

Caveats concerning the map classifications and possible improvements

1. Global livestock production systems

Below, we point out several caveats regarding our analysis and identify ways in which the map of global livestock production systems could be improved.

- 1.1 Our classification depends on data of land cover/land use from the United States Geological Survey (USGS), and is limited by that data set. In the analysis, we classified all USGS categories that represent pure or mixed cropland as mixed farming systems. We think this results in an overestimation of the area of cropland in East Africa and an underestimation of the cropland in West Africa. For example, in West Africa, the map shows very little cultivation on the border of the semi-arid/sub-humid zone (the Guinean savanna). This is particularly apparent in central Nigeria. Our long-term field observations of farming systems in Nigeria, Niger, Burkina Faso and Côte d'Ivoire do not match this interpretation: for example, in central Nigeria, mixed crop–livestock systems are common and cover large areas. Using human population density, we were able to correct for this problem in the current analysis. In eastern and southern Africa, our field observations lead us to conclude that there are large areas where cropping was overestimated. This was not corrected in the current analysis, but the solution is more complicated. Improvements in the future will come from consulting detailed land-use maps for each of the countries of the region, and substituting those for the USGS coverage.
- 1.2 Another caveat and improvement concerns the amount of variation within all of our production systems categories. For example, the mixed-farming systems or rangelands in East Africa are predominantly on rich volcanic soils associated with the highland areas. These differ markedly in agricultural production potential from those systems that are classified in the same way on our map in the rest of Africa: there, soils were weathered from the nutrient-poor African shield and thus their potential is much lower. In rangelands, this results in the presence of a very

different complement of herbivores, different vegetation, and thus different livestock production potential. In the nutrient-poor (dystrophic) savannas of southern and western Africa, forages are poor in quality and carrying capacity is lower than in the nutrient-rich (eutrophic) savannas of East Africa. The impact of livestock on natural resources also contrasts strongly in these regions: integrated livestock–wildlife systems in East Africa appear to be compatible (Reid et al., 2001), whereas they often are not in southern Africa (du Toit and Cumming, 1999). There may also be differences in the level of poverty of livestock keepers in these areas that is associated with livestock production potential, but this is unknown. These illustrations demonstrate that it is important to recognise the wide range in variation within each of the production system categories when using this map.

- 1.3 Our projection of human populations to the year 2050 contains a weakness that affects the population projections and also the future production systems map. The human population projection assumes that any cell with zero population in the year 2000 will still have no population in the year 2050. In order to overcome this problem, we intend to create a model of migration rates and locations in the future. It is logical to assume that there will be some migration into these areas as the human population grows over the next 50 years, and this improvement will account for those anticipated changes in the location of future human populations.
- 1.4 Lastly, there is a caveat associated with the category classified as 'other' on this map. This category contains ecosystems that range from arctic tundra to tropical rainforest to desert. Thus, it is important appreciate the wide range of systems represented by this category across the world. For example, the 'other' category in southern Tanzania is miombo woodland on nutrient-poor soils, whereas the same category in northwestern Tanzania is the water body of Lake Victoria. The map was created to show production systems alone and puts all non-livestock production systems into this category. The 'other' category can be described as all areas

where human populations and livestock populations are low, and that support widespread, intact native vegetation.

Also within the 'other' category are areas that are barren and sparsely vegetated. In some cases, these include very arid rangeland systems where livestock are kept by nomadic pastoralists on annual grasslands. One such area that is classified in this way is northwestern Kenya, where the Turkana pastoral people live and raise stock. Another is along the border of the Sahel where Fulani graze their cattle in the wet season and Tuareg people depend heavily on livestock. There are other areas like these in northern Africa, Eritrea, Djibouti and Namibia. These areas are small, so their exclusion does not significantly affect the production systems map.

2. Poverty maps on a global scale

The poverty maps in Section 2 of this report represent a considerable improvement over existing maps at national scale. In all such analyses, however, some compromises had to be made because of the lack of data. For example, for the global analysis, we had to assume that poverty rates for a particular country applied to all the production systems within that country. Data that would allow us to differentiate between different production systems within countries simply do not exist except in specific areas. Further, even if these data were available, there is little information on the geographical distribution of poverty within each production system within a country. It is reasonable to suppose that there are more poor people in more marginal systems, but currently information on these questions are very limited. Future improvements in global poverty maps will require the collection of such information.

3. Poverty maps of livestock keepers

General poverty maps may only poorly represent the distribution of poverty among livestock keepers. This is because the proportional importance of livestock to household income differs from one culture to another and within production systems. For example, mixed crop–livestock farmers have opportunities for obtaining income from a variety of sources; thus, income from livestock probably contributes a smaller proportion to their household food basket. By contrast, most pastoralists depend on livestock for a large proportion of their income, although this is changing. Thus, any map of poverty in livestock keepers needs to account for the importance of livestock to income at the household

level. Information on the importance of livestock for rural livelihoods is difficult to find. As described earlier in this report, one possibility is to use the density of tropical livestock units per person as a proxy for this importance on the basis that higher livestock numbers per person indicate that livestock are more important to household incomes within a particular system. This assumption has some obvious flaws; perhaps areas with more livestock per person are areas that have more income opportunities of all kinds. Other options are outlined in Section 2.5 of the main report.

References

- du Toit J.T. and Cumming D.H.M. 1999. Functional significance of ungulate diversity in African savannas and the ecological implications of the spread of pastoralism. *Biodiversity Conservation* 8: 1643–1661.
- Reid R.S., Rainy M.E., Wilson C.J., Harris E., Kruska R.L., Waweru M.N., Macmillan S.A. and Worden J.S. 2001. *Wildlife cluster around settlements in Africa. People, Livestock and Environment Working Paper No. 2*. ILRI (International Livestock Research Institute), Nairobi, Kenya. 25 pp.