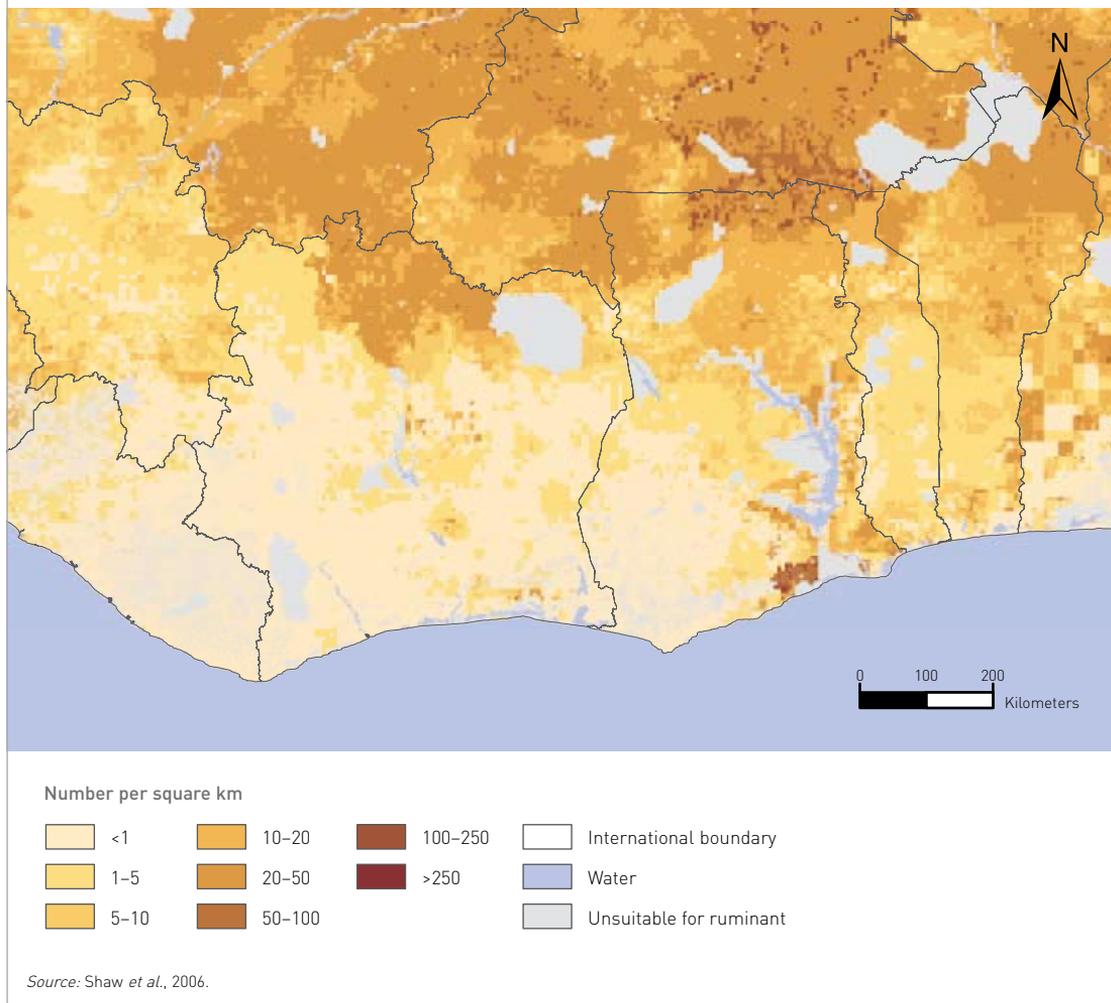


### 7.7 MODELLED CATTLE DENSITY AFTER 20 YEARS OF TSETSE AND TRYPANOSOMIASIS CONTROL IN WEST AFRICA



and Thornton, 1999) and the International Water Management Institute world water and climate atlas<sup>41</sup>. Irrigation data were taken from Doll and Seibert, 2000; elevation from the GTOPO30 DEM<sup>42</sup>; cropping was derived from a number of datasets, including those described in Loveland *et al.*, 2000; Anderson *et al.*, 1976, and Wood *et al.*, 2000, but was heavily dependent both on interpretation and on expert opinion; night-time lights were taken

from the NOAA/National Geophysical Data Center Stable Lights and Radiance Calibrated Lights of the World<sup>43</sup>; and human population data were taken from various sources (Hyman *et al.*, 2000; Reid *et al.*, 2000; Deichmann, 1996)<sup>44</sup>. Figure 7.9 provides an example of the resultant livestock production systems classification for Africa.

The above livestock production system classification does not incorporate livestock population data

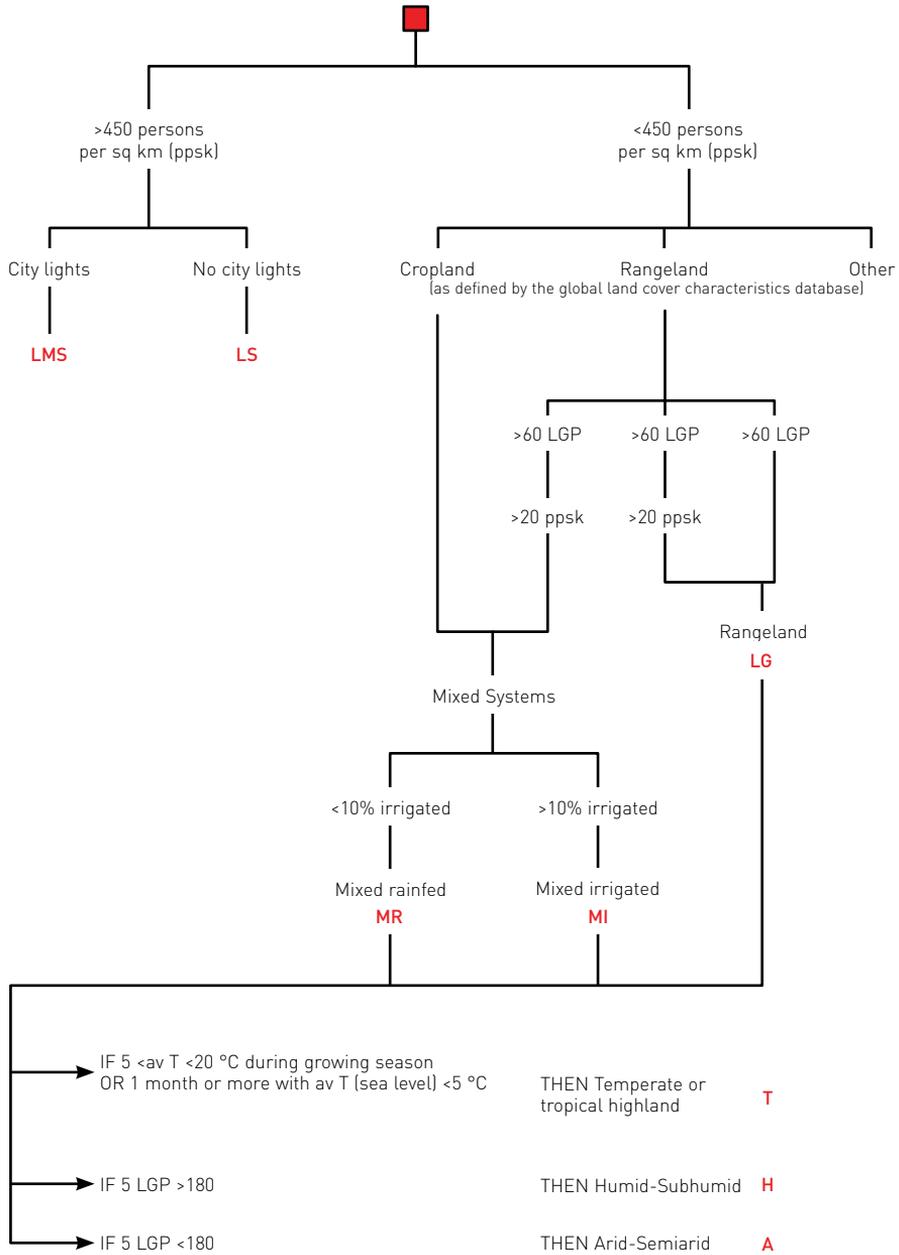
<sup>41</sup> <http://www.iwmi.cgiar.org/watlas/atlas.htm>

<sup>42</sup> <http://edc.usgs.gov/products/elevation/gtopo30/gtopo30.html>

<sup>43</sup> [http://www.ngdc.noaa.gov/dmsp/download\\_night\\_time\\_lights\\_94-95.html](http://www.ngdc.noaa.gov/dmsp/download_night_time_lights_94-95.html)

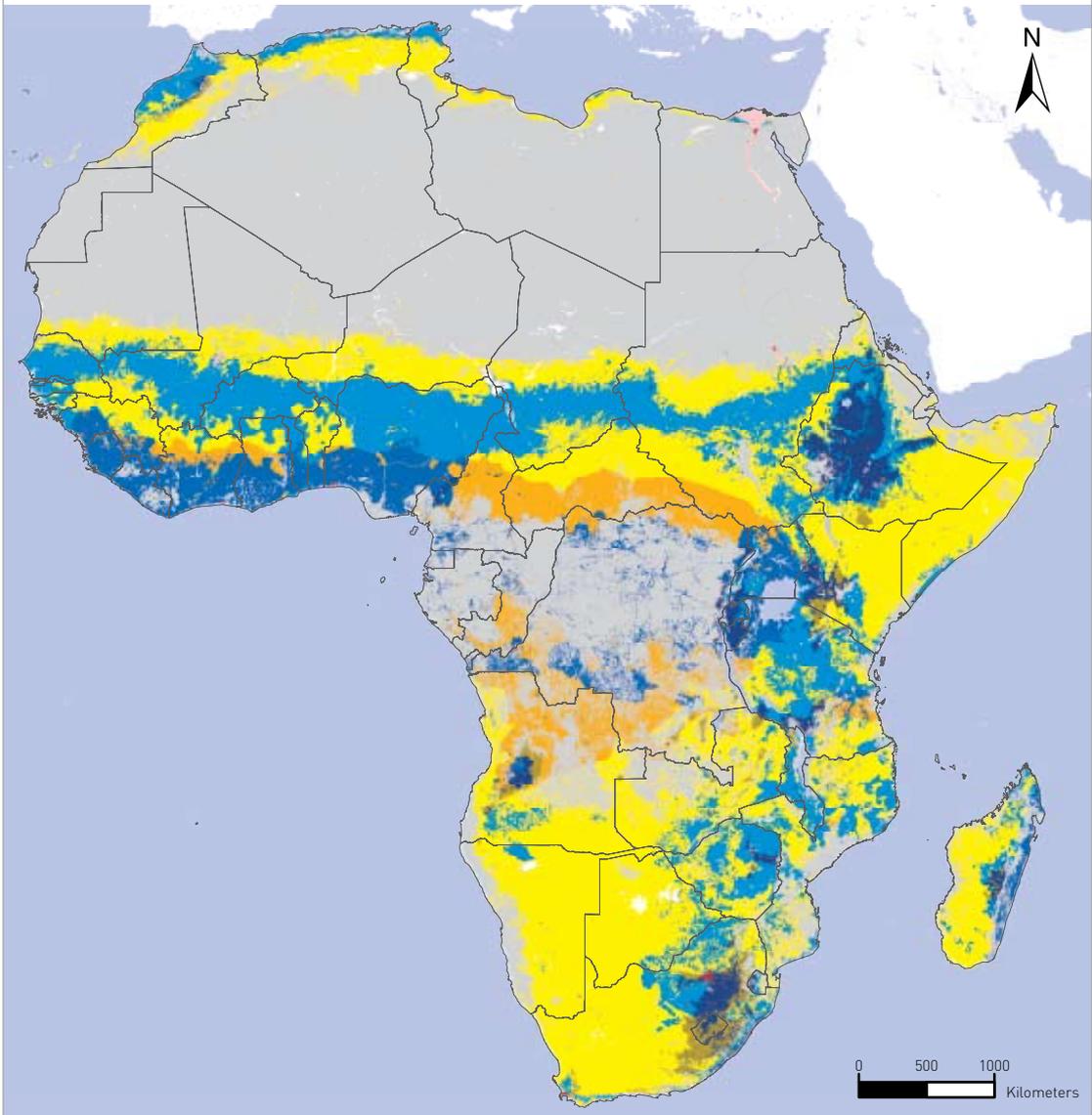
<sup>44</sup> <http://grid2.cr.usgs.gov/globalpop/>

**7.8 DECISION TREE FOR MAPPING LIVESTOCK PRODUCTION SYSTEMS**



Source: Thornton et al., 2002.

## 7.9 LIVESTOCK PRODUCTION SYSTEMS IN AFRICA



## Production systems

 LGA	 MIA	 MRA	 Other	 International boundary
 LGH	 MIH	 MRH	 Urban	 Water
 LGT	 MIT	 MRT		

Source: Reproduced from Thornton *et al.*, 2002.

**TABLE 7.1 DESCRIPTIONS AND EXAMPLES OF LIVESTOCK PRODUCTION SYSTEMS**

Production system	Examples
LGT: Temperate and tropical highlands (COLD GRASS)	<ul style="list-style-type: none"> <li>• Mongolia's steppe system</li> <li>• Dairy systems near Bogota, Colombia; Peru and Bolivia Altiplano camelid and sheep-grazing systems</li> <li>• Chinese merino wool sheep on communal grazing</li> </ul>
LGH: Humid/subhumid tropics and subtropics (WET GRASS)	<ul style="list-style-type: none"> <li>• Extensive ranching in South American lowlands</li> <li>• Ranching systems in West and Central Africa</li> <li>• Amazonian ranching</li> </ul>
LGA: Arid/semi-arid tropics and subtropics (DRY GRASS)	<ul style="list-style-type: none"> <li>• Pastoralists in the Sahel</li> <li>• Near East and North Africa pastoralists</li> <li>• Beef-milk systems on pastures in Mexico, Venezuela</li> <li>• Southern Africa ranches</li> </ul>
MRT: Temperate and tropical highlands mixed rainfed (COLD MIXED)	<ul style="list-style-type: none"> <li>• Smallholder peasant farmers in northern China</li> <li>• Smallholders in Ethiopian highlands where oxen for traction is important</li> <li>• Mixed crop-livestock smallholders in highlands of Central and South America</li> <li>• Smallscale peri-urban dairy in East African highlands</li> </ul>
MRH: Humid/subhumid tropics and subtropics mixed rainfed (WET MIXED)	<ul style="list-style-type: none"> <li>• Areas of South America where rainforests are being cleared</li> <li>• Large areas of sub-Saharan Africa (tsetse 'belt')</li> </ul>
MRA: Arid/semi-arid tropics and subtropics (DRY MIXED)	<ul style="list-style-type: none"> <li>• Dryland farming-sheep systems in West Asia-North Africa and India</li> <li>• Small ruminant-cassava systems in northeast Brazil</li> <li>• Mixed crop-livestock farms in Burkina Faso, Nigeria</li> <li>• Dairy in Senegal and Mali</li> </ul>
MIT: Temperate and tropical highlands mixed irrigated (COLD IRRIGATED)	<ul style="list-style-type: none"> <li>• Mediterranean region</li> <li>• Far East Asian irrigated rice/dairy farms</li> </ul>
MIH: Humid/subhumid tropics and subtropics mixed irrigated (WET IRRIGATED)	<ul style="list-style-type: none"> <li>• Irrigated rice-buffalo systems of the Philippines, Viet Nam and India</li> <li>• Irrigated rice, pig and poultry enterprises in Asia</li> </ul>
MIA: Arid/semi-arid tropics and subtropics mixed irrigated (DRY IRRIGATED)	<ul style="list-style-type: none"> <li>• Small-scale buffalo milk production, Pakistan &amp; India</li> <li>• Animal-traction-based cash crop production in Egypt and Afghanistan</li> <li>• Intensive dairy systems in California (United States), Israel, Mexico</li> </ul>
Other/Urban: Landless mono-gastric systems: value of production of the pig/poultry enterprises > the ruminant enterprises	<ul style="list-style-type: none"> <li>• Pig production in Asia</li> <li>• Poultry production in Central and South America</li> </ul>
Other/Urban: Landless ruminant systems: value of production of the ruminant enterprises > the pig/poultry enterprises	<ul style="list-style-type: none"> <li>• Landless sheep production systems in West Asia-North Africa</li> <li>• Sheep fattening operations in Syria and Nigeria</li> </ul>

*Source:* Reproduced from Thornton *et al.*, 2002.

in its definition. It tends to amalgamate similar systems and fails to capture important differences in use and livestock husbandry practices within categories, e.g. grassland-based grazing combines pastoralists and ranchers, which are clearly

not equivalent. However, it is undoubtedly the most appropriate classification system available, and does provide a relevant stratification through which to describe, visualize and explore livestock and livestock-related issues. Table 7.1, reproduced

from Thornton *et al.*, 2002, gives examples of systems around the world that fall under each of the 11 categories defined.

When these production systems are combined with the gridded livestock data presented here, estimated numbers of livestock can be extracted by production system. Compared with simple national totals, this gives a more meaningful breakdown of how livestock are distributed across the globe. As an example that shall be returned to later, Table 7.2 gives a breakdown of cattle numbers (in this case adjusted to FAOSTAT 2005 national totals) by livestock production system in the Horn of Africa. Tables of global livestock numbers by country and, where available, by production system, are given in the annex hereto.

In their original application of these livestock production systems, Thornton *et al.*, 2002, used them to delineate and extract a number of socio-economic variables. They produced tables, for each production system in developing countries, of estimates of the numbers of people, poor people and poor livestock keepers. This type of application is useful for regional targeting and for impact assessment. Since the systems are defined in terms of population density and LGP, the classification can be re-evaluated using different scenarios of population and LGP. A tentative assessment of how these systems might be transformed by human population growth and climate change was thus made, giving some clues as to how the distribution of farming systems may change in the future.

The original livestock production system maps produced by Thornton *et al.*, 2002, did not provide global coverage. However, collaborative work is ongoing at FAO and ILRI to further develop and standardize global livestock production system maps for a number of applications.

### LIVESTOCK PRODUCTION ESTIMATES

Livestock production and off-take rates vary across different livestock production systems, and in a broadly predictable way. This introduces a further application that involves livestock production sys-

tem maps to provide a stratification scheme within which to parameterize livestock growth and off-take models.

The GLW maps of livestock densities have been used to map production and off-take levels in sub-Saharan Africa (Otte *et al.*, 2001). For example, beef and milk production and use of draught power per square kilometre have been estimated by deriving annual output per head of cattle within each of seven major agro-ecological zones. These zones were defined and mapped by combining a number of spatial variables (temperature, elevation, LGP and crop type) in a decision tree (FAO, 2002b); livestock production was modelled for each zone using the herd growth model within the Livestock Development Planning System Version 2 (LDPS-2) (FAO, 1997). The herd models were parameterized separately for each zone, based on available published data (for some parameters, data were sparse). These production maps can then be further combined with human population density maps to produce estimates of off-take per capita.

To illustrate the above, in Figures 7.10 and 7.11, meat and milk off-take has been re-evaluated using both the new GLW grids for Africa (Figure 5.4) and the Thornton *et al.*, 2002, livestock production systems (Figure 7.9) to stratify production modelling.

These production maps of Africa are part of an ongoing FAO effort to map livestock production globally, based on the GLW datasets.

### LIVESTOCK PRODUCTION BALANCE

Detailed information on levels of international trade in livestock products is sparse, most especially that which provides consistent and complete global coverage. The situation is improving, however, and the Commodities and Trade Division of FAO has compiled estimates of imports and exports of livestock products at the country level, largely derived from FAOSTAT data<sup>45</sup>. In some cases, details are even provided on the countries to which a specific

<sup>45</sup> <http://faostat.fao.org/>

**TABLE 7.2 CATTLE NUMBERS BY COUNTRY AND LIVESTOCK PRODUCTION SYSTEM IN THE HORN OF AFRICA, ADJUSTED TO FAOSTAT 2005 NATIONAL TOTALS**

Production System	Djibouti	Ethiopia	Eritrea	Kenya	Somalia	Sudan	Uganda	System Total
LGA	137 070	3 743 525	861 950	2 932 925	4 264 535	16 443 100	262 500	28 645 605
LGH	n.a.	43 625	n.a.	n.a.	n.a.	967 500	208 570	1 219 695
LGT	n.a.	220 300	21 960	512 775	1 380	6 320	10 560	773 295
MIA	n.a.	7 150	610	n.a.	79 315	400 150	n.a.	487 225
MRA	8 760	8 735 260	693 880	2 044 045	372 780	17 751 500	1 536 415	31 142 640
MRH	n.a.	1 280 250	n.a.	1 006 430	n.a.	8 230	2 791 160	5 086 070
MRT	n.a.	23 198 000	175 580	4 030 505	n.a.	20 000	856 155	28 280 240
Urban	0	0	n.a.	13 470	0	9 000	0	22 470
Other	151 170	1 271 890	196 020	1 459 850	631 990	2 719 200	434 640	6 864 760
Country Total	297 000	38 500 000	1 950 000	12 000 000	5 350 000	38 325 000	6 100 000	102 522 000

Notes: Livestock production system data were taken from Thornton *et al.*, 2002.  
n.a. indicates that system does not occur in a country.