Appendix 4. Cattle ranchers' livelihoods: analysis and results

We analyzed the cattle rancher's livelihoods according to their socio-demographic variables (see Appendix 2). We used a Multiple Correspondence Analysis (MCA) when individuals were described by categorical variables (Le et al. 2008). MCA allowed us to see the relationship between variables and the associations between categories, and to characterize groups of individuals by category studied.

MCA also permitted us to explore patterns within a set of categorical variables. The ordering was composed of the dimensions which are obtained from the categorical variables. MCA was then used to graphically summarize relationships among different categories and as pre-processing before doing a Hierarchical Clustering on Principal Components (HCPC) analysis. HCPC was used to graphically summarize relationships among different individuals and their livelihoods.

Results showed that the variables, education, diversity of productive activity, and age; describe the dimension 1 of the principal components (Fig. A4.1). Other variables (e.g "ejidatarios") are linked to both first and second dimensions. A deep knowledge of (levels) categories allowed us to interpret these relationships (Table A4.1).

Fig. A4.1. Representation of the categories according to the dimensions of MCA. Education ("escolaridad_f"), age ("edad_f") and diversity of productive activity ("otra_act_f") are linked to dimension 1 (which explains the 19.39% variation between individuals).

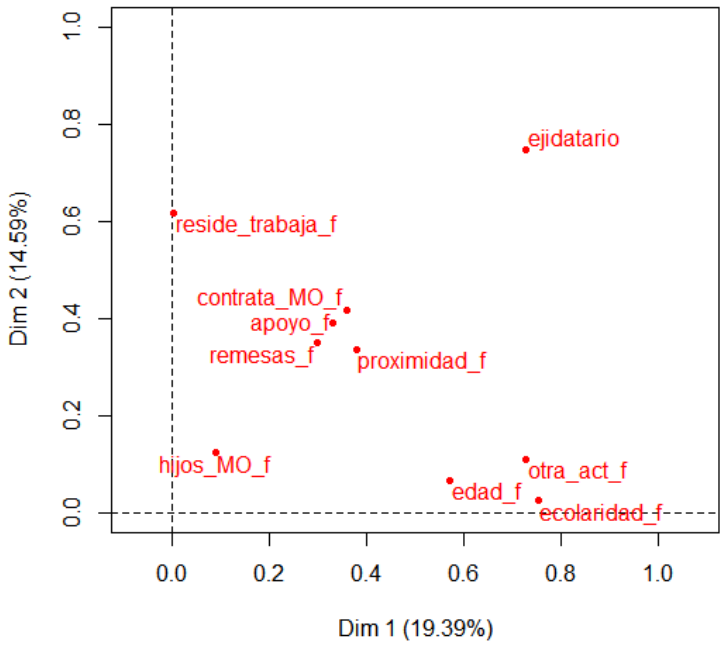

Table A4.1. Description of the dimension 1 by level of categorical variables: *Education* ("escolaridad_f") = None-incomplete means that the cattle rancher had not attended school or only studied a few years at primary school. *Productive activity* ("otra_act_f ") = the cattle rancher had no another productive activity apart from cattle raising. *Age* ("edad_f") = was older than 65 years old.

Variable	Category	Estimated value (in test.t)	p-value
Education	None-incomplete	0.568	4.888985e-09
Productive activity	No (has another activity)	0.558	1.588251e-08
Age	Older	0.495	5.099098e-06

We found two subgroups between individual cattle ranchers in a hierarchical clustering (Fig. A4.2). Members of subgroup 1 (cluster 1, in black) were characterized by the highest education and diversity of productive activities and, in general, were younger than 65 years old. Members of subgroup 2 (cluster 2, in red) were characterized by less education and diversity of productive activity, and, generally were older than 65 years.
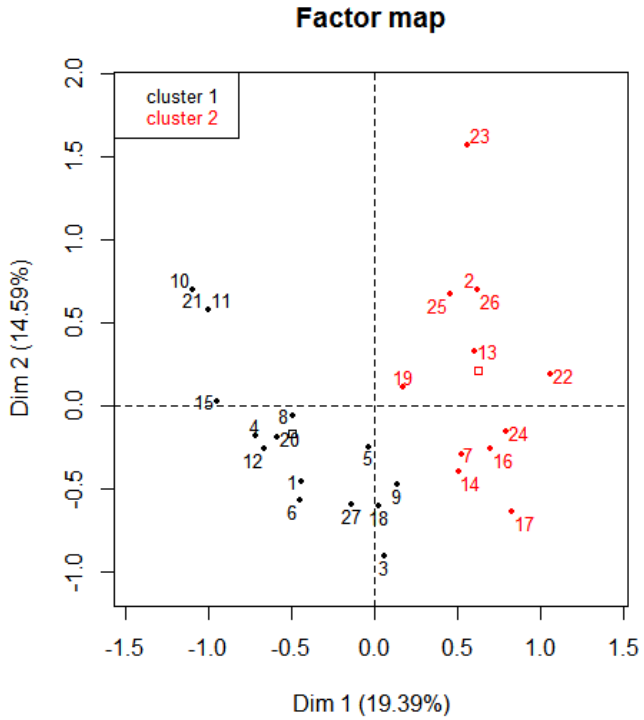
Fig. A4.2. Factorial map showing the two subgroups of individuals suggested by the HCPC analysis on the principal component map. Cluster 1 is described as subgroup 1 and cluster 2 is subgroup 2.