Appendix 1 Attribution of values for ecosystem services to each social-ecological patch

Social-ecological patches generate distinct but overlapping sets of provisioning ecosystem services used directly by the local population for multiple benefits (Fig. A1.1). The attribution of values for ecosystem services to each social-ecological patch builds on previous in-depth fieldwork (Sinare et al., 2016) that captured local knowledge on distribution of key ecosystem services using a diverse set of participatory research methods. The relative importance of each social-ecological patch for each provisioning ecosystem service was assessed using matrix scoring in 36 focus groups. Scores represented the relative contribution per unit area of each social-ecological patch to each of the provisioning ecosystem services and were normalized to 100, so that for each ecosystem service, the contribution of all social-ecological patches sum up to 100.

In this paper we used the scores to develop the simple model for backwards extrapolation (Fig. A1.2), and for that purpose we modified the matrix of ecosystem service production by social-ecological patches created by Sinare et al. (2016), in three major ways. First, because fallow cannot be distinguished from other patches on aerial photographs, the category of fallow was removed. The scores for the remaining social-ecological patch categories were adjusted so that their relative importance for each ecosystem service stayed the same, while still normalizing to 100. Second, in response to feedback in focus groups in January 2016, we adjusted the scores for relative productivity of annual crops so that homesteads generated double the production of fields, and depression 1.66 times the productivity of fields. Villagers argued that homesteads have in general more intensive management (including more nutrient inputs). Depressions have better soils and higher water availability, also maintaining a higher yield in drier years. Finally, since there are no woodlands among the current social-ecological patches, but these were identified in the past, we had to estimate what ecosystem services woodlands produce. We assumed that woodlands produce the same amount of ecosystem services as fields for ecosystem services from woody vegetation, but provide no contribution to cultivated ecosystem services, as woodland has similar cover of woody vegetation as fields, but are not cultivated. As forest only covers < 5% of the village surface and was pooled with shrubland in Sinare et al. (2016), forest has no scores in the analysis. Most forest patches are sacred and do not contribute provisioning ecosystem services, while non-sacred forest is

similar to dense shrubland. Forests have strong cultural meaning, and would have had values if cultural and regulating ecosystem services were included in the analysis.

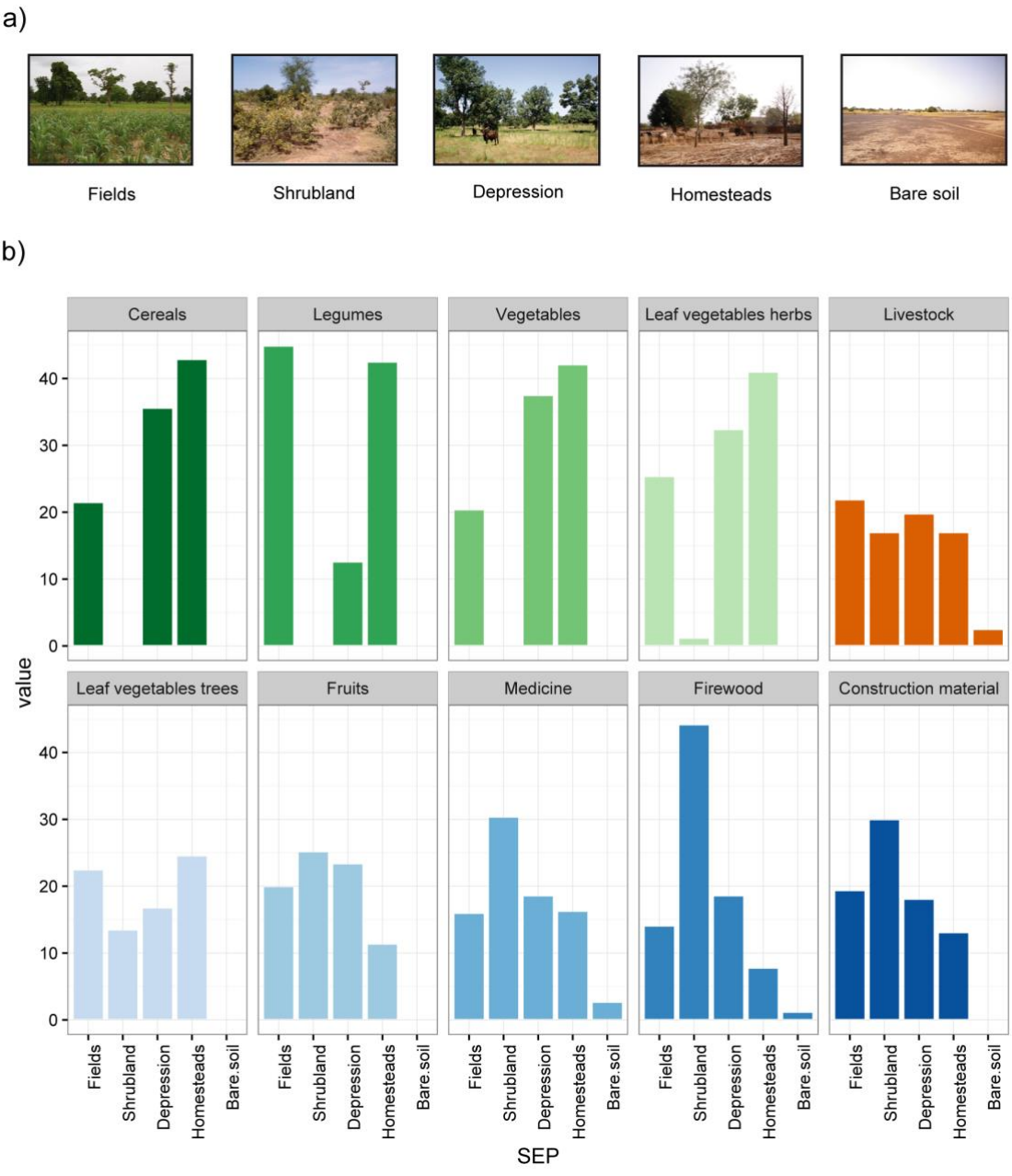

Fig. A1.1 a) Photographs of social-ecological patches today, and b) their related sets of ecosystem services adjusted from Sinare et al. (2016). Values indicate the relative contribution per unit area of each social-ecological patch to that ecosystem service, and is normalized to 100 for each ecosystem service

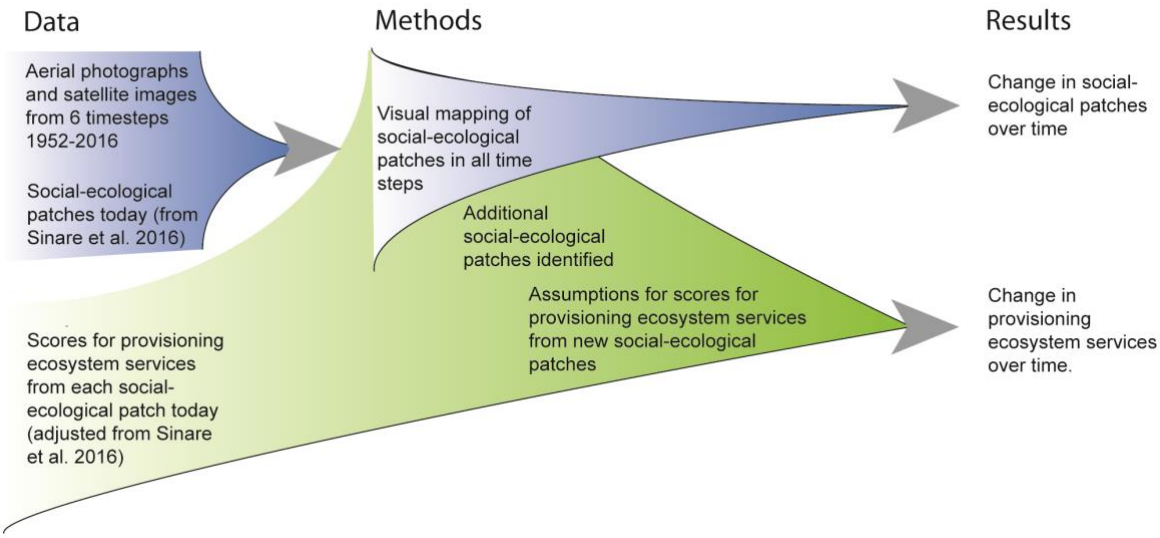

Fig. A1.2 Schematic illustration of data and methods used to identify change in social-ecological patches and change in provisioning ecosystem services over time