATIONS (758 ACTORS)

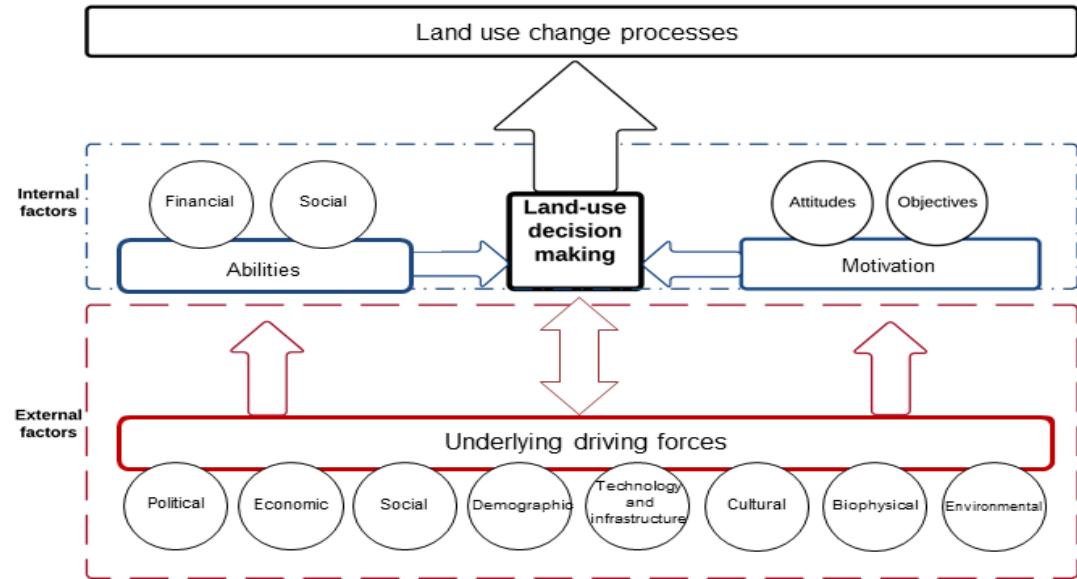


CODING OF ACTORS IN CASE STUDIES

Objectives (social prestige, lifestyle, survival, economic, environmental)

Attitudes (change, legislation, biospheric values)

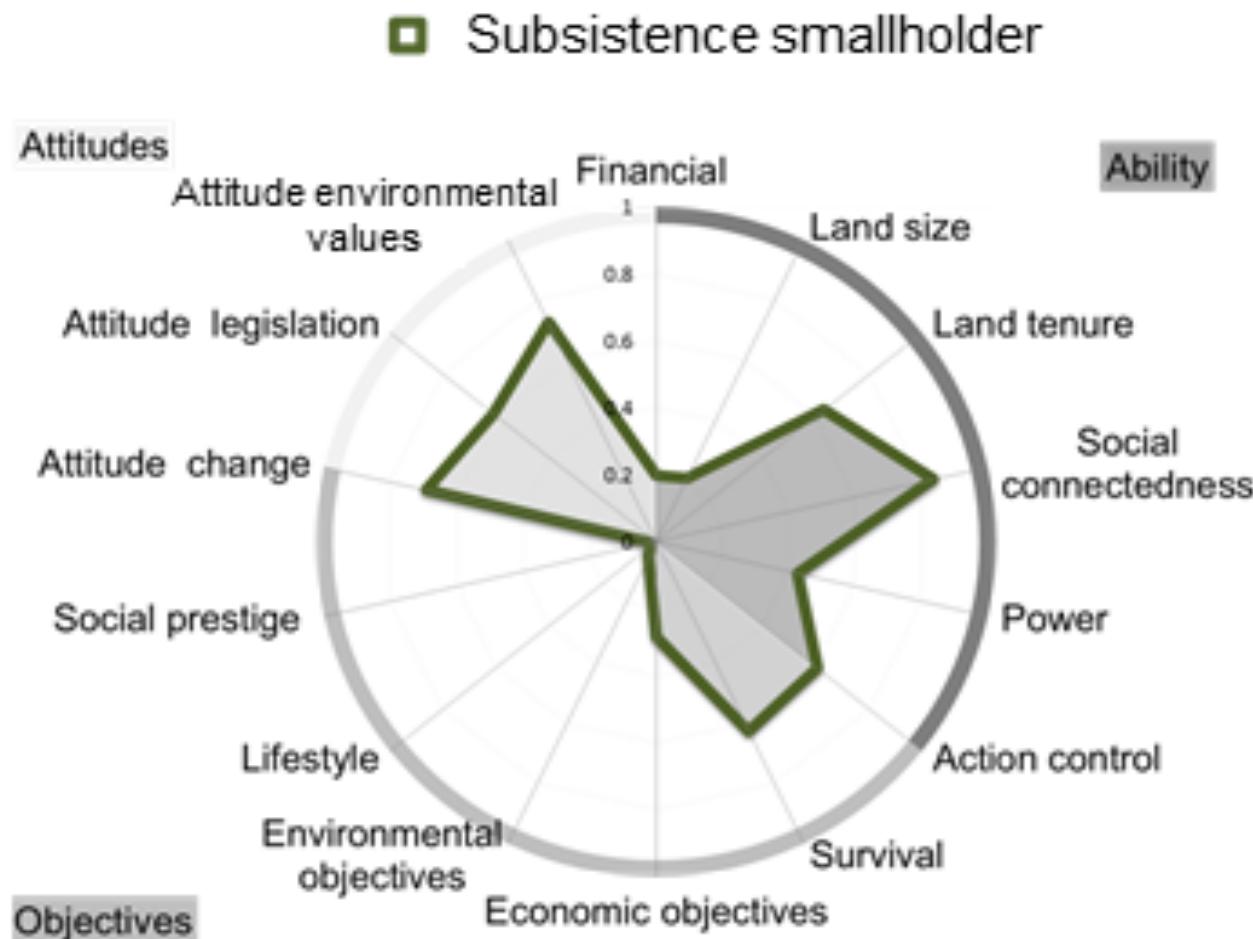
Ability (financial, land size, land tenure, social connectedness, power, action control)



RESULTS: TYPOLOGY OF DECISION-MAKING



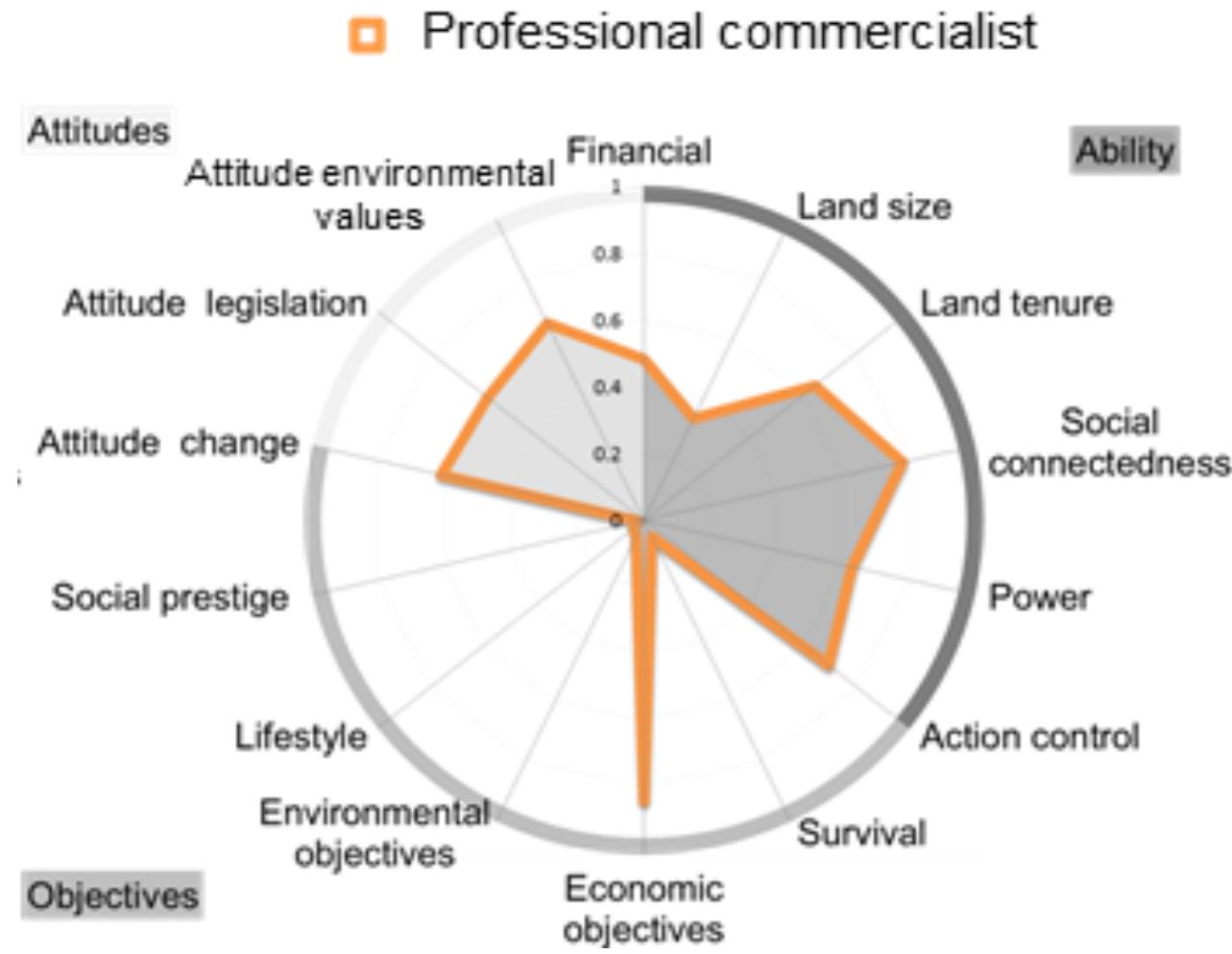
RESULTS: TYPOLOGY OF DECISION-MAKING



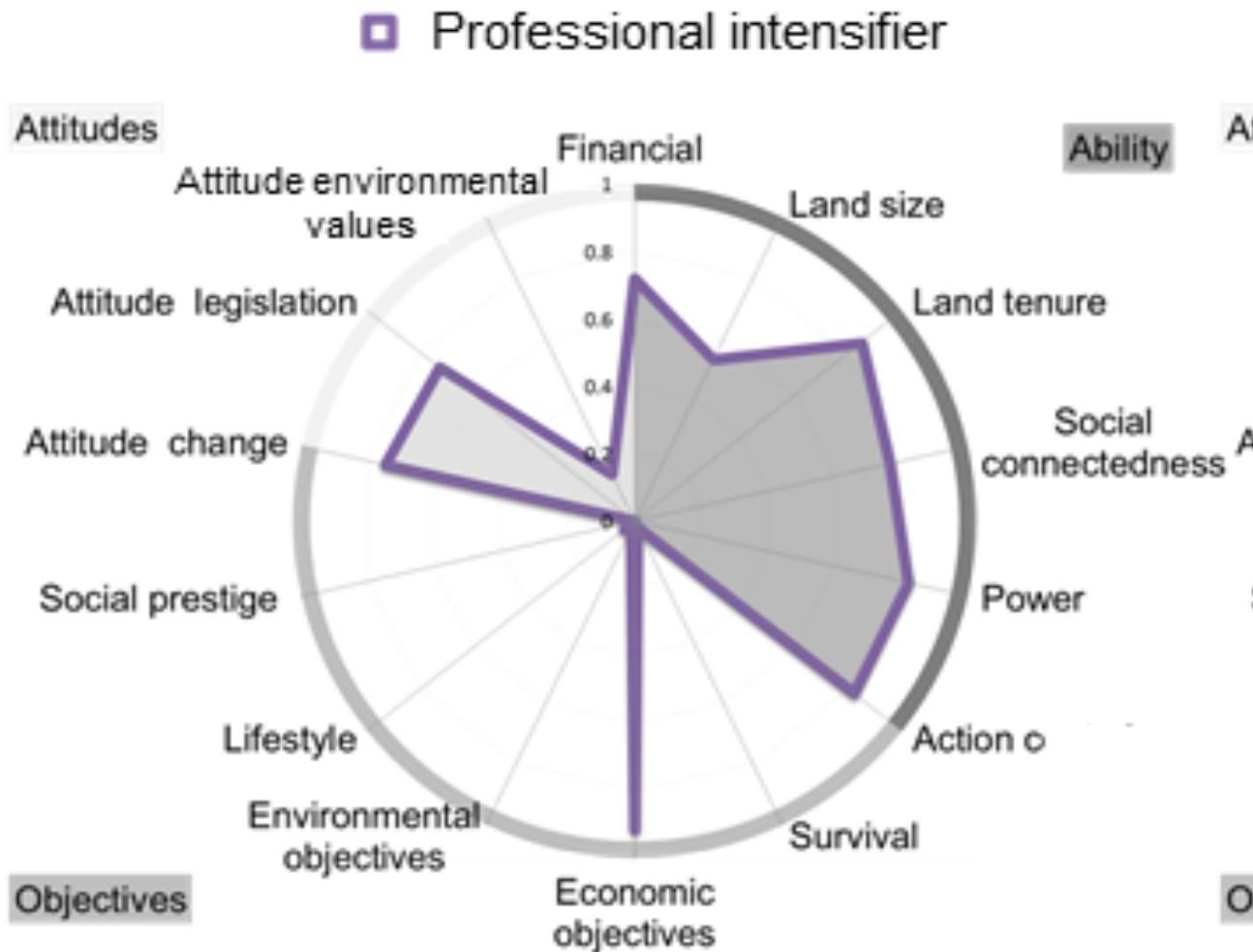
RESULTS: TYPOLOGY OF DECISION-MAKING



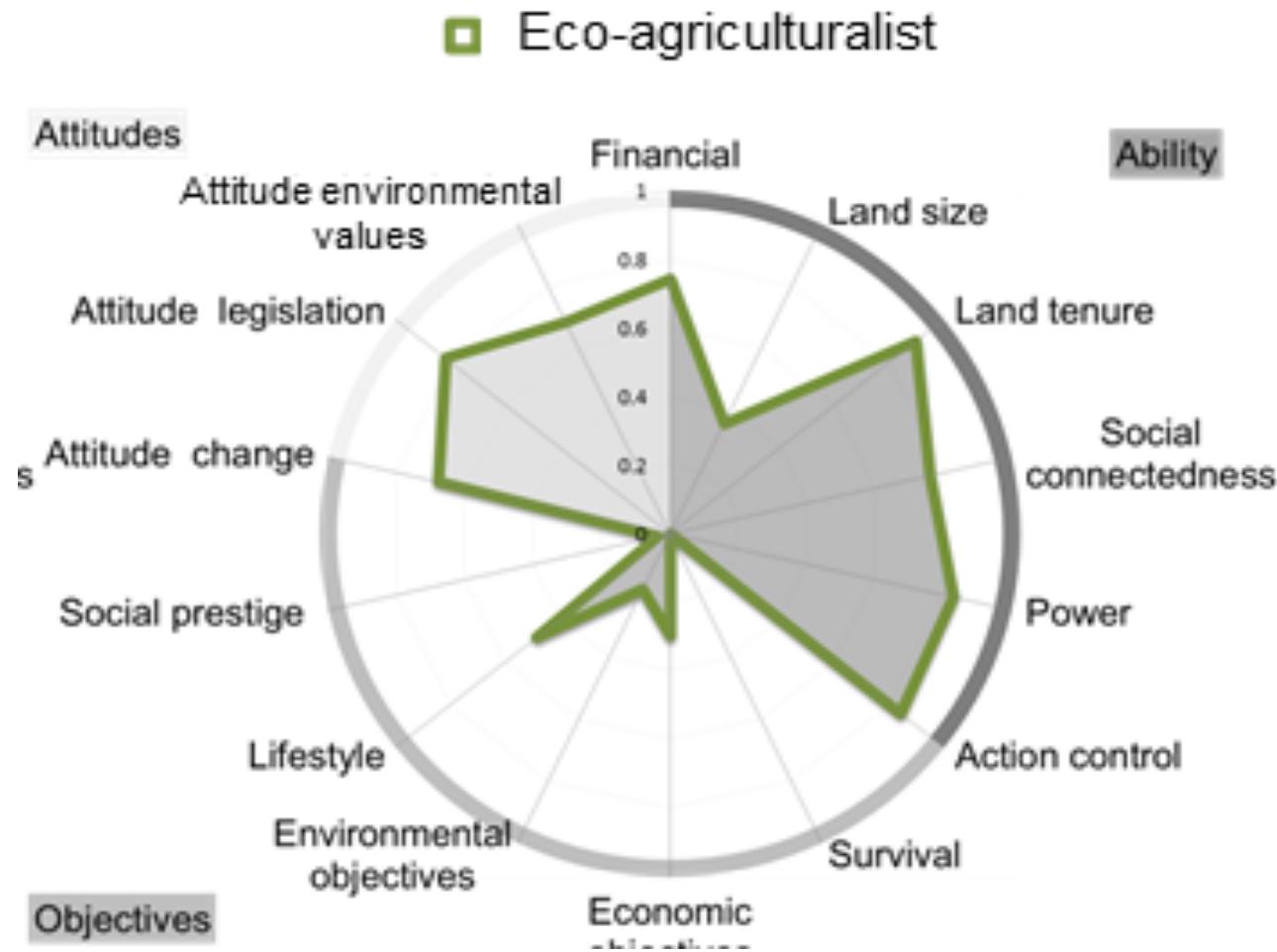
RESULTS: TYPOLOGY OF DECISION-MAKING



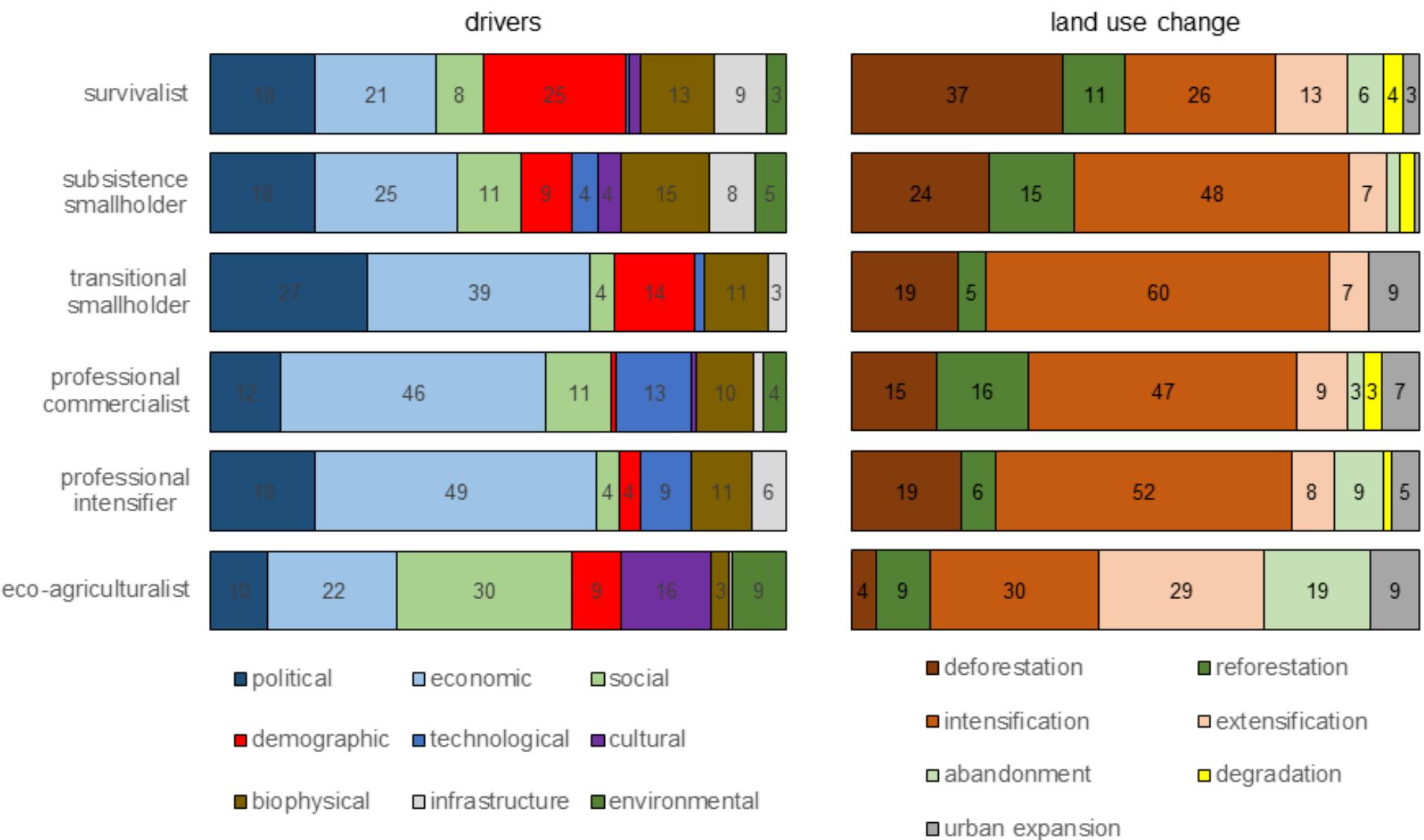
RESULTS: TYPOLOGY OF DECISION-MAKING

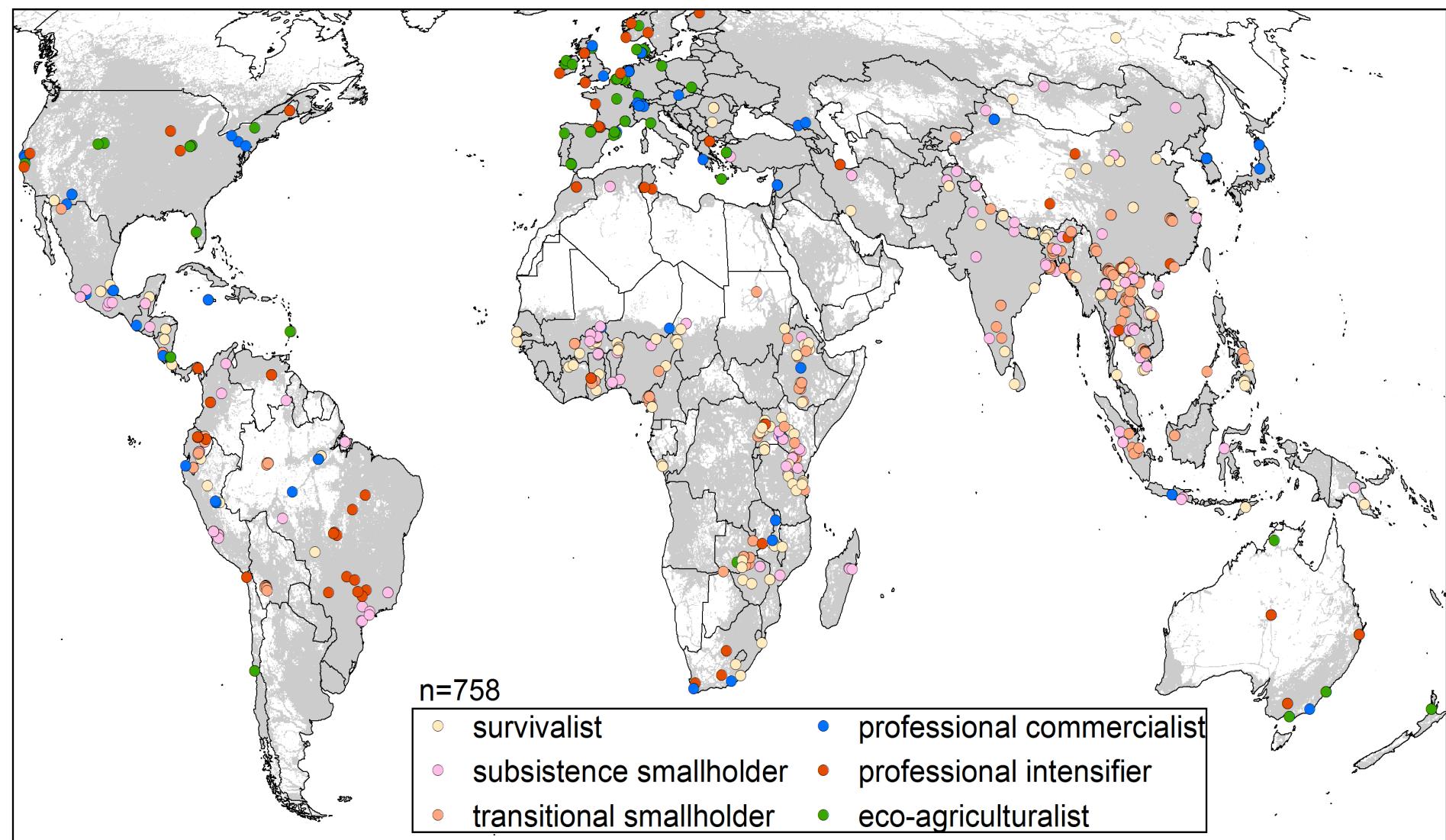


RESULTS: TYPOLOGY OF DECISION-MAKING



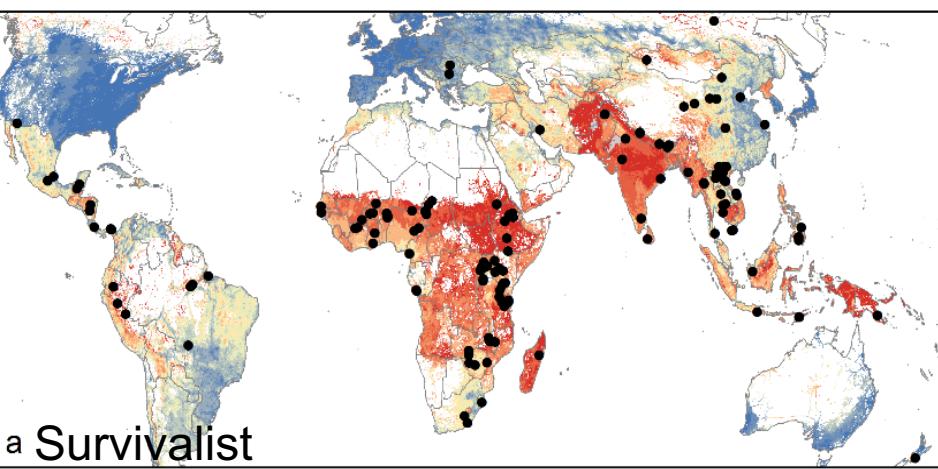
RESULTS: DRIVERS AND LAND USE CHANGE



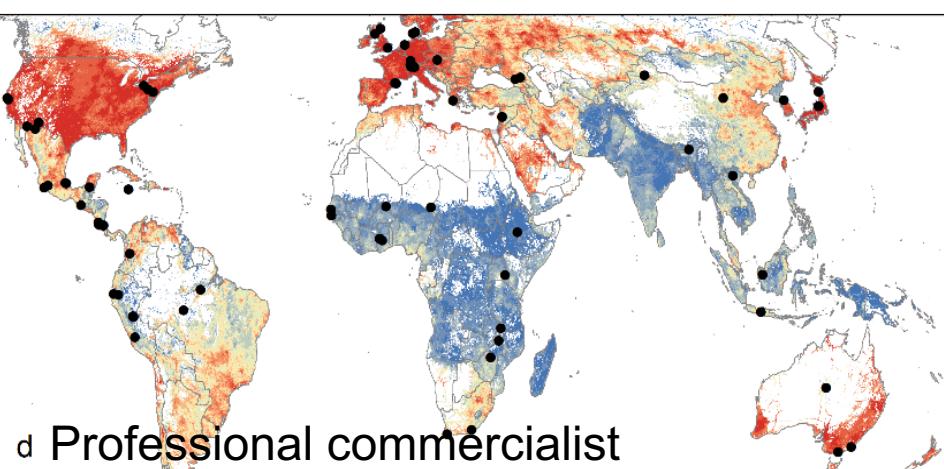


LOCATION CHARACTERISTICS

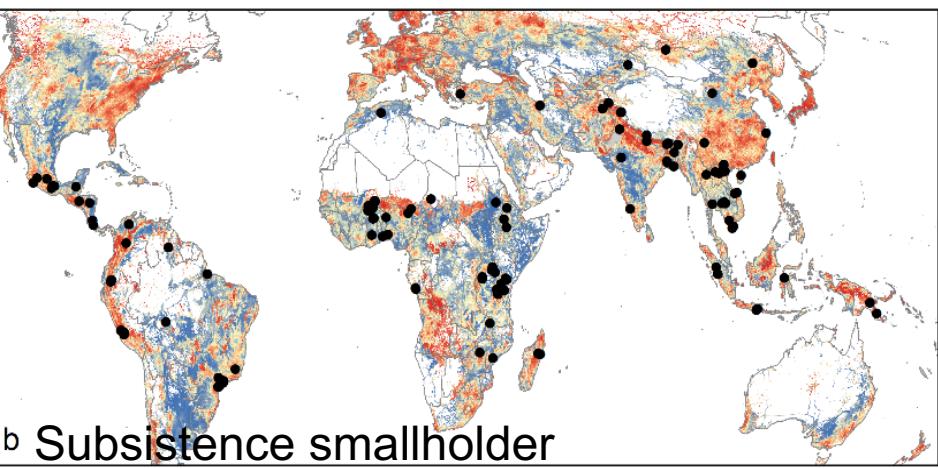
	Subsistence smallholder	Market-or. smallholder	Professional commercialist	Professional intensifier	Eco- agriculturalist
Intercept	-0.291	-1.325	-0.69	-0.656	-4.717
Population density	0.005	0.217*	-0.087	-0.039	-0.162
Poverty	0.093	0.219	-0.402	-0.284	-0.61
Distance to cities	0.224	0.635*	-1.133*	-1.333*	-4.272**
Market access	0.236	0.05	0.238	-0.138	-0.186
Malnutrition	0.087	-0.457**	-1.011**	-1.083**	-4.382**
Distance to roads	-0.04	-0.446*	-0.128	-0.256	0.263
Irrigation	0.133	0.326*	-0.065	0.124	-0.197
GDP	0.151	-1.259**	0.468	0.83**	1.213**
Slope	0.082	-0.286*	-0.036	-0.383*	-0.773**
Soil clay	-0.451**	-0.081	0.02	-0.122	-0.639*
Soil drainage	0.097	0.161	0.168	-0.532**	0.073
Soil pH	-0.25	-0.296	0.289	-0.197	-0.18
Precipitation	0.186	0.378*	0.246	-0.159	0.36
AUC	0.76	0.8	0.75	0.83	0.94



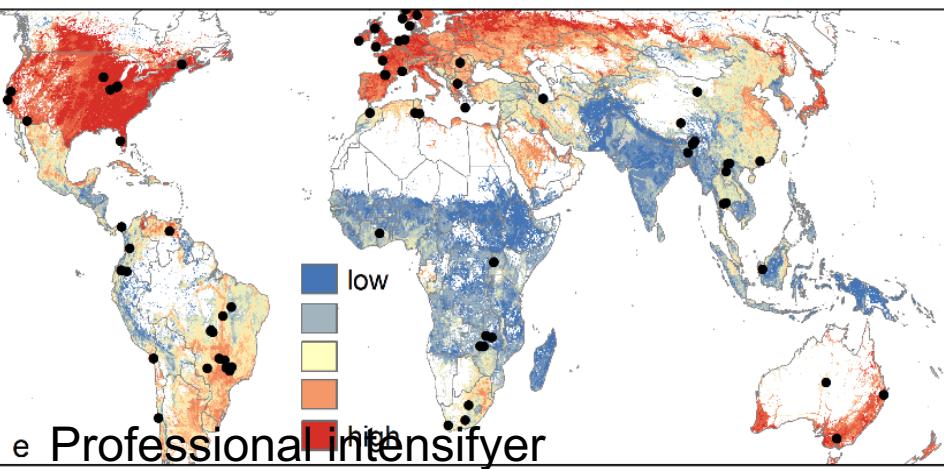
a Survivalist



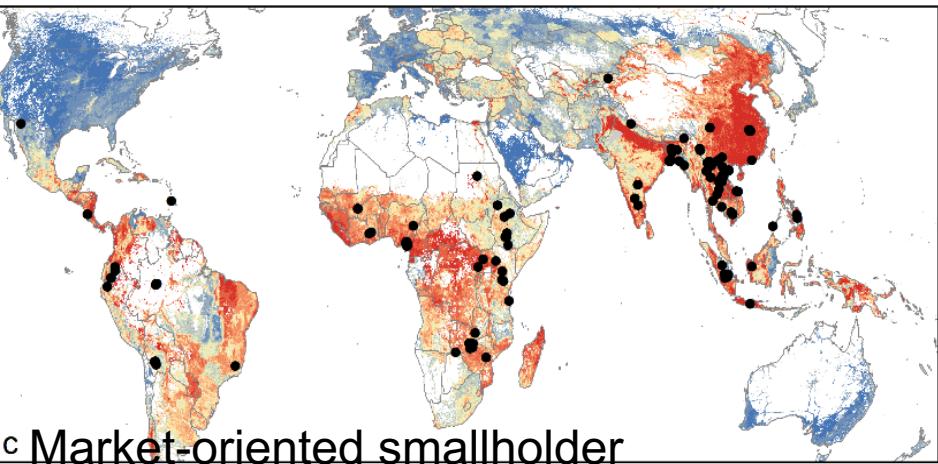
d Professional commercialist



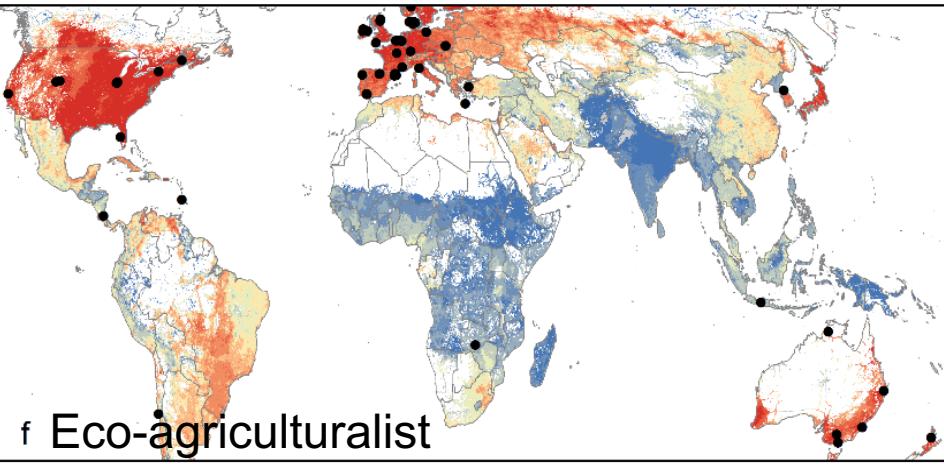
b Subsistence smallholder



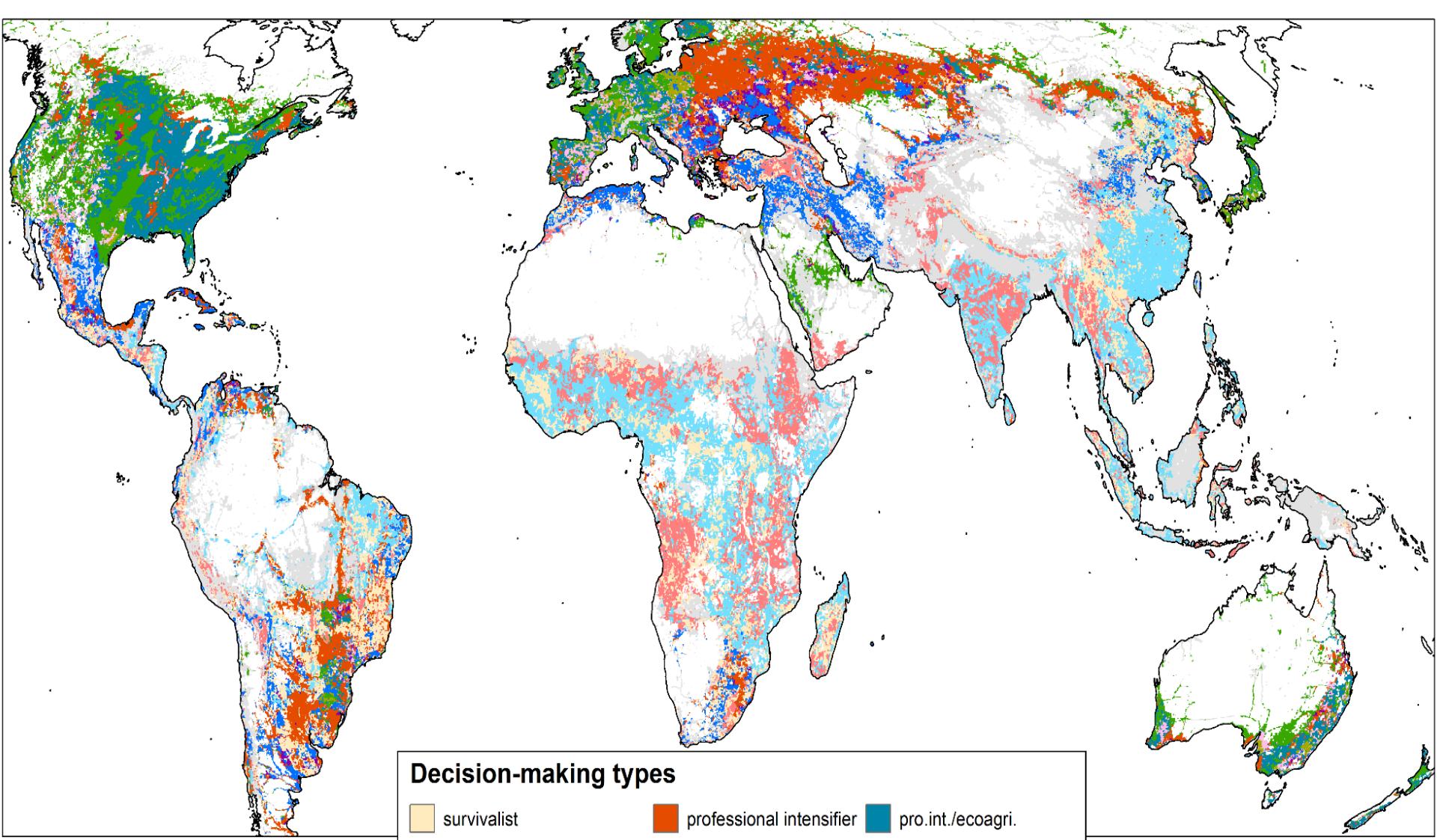
e Professional intensifier



c Market-oriented smallholder



f Eco-agriculturalist

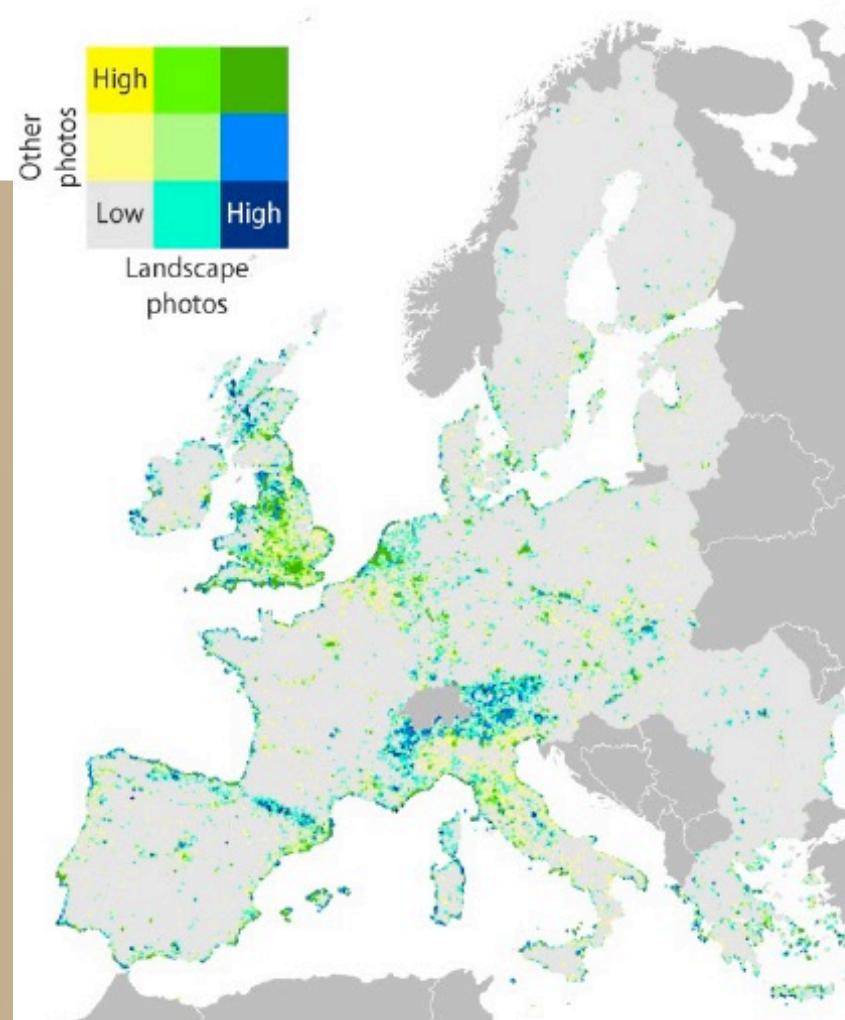
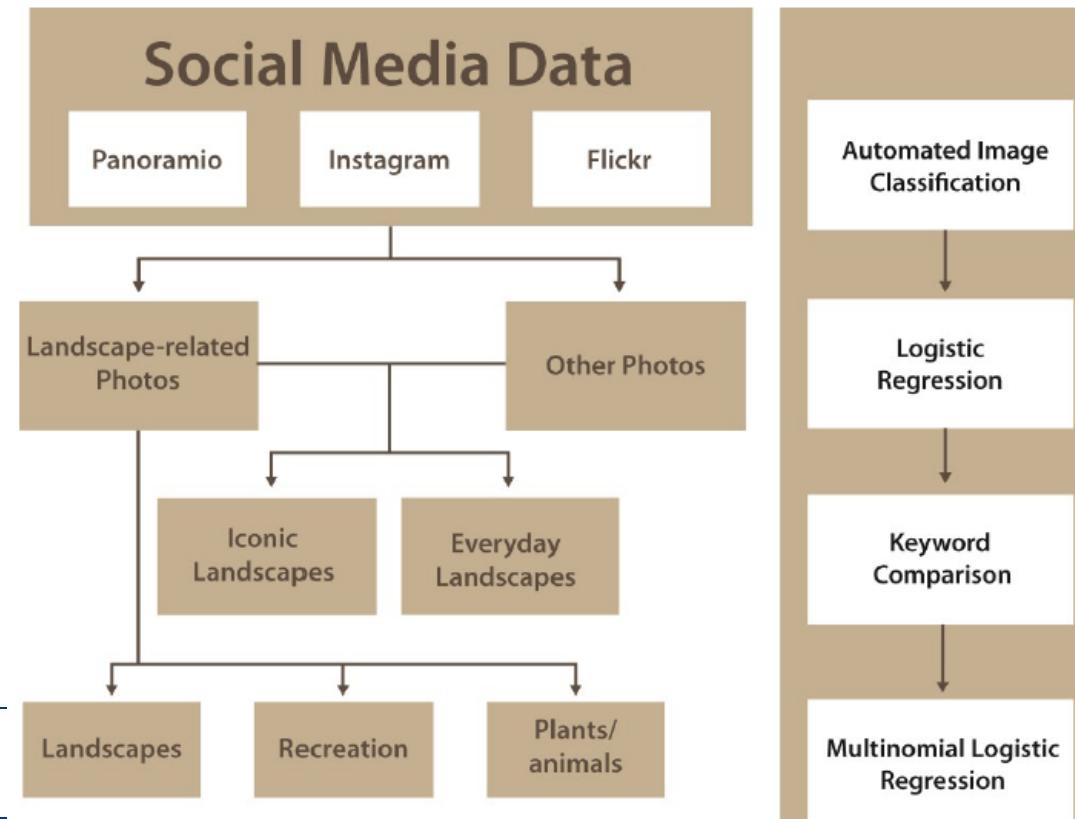


Decision-making types

survivalist	professional intensifier	pro.int./ecoagri.
subsistence smallholder	eco-agriculturalist	pro.com./inten/ecoagri.
transitional smallholder	pro.com./inten.	low confidence areas
professional commercialist	pro.com./ecoagri.	

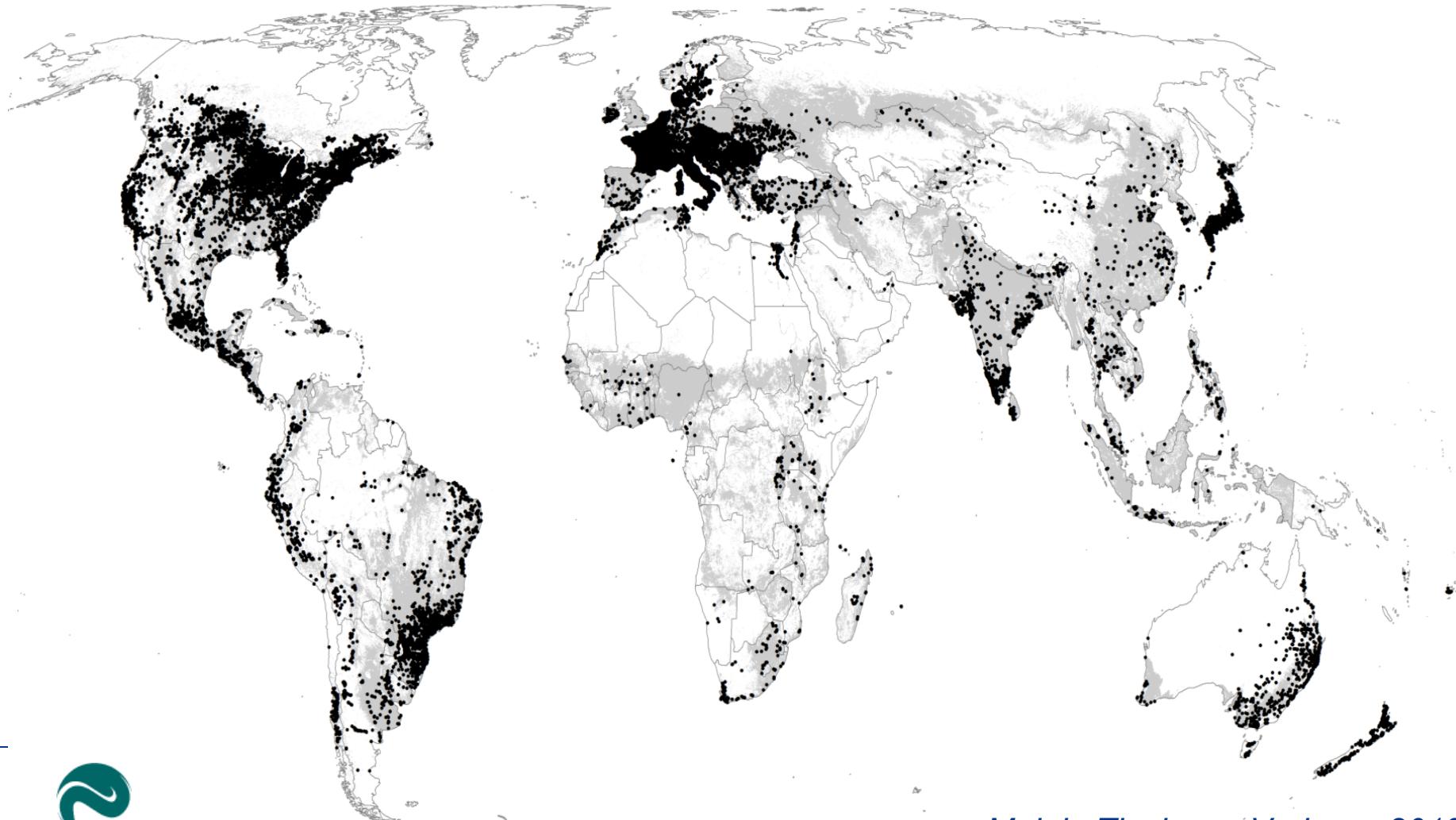
Social Media big data

- Actual behavior: signals of location etc
- Stated behavior: photos, text
- Few applications for land use



Location choice for organic agriculture

Locations of organic agriculture certificates



Location choice for organic agriculture

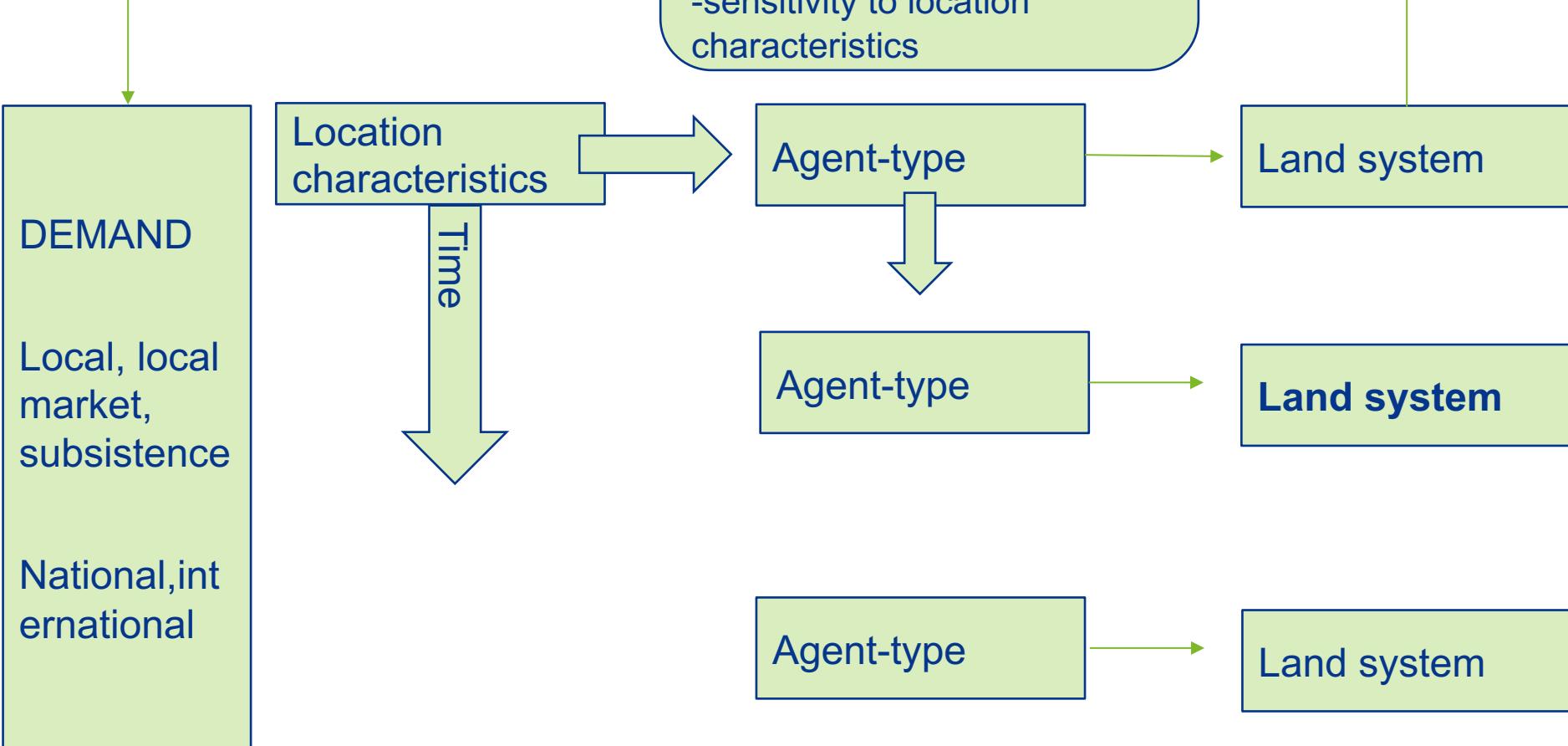
	national	all
population density	0.243	0.584
rural population		0.086
market access	0.160	0.370
poverty	-0.532	-0.434
irrigation		0.176
precipitation	0.250	0.325
temperature	0.376	1.001
PET	-1.725	-2.150
sand	0.039	0.148
drain		-0.040
pH		0.036
soil depth		-0.187
cecs	0.159	-0.087
organic content	-0.074	0.027
altitude	0.057	-0.094
slope	0.334	0.332
constant	-1.423	-0.060
AUC	0.853	0.883



Location conditions of organic farms as compared to conventional farms

And then: a model...

Decision making:
-sensitivity to local vs international demand
-sensitivity to technology
-sensitivity to location characteristics



THANK YOU

