

Cattle and Sheep from Old to New Spain: Historical Antecedents

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Abstract. The transfer of cattle and sheep from Spain to Mexico during the sixteenth century raises questions about regional evolution and variability of livestock economies in the source area, the regional and socioeconomic roots of the emigrants, and the ecological and economic integration of specific animals, management methods, and related products within New Spain. Such issues of diffusion, cultural adaptation and transformation must be disentangled before interpretation is attempted, and this paper focuses on the Old World antecedents. Traditional nineteenth-century patterns of livestock herding in different regions of the Iberian Peninsula were already established in Roman times and changed but little during the Islamic period. Long-distance sheep transhumance is verified prior to the Christian reconquest and was greatly amplified thereafter. Yet late Medieval Spain was not a great ranching frontier, but an agrosystem in which farming and livestock raising always formed a complementary but interlinked economy. This duality was expressed in different forms of land ownership: cultivated land was intricately subdivided and carried clear title, while pasture zones remained to some degree in the public domain. Sheep raising, both within the mixed, Mediterranean economy and in the form of long-distance transhumance (the *Mesta*), was broadly familiar throughout Castile and was reflected in similar counterparts on the Mexican plateau. But cattle raising was small-scale and of subordinate importance in Spain, except in the estuarine marshland below Seville. Whereas the early cattle owners in Mexico came from all over Spain, their highly extensive management style appears to derive from

the *Marismas* of Seville. This evidence may be explained by the interplay of cattle owners and cattle herders as they adjusted to a new ecology in the tropical lowlands.

Key Words: agrosystem, diffusion, *Mesta*, Mexico, Spain, ranching, transhumance.

CULTURAL and historical geographers working in eastern North America have until recently focused almost exclusively on European-derived culture spheres, viewing native American contributions as minor or peripheral. By comparison, Latin Americanists, both geographers and anthropologists, have concentrated their attention on indigenous roots, paying only nominal attention to Iberian components.

Latin Americanists, in their perception of Spain as seen from Hispanic America, have tended to assume a monolithic, common cultural hearth, even though sixteenth-century Spain consisted of a dozen or so culturally distinctive regions (Foster 1960). On the other hand, North Americanist geographers have sought to disentangle the multiple strands of European elements intertwined in the different culture spheres that emerged between the St. Lawrence River and the Georgia seaboard. They have also been explicitly interested in what Harris (1977) has called "the simplification of Europe overseas," i.e., the process whereby the great cultural variety encompassed by the North European immigrants was reduced to a much simpler and relatively homogeneous American and Canadian cultural repertoire.

These different preoccupations of research-

ers working north and south of the Rio Grande are, of course, reasonable in the context of their study areas. In Texas, situated on the border between the North and Latin American culture worlds, it is possible to see the benefits of complementarity between the two approaches. There are several ranching traditions in Texas, ultimately derived from different European roots (Jordan 1981; Jackson 1986). Iberian antecedents appear to have had considerable impact both indirectly, via Florida and the Carolinas, as well as directly, via Mexico, in regard to basic stock, management strategies, and the details of associated material culture and social customs. But such features did not come directly from Spain, but from the West Indies and the Gulf lowlands of Mexico (Doolittle and Jordan 1987; Doolittle 1987), where Iberian cattle raising was first adapted to new economic and ecological conditions and significantly transformed in the course of a century or two.

An analogy is provided by the mission irrigation systems of San Antonio, the origins of which are equally complex. That irrigation served and was at least maintained by Texas Indians, although the missions were founded by Franciscans and possibly craftsmen from central Mexico (Habig 1976), with the technology and water laws subsequently modified by settlers from the Canary Islands (Glick 1972). But Mexican and Southwestern irrigation derives from both indigenous and Iberian roots (Meyer 1984). So how exactly does one distinguish Indian and Spanish irrigation? Equally perplexing, was Canary Island water management different from earlier Spanish contributions to hydraulics in central Mexico?

Such questions are not purely academic. They are fundamental to understanding how Old World information and technology were selected, modified, and transformed in the Americas to create new agrosystems that have proven to be more successful than those of Europe. It is in Colonial Mexico or America that we can hope to learn how that searching and sorting-out process worked, how cultural elements were accepted or rejected, recombined, or transformed. This is a process that continues in the modern world, where we impatiently contemplate the seemingly erratic development of Third World nations. The Colonial eras on either side of the Rio Grande have much light to shed on how technology is diffused and

adapted and how societies acculturate or crystallize into new configurations.

This study is the result of comparative work on Hispanic livestock raising in Spain and Mexico that began with William Doolittle's suggestion that cattle raising in the Guadalquivir estuary of Spain and in the Pánuco estuary of Mexico may have had close historical and ecological linkages. A productive collaboration between Doolittle, Terry Jordan, and myself followed, in which each of us sought to unravel the broader problem from different vistas and experiences. From my own perspective, one of the central questions is the matter of regional roots in the Iberian Peninsula for key elements of agrotechnology introduced to Mexico by Spanish settlers. A second question concerns patterns of stock-raising and use of animal products in these specific Spanish source areas during the fifteenth and sixteenth centuries. A third question concerns the ecological suitability of specific animals, management methods, and their products—as components of an integrated economy in different environments and culture complexes of Colonial Mexico.

It bears emphasis that specific culture traits are not simply drawn from a variety of source areas in one country and reassembled in another:

- (1) Historical accident and cultural selection drew different segments of society from different regions, introducing a range of alternative socioeconomic components from Spain.
- (2) Whatever the pull factors, these selected strands of emigration were drawn in different proportions to different colonies of destination in the Americas.
- (3) Within any one new colony, the emigrants found a different range of potential opportunities to which they were able to adapt with variable levels of success, depending on their backgrounds.
- (4) The activities of the immigrants in a particular colony were channeled or restricted by administrative structures, planning and prevailing policies, and the regional strategies of and interference by the missionary orders, as well as market opportunities.
- (5) Collectively, the several selection and adaptive processes operating in the New World led to a fundamental recombination of the

Spanish socioeconomic components, favoring the crystallization of new, fully transformed, sociocultural and ecological-economic modes.

This argument implies that Old World antecedents and New World transformation should each be examined in their own right before broader generalizations are attempted. The present analysis attempts to take that first step by focusing on the historical evolution and adaptation of livestock raising on the Iberian Peninsula until the sixteenth century. A parallel study of the development of sheep transhumance in north-central Mexico, following an abortive attempt at pioneer cattle raising in the Bajío, has been initiated and served to sharpen the focus of the present paper.

Regional Roots

It is first necessary to identify the background of the early Spanish herd owners in Mexico. Fortunately, the archival data for legal immigration to the New World have been meticulously analyzed by Boyd-Bowman (1973, 1976a). For the sixteenth century, they include source areas for more than 17,000 emigrants to New Spain. The great majority came from the western half of Castile, with Lower Andalucía and Extremadura accounting for just under 50 percent (see Figs. 1 and 2). For our purposes, such aggregate data can be misleading, however, since 46 percent of the sixteenth-century emigrants to all destinations apparently came from urban areas (Boyd-Bowman 1976a). A detailed study of the 1900 emigrants of 1595–98 gives a modal picture of a poverty-stricken, urban Andalusian male, aged 27, unmarried and unskilled, probably semi-literate, and engaged as a "servant" to someone who paid his passage (Boyd-Bowman 1976b).

Equally misleading is the nature of the sample. The records of legal migration to the Americas total only 55,000, of an estimated 240,000 emigrants inferred from the number of vessels leaving Sevilla for the Indies during the sixteenth century (Mörner 1976). Based on the size of the ships, their complement of sailors, and the number of vessels remaining in the New World, about one-third of this much larger number were migrants signed on as sailors

(Mörner 1976). They would have come overwhelmingly from the areas of Sevilla and Palos, so that the contribution of Lower Andalucía will have been substantially greater than suggested by Boyd-Bowman's figures.

The lack of information on emigrant farmers is particularly frustrating. Farmers were not allowed to emigrate legally. But many rural emigrants escaped identification as soldiers, as the retainers or servants of prominent men, or as once-only sailors who had no intention of returning with their ships. But even so, we cannot know to what degree Spanish agrotechnology was implanted in the New World through the process of spontaneous migration. It is equally plausible to see the early transfer of livestock to New Spain as the collective result of decisions by individual colonizers, of the disproportional influence of aristocratic settlers with agricultural backgrounds, of royal edicts or policy, and of the missionaries who were so influential in transforming rural economies.

Another shortcoming is that the emigration details at present are limited to the sixteenth century. Emigration peaked during 1601–25, when an annual average of 4450 persons sailed for the New World (Mörner 1976). During the years 1528–91, the population of southwestern Spain was increasing dramatically, with an average annual growth rate of 0.62 percent in Extremadura and 0.57 percent in Lower Andalucía (Molinié-Bertrand 1985). In at least some areas this population explosion had begun almost a century earlier, and for 50 communities in the hinterland of Sevilla the growth rate 1433–1528 was 0.78 percent per year (Ponsot 1980). But a strategic sample of parish registers shows that the number of rural births in Andalucía plummeted 25 percent from 1580–1620, only recovering their former level after 1700; in Extremadura there was a 39 percent decline 1590–1659, with full recovery delayed until 1750 (Fortea 1981, 77–78; Nadal 1984, Table 10). By contrast, birth rates in Galicia and the Basque Country increased slowly but fairly steadily throughout the seventeenth and eighteenth centuries.

It can therefore be expected that first-generation colonists involved in later agricultural settlement on the Northern Frontier of Mexico often came from parts of Spain different from those who had developed the first haciendas around Puebla and Mexico City dur-

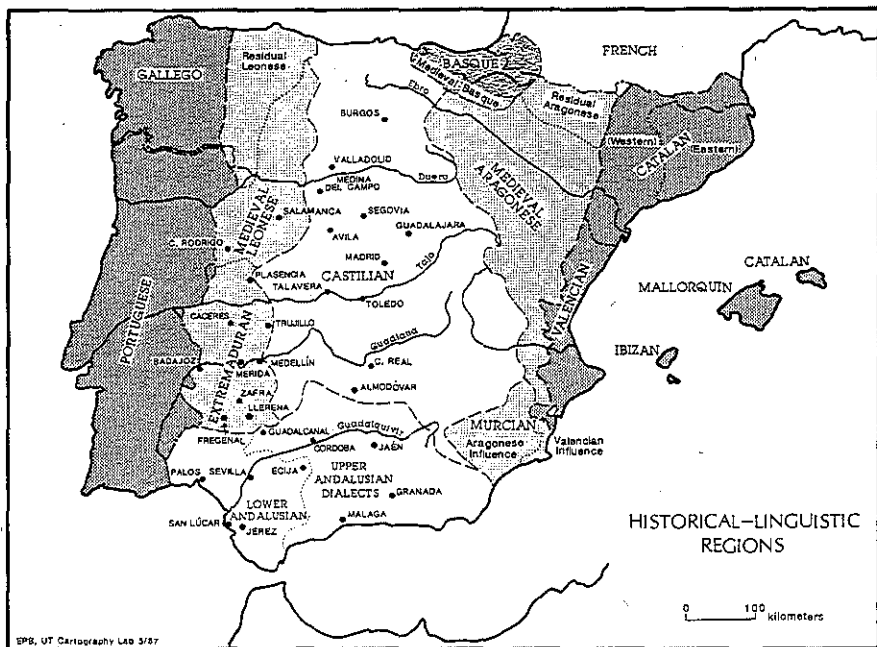


Figure 1. Languages and dialects provide one measure of regionalism on the Iberian Peninsula. Reflecting Medieval political fragmentation and the reconquest of the Islamic South, linguistic borders tend to run north-south. Catalan (and Valencian) in the east and Portuguese (and Gallego) in the west represent distinct but related languages, more closely linked to late Latin than Castilian. The Aragonese and Leonese dialects were eventually limited to small residual areas by the vigorous expansion of Castilian over other variants of Spanish in late Medieval times. Explanations for the emergence of the Andalusian dialect bundle, most closely related to New World Spanish, are controversial. Basque is an unrelated, non-Indoeuropean language that has retracted considerably since the early 1800s. Map based primarily on phonetic and lexical data in *Atlas Lingüístico* (1962) and Menéndez Pidal (1950). The main source areas of emigrants to the New World are highlighted by those towns supplying more than 200 verified emigrants by 1600 (Boyd-Bowman 1976a).

ing the sixteenth century. Even during that first, formative century, different source areas provided the colonists of Yucatán (predominantly from Old Castile and León), of central Mexico (mainly from Andalucía), and the northern mining districts of Mexico (Extremadura and New Castile, with a strong minority of Basques) (Boyd-Bowman 1973, 1976b). Distinctions must also be drawn between settlement by new immigrants versus internal migrants in fashioning the expanding frontiers of New Spain. Diffusion studies of agrotechnology from Spain to Mexico must therefore deal with specific regional and historical contexts.

Given these perspectives and caveats, it is

now possible to examine the roots of the emigrants more closely. Boyd-Bowman (1976a) lists 32 cities and towns as the chief urban component to colonization of the Americas. Examination of these centers reveals that their degree of urbanism varied greatly. Only 21 bore the title *ciudad* (a city with special privileges), seven had the title *villa* (in effect, "other" cities), and four were undistinguished *lugares* (small towns). Even the *ciudades* varied in size, from only 675 to 10,977 households or *vecinos* in 1528, numbers commonly multiplied by 4.5 to obtain an approximate number of inhabitants. The censuses of 1528, 1561 and 1591 (Molinié-Bertrand 1985) have been used to derive me-

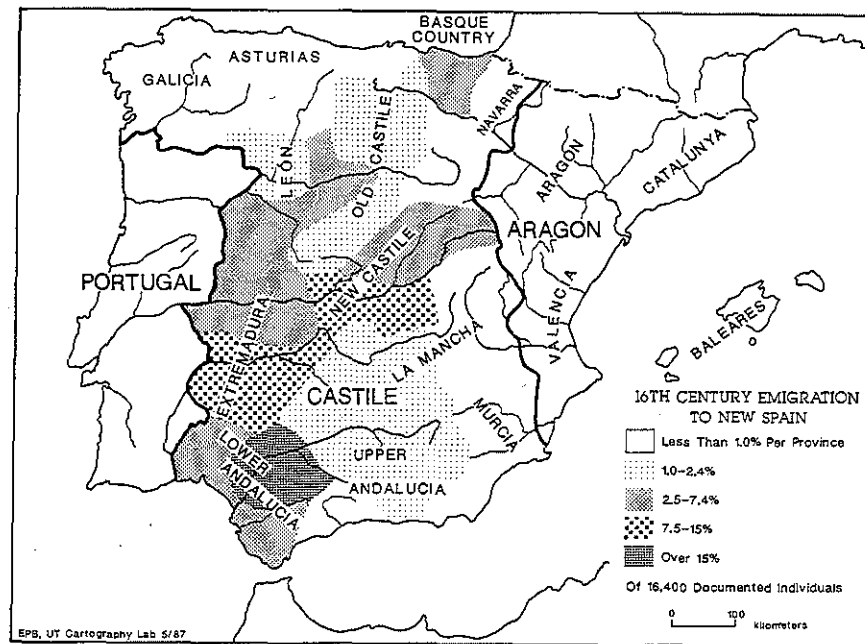


Figure 2. Sixteenth century emigration to Mexico derived overwhelmingly from the western and central parts of the Kingdom of Castile (Boyd-Bowman 1976a). The northern regions of Galicia, Asturias and Navarra, as well as the eastern regions of Aragón, Catalunya, Valencia and Murcia were essentially unrepresented.

dian populations for the 15 smallest places of this list in mid-century (about 1560); these average 1333 households or about 6000 inhabitants. They were small market, craft and administrative centers, in which the bulk of the population was directly engaged in agriculture (see, for example, Phillips 1979).

Together with Sevilla, Salamanca, and Madrid, these 15 towns also provided a disproportional share of their population to the list of documented emigrants (Table 1). Considering no more than one-quarter or one-third of the actual emigrants are documented, these 18 centers could only have maintained their strong, sixteenth-century growth rates (median 1.31 percent per year 1528-61, but less than 0.10 percent from 1561-91) through persistent in-migration and high local birth rates. This increase implies that a substantial part of the growing "urban" populations were first-generation farmers recently derived from smaller towns. This expansion began almost a

century earlier in the city of Sevilla, where the annual growth rate averaged 0.70 percent from 1433-1528 (Ponsot 1980), accelerating to 1.64 percent thereafter. Thus the influx of farmers, or of their second and third sons, was a prominent and continuous phenomenon (Borrero 1983, 167-71) that will have given the population of even that highly urban center a strong agricultural flavor. These demographic features, combined with the small-town origin of many of the "urban" emigrants, imply that the overwhelming majority of the New World colonists had rural backgrounds. To this evidence must be added two facts: (1) the established urban oligarchies to a surprising extent represented *vecinos-ganaderos*, citizens owning large herds of cattle or sheep (Bishko 1978; González Jiménez 1983); and (2) the middle classes of the wealthier Spanish cities preferentially invested their money in the agricultural sector (Vassberg 1984, 147).

It can therefore be argued that the sponta-

Table 1. Sixteenth Century Colonist Centers with High Emigration Ratios

Place (province)	Number documented emigrants ^a	Median number vecinos c. 1560 ^b	Proportion emigrants to vecinos (%)
Sevilla (Sevilla) C	10,638	17,750	59.9
Trujillo (Cáceres) V	913	1,350	67.6
Salamanca (Salamanca) C	900	4,000	22.5
Madrid (Madrid) V	846	5,500	15.4
Palos-Moguer (Huelva) L	605	1,350	44.8
Talavera (Toledo) V	524	1,650	31.8
Záfra (Badajoz) V	471	1,050	44.9
Cáceres (Cáceres) C	439	1,300	33.8
Medellín (Badajoz) V	418	1,150	36.3
Guadalcanal (Sevilla) L	390	1,150	33.9
Ciudad Real (C. Real) C	328	1,700	19.3
Mérida (Badajoz) C	286	1,000	28.6
Plasencia (Cáceres) C	284	1,550	18.3
Llerena (Badajoz) L	273	1,450	18.8
Sanlúcar Barrameda (Cádiz) V	270	1,250	21.6
Guadalajara (Guadalajara) C	252	1,150	21.9
Fregenal Sierra (Badajoz) L	249	1,400	17.8
Almodóvar Campo (C. Real) V	204	1,250	16.3

^a Data from Boyd-Bowman (1976a).

^b Median number of vecinos inventoried in 1528, 1561, and 1591; data from Molinié-Bertrand (1985), figures rounded off. C, Ciudad; V, Villa; L, Lugar in 1528.

neous emigration from Castile to the New World was strongly rural in character and, until the end of the sixteenth century, derived mainly from southwestern Spain.

In regard to individual emigration, it will be necessary to study the land grants (*mercedes*) for sheep or cattle farms, awarded to specific individuals in sixteenth-century Mexico, and to trace these back to their places of origin in Spain. The *mercedes* specify land granted for cattle, sheep, or horse breeding, as well as land destined for cultivation (Simpson 1952), but their utilization requires a major archival study, which is planned for a subsequent phase of this project. As to the matter of Spanish roots, Boyd-Bowman (1964-68) has published a "geobiographical" inventory of the documented emigrants before 1540 that includes place of origin and

date of emigration, to what area. For the interim, 155 early cattle or sheep owners in Mexico have been identified and traced back to Spain. About one-half of these names come from the branding permits issued in Mexico City before 1538 and from the lists of officers in the stockmen's organizations (*Mesta*) of the capital (Dusenberry 1963, app. 2-3) and Puebla (Algier 1969). The remainder have been compiled from a variety of sources and include the first pioneer stockmen in the core area of New Spain, and in the Pánuco lowlands, the Bajío, and New Galicia. Of these 155 individuals, 78 were sheepmen, 58 cattlemen, and 19 holders of undifferentiated *ganados* (stock). As owners rather than herders, they represent a better social class than the average emigrant, but only 14.1 percent were *hidalgos*, i.e., nobility (compared with 3.5 percent for the emigrants as a whole, Boyd-Bowman 1973); most, in fact, were upwardly mobile *conquistadores*.

The origins of these stockmen and the areas where verified herd owners made up at least 1 percent of the documented emigrants are shown in Figure 3. Their home towns are concentrated in western Castile (46 percent in Extremadura and Lower Andalucía), but the pattern is better characterized by its scatter, with clusters in Avila, Cuéllar, Segovia, Burgos, and on the north coast. Traditional cattle and sheep-raising areas, shown in Figure 3, are based on the livestock counts in the *Catastro de Encomienda* of 1750 for Castile (Matilla 1947, 32). About half of the stockmen came from provinces that specialized in neither cattle nor sheep, with the remainder split between the sheep and cattle areas. In detail, the symbols with cattle or sheepmen in Figure 3 vary almost at random. This pattern suggests that dominant regional economies did not determine the type of herding selected by emigrants from a particular region after settling in New Spain; this choice was based on personal experience or the ecological and economic parameters of land grants awarded in Mexico.

The individual experience of the pioneer stockmen in Mexico, both cattle and sheep raisers, ranged from the Guadalquivir lowlands to the rolling or broken landscape of Extremadura, to the vast plains of the Duero, and to the Atlantic slope of the northern mountains. This diversity cautions against simple linkages between cattle or sheep-raising spheres in Mexico, on the one hand, and specific parts of

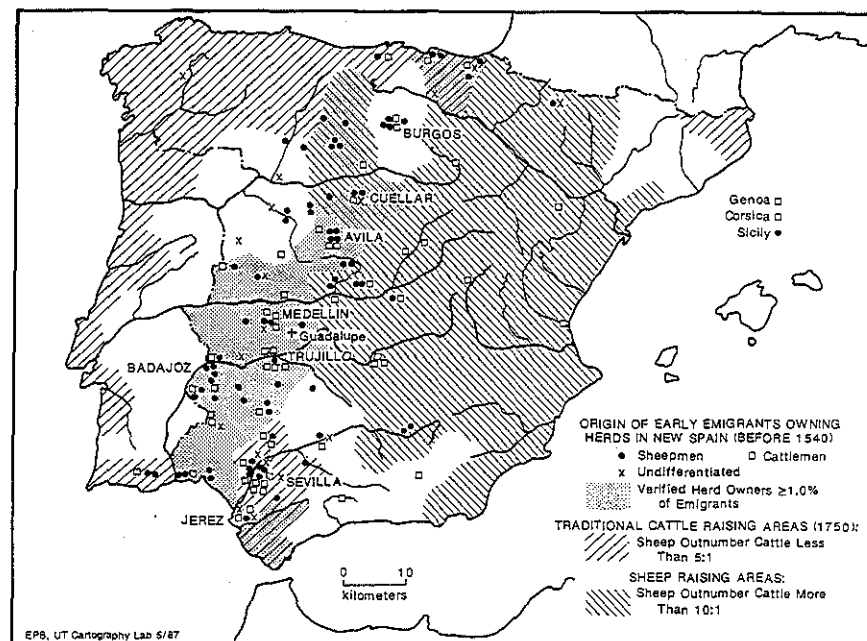


Figure 3. The first cattle and sheep owners in Mexico came from all parts of western Spain, without any linkage to dominantly cattle- or sheep-raising areas. For sources, see text.

Spain, on the other, without careful historical examination.

Prehistoric and Roman Stockraising

Domesticated animals are verified in prehistoric sites of the western Mediterranean even before the introduction of Neolithic pottery and agriculture (Lewthwaite 1986). Studied Neolithic and Chalcolithic faunas are dominated by sheep and goat; such sites were essentially restricted to the peripheries of the peninsula, and hunting-gathering remained important components of the economy. Only with the Bronze Age (after 2400 B.C., in calibrated years) did cattle and pig assume greater importance, and settlement of the interior plains become more systematic (Butzer 1988). Pollen cores from the oak-pine woodland near Palos

show a stable pattern of moderate vegetation disturbance, with considerable grass but few weedy plants, established about 1900 B.C. and remaining in place until 1000 A.D. (see Menéndez and Florschütz 1964; Stevenson 1985). Extensive cattle grazing and relatively standardized land-use patterns are implied, but sheep and goats are unlikely in view of the absence of weed "explosions" in the profiles.

Despite abundant general information about protohistoric and Roman Spain, very few faunal collections have been excavated and studied, leaving animal sculptures or mosaics as a major but unsatisfactory source of economic inference. But references to livestock are given by the second-hand geographical accounts of Strabo (c. 20 B.C.) and Pliny (c. 75 A.D.), the miscellaneous first-hand comments of Martial (c. 100 A.D.), and occasional remarks by other authors (see Blázquez 1978). The qualified and incomplete picture so obtained is best com-

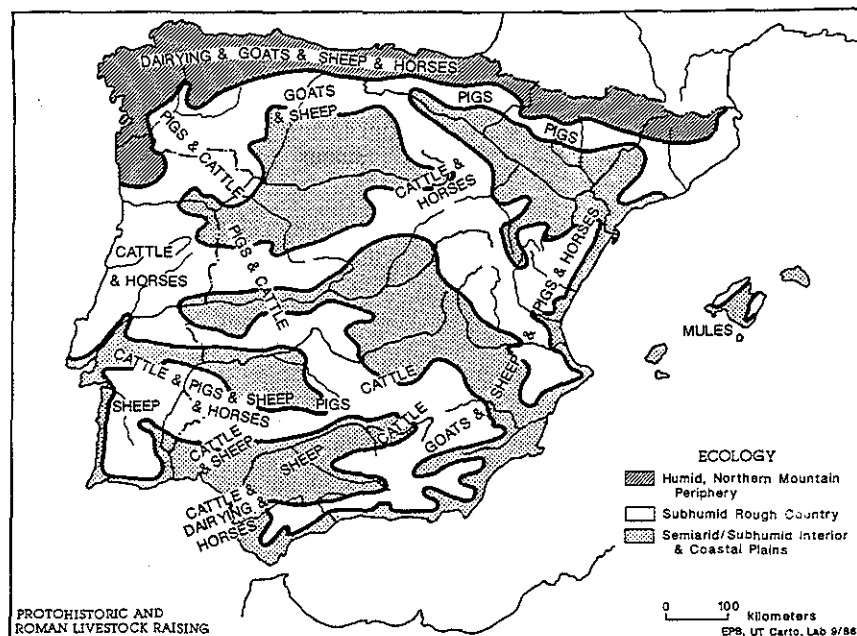


Figure 4. Protohistoric and Roman livestock raising was already strongly differentiated on the Iberian Peninsula in relation to ecological potential. For sources, see text.

pared with the basic ecozonation of the peninsula (Fig. 4), taking into account tribal boundaries and characteristic tribal economies.

- (1) The humid mountains of Galicia and the northern coast were notable for goatmeat, cattle and butter (used for cooking in place of oil), and pigs. Cured hams came from the Pyrenean foothills of Navarra and Aragón (Strabo 1942, 3.3.7, 3.4.11). Two breeds of swift horses were notable in Galicia and Asturias.
- (2) Iberian archaeological sites from Valencia and Roman sites from Catalunya indicate goat and sheep dominant, together with pigs and horses; cows were used for milk and calves for veal, while wool was spun locally (for example, Pla 1983).
- (3) The central Duero plains were wheat country, but stockraising was prominent around the margins. One town delivered 10,000 pieces of wool cloth, and the inhabitants of

another region provided the Roman army with 3000 cowhides and 800 horses in 140 B.C.; the soldiers engaged in the campaign fretted because of a meat diet with too little bread. Innumerable crude figurines of cattle and pigs are found in the area between southern Galicia and southern León (Maluquer and Taracena 1954, 101 ff., 167 ff.). They are linked with the intrusive Halstatt culture, representing early Celts and dated about 900–450 B.C. Overall, this suggests sheep on the northern Duero plains, cattle and pigs in the rougher, extensively wooded country to the south and west. The presence of wild horses in this part of Spain gives a tantalizing clue for uncontrolled herding in protohistoric times.

- (4) Cattle, horses, pigs, and sheep, in that order, are mentioned from modern Portugal (Strabo 1942, 3.3.5; Pliny 1940, 8.191).
- (5) Between the Guadiana and Guadalquivir there were black-fleeced sheep and cattle

of all kinds (Strabo 1942, 3.2.6), while the oak forests north of Córdoba probably provided the hams of that city (Martial 1968, 3.77). Cattle herding was prominent in the upper basins of both rivers.

- (6) The high plains south of the Guadalquivir provided good pasture (Strabo 1942, 3.2.3) for golden-fleeced sheep (Martial 1968, 5.37, 8.28, 9.61, 12.63), and woolmaking was important in three regional cities (Blázquez 1978).
- (7) The tidal marshes of the Guadalquivir's estuarine delta (Strabo 1942, 3.1.9, 3.5.7) can be identified with legendary Erytheia² and the lost entrepot of Tartessus, where the fine pastures reputedly produced fat cows and milk so rich that it yielded no whey (Strabo 1942, 3.2.11, 3.5.4). In his day, Strabo (1942, 3.2.4) relates that:

The cattle which cross over to the islands ... have at times actually been engulfed (by the speed of the flood and ebb-tides)³ at other times they have merely been cut off ... But the cows, they say ... wait for the retirement of the sea, and then make off for the mainland.

The protohistoric and Roman data are sketchy but valuable in that they suggest regional livestock patterns similar to those of the "traditional" economy of the eighteenth century (see Figs. 3 and 4). They imply special regional horse breeds in the northwest and improved breeds of sheep in the south. They fill in a major lacuna in the Arabic sources, namely the importance of pigs. They serve to indicate a close link between regional ecologies and livestock patterns. They also provide no evidence for long-distance (or "inverse") transhumance of sheep in the style of the Medieval Mesta.

The Visigothic legal code of the seventh century fortunately gives more precise information on the rights and responsibilities of livestock owners. Unenclosed and uncultivated land, for example, was open to herders to pasture their animals for two days, without obligation to seek the landowner's permission; public roads could not be closed, and an 18 m stretch of land had to be kept clear on either side of the road (King 1972, 200; Zeumer 1902, VIII, 4.25–27, 5.5). This evidence indicates unusual rights for itinerant herders; particular edicts specify horses, cattle, sheep, and other animals, implying mobile herding of stock. Pig raising was linked to the acorn supplies of oak woodlands (Zeumer 1902,

VIII, 5.1–4; Parsons 1962), but sheep were periodically moved up into the mountains, under the supervision of shepherds (King 1972, 216), a clear case for vertical (or "normal") transhumance.

Early Medieval Sources on Peninsular Pastoralism

The substantial body of Medieval Arabic literature is fundamental to the historical geography of Spain between about A.D. 950 and 1150. Economic syntheses derived from these sources have been presented by Dubler (1943) and Lévi-Provençal (1932, chap. 5), but they do scant justice to the geographical variability of the peninsula. For a succinct overview of the issues, see Glick (1979, 103–106).

A key source is the comprehensive gazetteer of Yakūt compiled in 1224 on the basis of eleventh- and early twelfth-century sources. Organizing this information by province allows ratios of agricultural versus pastoral districts, a picture that is amplified by the regional clustering of towns and villages, as well as by specific references to irrigated areas or woodland in other authors.⁴ Agriculture dominated the coastal provinces from Sevilla eastward to Valencia, while livestock herding was characteristic of much of the interior and west (Fig. 5). Specific livestock are cited by several authors as characteristic of particular regions, and Dubler (1943) provides lists of those centers that produced wool or rugs, or were noted for their tanneries.

The patterns in Figure 5 suggest that thinly settled, secondary grassland and *matorral* (degraded woodland) were used for cattle or sheep grazing, that low-lying or relatively level woodlands and scrub vegetation provided extensive range for cattle, and that wooded or degraded mountain country was primarily utilized for goat pastoralism. Cattle and sheep appear to have been characteristic of the country between the Duero and Tajo, as well as in the Ebro basin. Sheep were dominant in eastern La Mancha and southern Aragón, while cattle were typical between the Guadiana and Guadalquivir, in Portugal, and south of the Guadalquivir mouth.

These general impressions become more concrete on the basis of the available local or regional descriptions. Of the Central Sierras

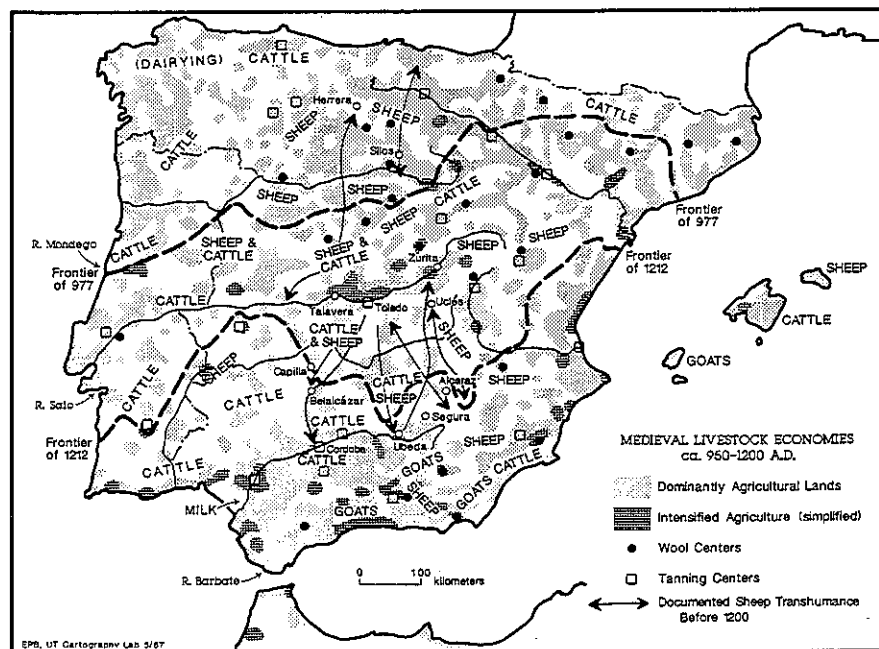


Figure 5. Early Medieval livestock raising (c. 950–1200 A.D.) can be reasonably well delineated from historical sources. Cultivation can be inferred in proximity of verified settlements and several centers of intensified agriculture are documented. For sources, see note 4.

north and west of Toledo, Idrīsī (completed in 1154) and al-Himyārī (completed in 1461, but based on Idrīsī and eleventh-century sources) tell us that they supported great herds of cattle and sheep, which the livestock merchants of Toledo buy up to expedite as meat sheep (*carneros*) to distant parts of the peninsula. Since cattle and sheep are not raised in rugged mountain country, and since the southern flanks of the Sierra were dotted by a string of villages practicing irrigation, these herds were probably concentrated in the thinly settled frontier zone between the Sierras and the Duero. Transshipping through Toledo implies considerable mobility, so that one can speculate about the possibility of sheep transhumance across the mountain passes down to the Tajo and Guadiana.

To what extent were the stockowners or herders Christians or Muslims? Until the early 1100s, there is no evidence for large flocks of

sheep in the Christian lands north of the Central Sierras, and the key livestock were plow oxen, milk cows, and pigs (Pastor 1970). This implies that the livestock trade of Toledo (prior to 1085), first described by Idrīsī, was a Muslim enterprise in all its phases. However, this picture changed radically by the mid-1100s, when sheep herding in Old Castile and León increased exponentially (Pastor 1970). Documents of 1169, 1173, 1179, and 1193 verify that the military Orders of Calatrava and Santiago were regularly driving sheep herds from New Castile into the Muslim sectors of La Mancha and western Murcia, or across the mountains into the Guadalquivir valley, as had been the case "in Saracen times" (Julio González 1960, docs. 116, 176, 610; 1975, 338, 341; González Jiménez 1985) (Fig. 5). This information is significant for several reasons: it shows that long-distance transhumance was a standard feature of Islamic Spain, that the Christians had as-

sumed this transhumant role by the late twelfth century, and that transhumance crossed political boundaries.

At this time, long-distance transhumance had also been established in northern Spain, between the northern mountains and the Duero or even the Tajo (González 1960, docs. 558 and 739, dated 1190 and 1203). Defined *cañadas* or transhumant sheep routes across the Central Sierra were first specified in royal privileges of 1207–08 (Julio González 1960, docs. 815, 828–30). These facts are the basis for the transhumance patterns shown in Figure 5.

Cross-border transhumance is also verified between Catalunya and France during the 1320s (see Le Roy Ladurie 1980). Documents from Valencia dating to the thirteenth century, immediately after the Reconquista, indicate both interregional transhumance, with Christian herders from Aragón moving down into the Muslim-settled lower country in winter, as well as intraregional transhumance between the coastal plain and the hill country by Muslim herders (Butzer et al. 1986). The fact that these patterns were confirmed by the king of Aragón, as traditional rights, indicates that they too antedated the Reconquista.

Cattle in some areas of Muslim Spain were raised for their milk as well as meat. Al-Rāzi (died 955) and al-Himyārī note that the temperate climate of La Mancha was ideal for cattle raising and that the cows gave milk in abundance. Since the milk was naturally sour it was beaten in wineskins which purportedly removed the acidity; La Mancha is still noted for its cheeses. The Saló valley of Portugal, mentioned by Strabo (3.3.1) as a key estuarine setting and by al-Himyārī as a watershed of pine forests, produced beef and dairy products such as butter. Along the length of the coastline of Portugal and southwestern Spain, the estuarine zones appear to have been centers of cattle raising. Idrīsī and al-Himyārī note the cattle of the lower Mondego River, and al-Rāzi points out that the seasonal lakes of the lower Barbate were good for both grain farming and livestock raising.

The most famous cattle and dairy zone was centered on the marshland or *Marismas* of the lower Guadalquivir, already described by Strabo. Al-Rāzi informs us that

There are low islands here, and marshes and grasslands that never dry up; the cattle give abundant

milk; if all the herds of Spain were brought together there they would find sufficient pasture.

Details on cattle use are provided in the legal prescripts of Ibn Abdūn of Sevilla, writing in about A.D. 1100. Most relate to dairying. The cottage cheese of the *Marismas*—*al-Mada'in*—was not to be sold, because it was foul; other cheese was only to be stored in leather bottles that had to be washed regularly; milk was not to be placed in containers with remains of curds, and only glazed pots or wooden vessels were to be used because of the toxicity of unlined copper; finally, milk was only to be sold by reputable dealers who would not dilute it with water. One of the favorite uses of cheese was in the form of *almojábannas*, small balls of fat cheese, lightly battered in flour and then fried in oil by the street vendors; *Jérez de la Frontera* is still noted for such cheese fritters.

Cattle, as Ibn Abdūn continues, were to be brought to the meat market—the *sūq al-da-wābb* or *zocodóvar*—live, so that an official could ascertain their ownership, presumably on the basis of brands. After a price was agreed upon, the cattle were there slaughtered in large vats, so that the blood and entrails could be removed, but cattle good for plowing or cows of reproductive age could not be killed for meat. Cowhides were important and the tanners were urged to use bird guano in their preparation. At the market, meat of different qualities was not to be mixed. At the next level, street vendors sold prepared meats. These included jerky—only to be made from unspoiled meats; sausages—made of minced beef, fat, spices, garlic, and salt; and meatballs of *carne picada*. The meat market of Sevilla also dealt in mutton, sold together with its entrails, and goat meat.

In overview, the Islamic sources, amplified by early Medieval Christian documents, serve to identify regions of sheep versus cattle raising and to distinguish between areas with beef cattle and dairying. They also provide considerable detail on the processing of meat and dairy products, especially in Sevilla and the nearby marshlands of the Guadalquivir estuary. This picture is compatible with but enhances the sketchy information from the Roman period. It also implies that the small Berber and Arab minority settling the peninsula after 711 did not fundamentally change the regional patterns of livestock raising, but it does appear to have introduced long-distance sheep transhumance

from North Africa, together with the Merino sheep (Lopez 1953). Urban expansion and agricultural intensification in Islamic times (Butzer et al. 1985) will have affected the relative role of herding and the specific market needs for livestock or animal products in quantitative terms. But overall the Islamic data suggest more continuity than change. In effect, these early Medieval sources provide a longer perspective on the evolution of livestock raising on the peninsula that emphasizes persistence since late prehistoric times, a characteristic that must be attributed to ecological factors.

Sheep Transhumance during the Later Middle Ages

Between about 1050 and 1300 the balance of power between Christian and Islamic Spain shifted abruptly, and the areas controlled by the Christian principalities increased by almost 150 percent, leaving the Muslims only in control of the kingdom of Granada. The population of the Muslim-controlled areas declined steadily after the mid-eleventh century as Christian armies regularly pillaged the countryside, probing deep into Andalucía and progressively weakening the economy. As the Reconquista in each province terminated with the capture of the key fortresses and cities, the small residual Muslim populations generally preferred to emigrate, rather than accept the promising terms offered for staying on. The remaining Muslim population in the lands of Castile and Portugal probably numbered much less than 50,000. In the lands of Aragón and Murcia, on the other hand, intercultural relationships were more positive and some 250,000–300,000 Muslims stayed behind.

Castile lacked the demographic resources to repopulate the vast regions of the center and south, and the only population nucleus was the body of Arabic-speaking Christians (Mozarabs) that had managed to survive in the upper Tajo drainage. Even the prime lands of Sevilla in the 1250s managed to attract only 4800 families of Christian colonists (González 1951, 316), and their numbers did not increase substantially until well into the fourteenth century (González Jiménez 1975).

The settlement map of Spain continues to reflect these historical circumstances, namely

the widespread abandonment of Muslim villages during the insecurity of the decades preceding the Reconquista, and the demographic incapacity of the Christians to immediately repopulate the vast areas conquered rapidly after about 1100 A.D. In roughly the southern half of the country the rural population is aggregated in a limited number of fairly large towns, whereas in the north it is spread over a much larger range of hamlets, small towns and large ones (Fig. 6).⁵ At least initially the agricultural perimeter of the southern towns did not intersect with that of other communities, from which they were frequently separated by large areas of pasture. Land grants in the rapidly conquered southern regions also were uncharacteristically large, forming the nucleus of large estates or *latifundia*, many of which consisted primarily of grazing lands. The high costs in time of traveling to fields located more than 5 or 6 km outside of an agricultural town were responsible for a major lag in the expansion of agriculture in southern Spain, and left large areas uncultivated until the nineteenth century.

The lands between the Tajo and Guadalquivir were then initially underpopulated and reverted to extensive grazing. The pollen profile near Huelva (Menéndez and Florschütz 1964) shows that woodland increased steadily from 1000–1550 A.D., oak forests recovering to a degree that they had not since the onset of the Bronze Age. It was this quasi-abandoned landscape of the southern interior that attracted the Mesta, the organized, long-distance sheep transhumance of the classic work of Klein (1920).

As described by Klein (1920), great herds of sheep from the northern mountains and plateaus began to be driven hundreds of miles south to winter pastures in Extremadura, La Mancha, and Andalucía. This differed in degree from earlier, Islamic transhumance in that the herds now moved not just across the northern or southern halves of the peninsula, but across the whole of Spain. According to Klein, the herd owners were mainly of small or intermediate wealth, banding together in a democratic alliance that came under the king's protection even before 1273. The numbers of sheep passing through a series of designated toll stations guaranteed substantial revenues. Beginning during the late 1400s, Klein claims that local proprietors and towns had only limited recourse against the constant depredation by the voracious herds on private or communal

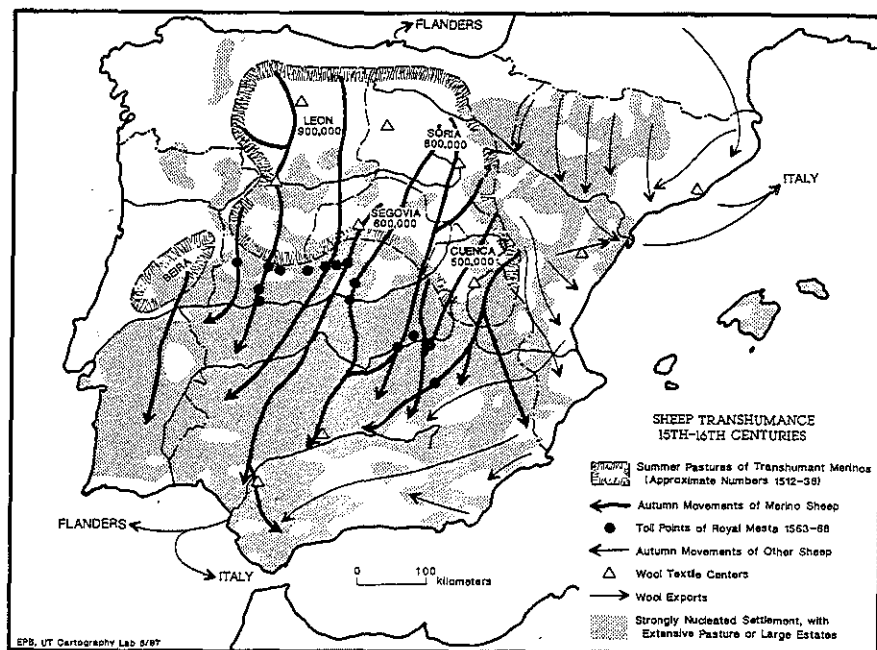


Figure 6. Sheep transhumance on the Iberian Peninsula during the fifteenth and sixteenth centuries at the height of the Mesta. Data from Le Flem (1972); Klein (1920); Aitken (1945); Sibbert (1966); and Lemeunier (1977). On settlement nucleation, see note 5.

land. Already in 1190 there was a case of a royal interdiction against the expansion of cultivation into range land (González 1960, doc. 555), and by 1500 this allegedly misguided policy seriously impeded economic growth in the interior. The numbers of sheep involved in long-distance drives increased from about 1.5 million around 1400 (Ladero 1978, 77) to reach a peak of almost 3.2 million head in 1519 (Le Flem 1972), and still numbered 1.5 million in 1865 (JGE 1868), long after the royal privileges had been revoked.

Klein's basic argument remains more or less valid (Bishko 1981) but a more complex picture emerges from subsequent research.

(a) In 1865 only 14 percent of the sheep of Spain were involved in transhumance on any scale (see JGE 1868), and of these only a half were in any way linked to the old Mesta routes. Without minimizing the importance of Merino wool for the Spanish economy of the sixteenth

century, this observation clarifies a neglected fact that local sheep almost always greatly outnumbered migrant sheep in any one region. Large-scale transhumance was limited to wool sheep which, in the kingdom of Castile, were Merinos. Twice a year they were driven over distances of 250 to 700 km at rates averaging 15 km per day (Klein 1920, 23–24, 28–29). Sheep raised for meat (*carneros*) or for combinations of meat and wool were of different breeds and not part of the mobile sheep economy. Transhumant wool sheep in the kingdom of Aragón included only a few herds of Merinos and the Castilian Mesta officials prevented the export of Merinos to Mexico and the New World.

(b) The majority of the Merinos had their home pastures in León, Old Castile, and north-eastern La Mancha, in a zone divided into four sectors (*quadrillas*)—León, Segovia, Soria and Cuenca (Fig. 6) (Le Flem 1972). The proportion

of Merinos driven south in any one year depended on the spring rainfall received in the northern pastures, losses due to periodic disease, and the highly fluctuating price of pasture south of the Tajo (Le Flem 1972). From 1512 to 1540 the number of transhumants averaged 2.6 to 2.8 million (5-year overlapping means), but declined thereafter to reach a new equilibrium level of 1.8 million head by 1620 (Le Flem 1972). This decline did not represent a diminution of the Merino herds, but simply a reduction in long-range transhumance, judging by a parallel increase in pasture fee income within the jurisdictions of the four *quadrillas*.⁶ The reasons for this decline probably reflect rising pasture fees for migratory sheep in south-central Spain, as a growing population required more cultivable land and assured the landholders a higher income from rents and tithes on agricultural productivity. At the same time, the non-migratory herds of the regional cities expanded and came into increasing competition with transhumant flocks, as in the case of Córdoba (Edwards 1977; Bishko 1978).

(c) Klein (1920, 18) produced a map with a half dozen north-south arterial routes, based more on inference than the surviving Mesta records. Instead, these documents indicate a much more diffuse pattern of movement (Aitken 1945), and my own reconstruction of *cañadas* for two sample areas (from the first edition of the 1:50,000 topographic maps) reveals a complex hierarchy of web-like sheep trails that defies mapping on a national scale. The only fixed points in this unstable pattern appear to have been the royal toll stations (Fig. 6) identified by Le Flem (1972).⁷

(d) The key herd owners were the city councils of Segovia, Salamanca, Zamora, and Soria—in addition to other municipal councils, a number of major monasteries and church institutions, the military orders, and the king himself (Pastor 1970). Local communities and smaller proprietors were a relatively minor component of the Mesta.

(e) The Mesta was not the logical, spatial extension of an age-old transhumant tradition in Christian, as opposed to Islamic, Spain. Until the 1150s there is little evidence of special grazing privileges, and sheep were not the dominant animal in Castile and León (Pastor 1970). Instead, the growth of the Christian livestock economy was closely correlated with the practice of Christian raiding deep into the Islamic

south, the spoils of which were immense herds of animals (see above). One rustling expedition in 1174 apparently netted 50,000 sheep and 1200 cattle in Andalucía, where such raiding is first documented in 1063 and became an almost annual occurrence after 1158 (González 1951, I, 194). In 1177 Muslim cavalry chased a returning Christian expedition to the gates of Talavera to recapture their cattle and sheep. It is probable that the famous Merino sheep of Castile were acquired through Christian raids into Andalucía during the mid-12th century (González 1944, I, 280; Lopez 1953). As a consequence of razzias and conquest, Christian Spain inherited and then embellished the Islamic pastoral economy described by Idrisi.

(f) Archival data from Extremadura in 1466 show that cattle and pigs together were as important as sheep. Of the tithes on newborn animals collected in seven towns, 52.5 percent came from sheep, 33.3 percent from calves, and 14.2 percent from pigs (Ladero 1970). These data demonstrate a diversified, local livestock economy in the heartland of the Mesta pastures, with the net value of cattle and pigs together roughly equal to that of sheep. Further, the total income from tithes on newborn animals was 369,000 maravedis in these same communities, compared with 309,500 from grazing rights on private pastures (*dehesa*), which would include local as well as migrant animals; income from transit tolls, probably including Mesta sheep, was 44,000 maravedis. Two further conclusions emerge. Firstly, the local livestock economy was more important in Extremadura than was the interprovincial Mesta and, secondly, the local towns and the Order of Santiago, as proprietors, made substantial earnings from the Mesta. Similarly, in La Mancha, the major source of income for the Order of Calatrava 1471–1510 was from pasturage of transhumant sheep (Solano 1978).

(g) The Extremaduran records for 1466 also include tithes from vineyards and fruit trees, namely 249,000 maravedis, and fixed rents on units of land in wheat or barley that can be calculated to total 865,200 (see Ladero 1970). The sum of agricultural income was 1,114,200 maravedis, compared with a maximum of 772,500 from the livestock sector. This surprising fact puts a different perspective on the comparative role of cultivation in Extremadura: it was much more important than livestock raising,⁸ employed far more people, and was re-

stricted from expansion rather than seriously threatened by transhumance.

(h) Livestock raising in general, and sheep transhumance in particular, were complementary to cultivation in Spain. The labor costs for raising sheep were far lower than for growing crops, but cereal cultivation supported more people, both as food and as employment. As long as the southern interior was thinly settled, as it was after the Reconquest and again after the Black Death (1348), stockraising was the most economical way to generate income from the vast pasture lands. While demographic growth was negligible, until the mid-fifteenth century, the numbers of sheep increased dramatically (ten-fold in Guadalupe 1389–1479 [Gerbet 1982]). Thereafter, population began to increase, slowly at first, and the growth of the herds tapered off, as competition and conflict with farmers increased (Marín 1987). From 1528 to 1591 the population of Castile increased at a rate of 0.62 percent per year (Molinié-Bertrand 1985, 309)—assuming a constant family size. For Old Castile and León the net increase was 21.9 percent, compared with 67.3 percent for New Castile, La Mancha, and Extremadura, in part as a result of emigration from Old Castile to south of the Tajo (Cabrillana 1971–72). With agricultural expansion seriously restricted by the expanse of enclosed *dehesas* in private hands and open pastures in the royal domain, the younger sons of farm families began to emigrate to the New World (Rodríguez 1985). There must therefore have been intense pressures to achieve a greater food supply and higher gross income in the southern interior. This information argues that the notable decline in transhumance after 1540 reflected a fundamental economic shift from herding to cultivation in Extremadura, La Mancha, and New Castile. The rationale for an extensive herding economy in the “new” lands of the south had been voided.

We now turn to cattle raising. Bishko (1952, 1963) points out that it was practiced by intermediate and large proprietors as well as the agents of the great military orders. He also argues that it was extensive in character, making use of herders, branding, and extended cattle drives. Even so, herd size was small by Texas standards, the largest owners having 800 to 1500 head, with smaller owners having to pool their cattle to reach the minimum count of 400 head to send out on seasonal drives. The most common size appears to have been between 40 and

100 head, which by law required a single *vaquero*; larger herds called for one *vaquero*, a chief herder or *rabadán*, and a mounted guard (Pastor 1970).

In fact, only a small percentage, exclusively beef cattle, appears to have been moved in extended, transhumant drives (1.1 percent of Spanish cattle in 1865 [JGE 1868], with a maximum of 11.2 percent in Avila). More typical appears to have been the documented case of some 1900 cattle grazed by the monastery of Guadalupe on the Guadiana floodplain near Medellín in 1479 (Gerbet 1982, Table 4): these beef and breeding cattle were tended by 25 *vaqueros*, i.e., a ratio of 76 to 1, compared with 175 sheep to one shepherd on the monastery's pastures near Trujillo. The great majority of Spanish cattle have always served for labor (56 percent in 1865 [JGE 1868]), and this proportion will have been even greater prior to the widespread shift from oxen- to mule-plowing during the sixteenth century (Vassberg 1984, 158). Finally, there is evidence for a notable decline in the number of beef cattle during the later Middle Ages: in 1351 the Order of Calatrava was given a royal privilege to graze 15,000 cattle and 8000 sheep free of all charges on crown land; in 1429 this number was changed to 2000 cattle and 12,000 sheep, presumably to reflect a fundamental shift in grazing strategies (Solano 1978). There is then little evidence to support Bishko's contention of large-scale, extensive cattle herding—at least not after 1400.

In conclusion, a dual economy, of cultivation and livestock, was and always has been characteristic of the Spanish interior. “Traditional historiography has stressed the conflict between farming and herding, but it is better understood as a mutually profitable, if contentious, partnership” (Phillips 1987, 535). The role of stockraising, and especially of the Mesta, has evidently been grossly overestimated for the late Spanish Middle Ages. By 1600 interprovincial sheep transhumance had become only a minor component of a regional economy south of the Central Sierra in which the more productive agricultural sector provided the livelihood for an exponentially greater number of rural workers.

Pastoralism and Property Rights

Since Roman and Visigothic times, the Iberian Peninsula was everywhere divided into (a)

arable land or *cultivos* (Latin, *ager*) and (b) unimproved land or "waste," known as *baldíos* (Latin, *saltus*). Cultivated land was held by rights conferred through royal privilege to individuals, institutions, or corporate communities (*municipios*) or, less securely, by right of occupancy, conditional upon continued cultivation (squatter's rights or *presura* [Vassberg 1984, 10–13]). Unimproved land remained in the royal domain (*realengo*), but was often attached to *municipios*, as commonage for the benefit of all, or awarded to monasteries or aristocrats by special privilege. The unassigned *baldíos* were initially vast, in the wake of the Reconquest, and free passage and access for pasture was generously granted (especially in the years 1150–1250) to prestigious monasteries and city councils. But over the centuries, an incremental policy of royal awards and unresolved usurpation, primarily by the nobility, created an extensive intermediate sphere of assigned or restricted but uncultivated lands with a patchwork of different property rights. The remaining "open" *baldíos*, linked by vigilantly protected *cañadas* (Marín 1987), shrank to a mere fraction of their original extent, especially after the big wave of royal sales 1560–90 designed to raise money for the royal treasury (Vassberg 1984, 172–176).

It is instructive to examine the different categories of potential grazing land to illustrate the range of different pastoral ecologies (Gerbet 1982; Vassberg 1984):

(1) Meadows or *prados* referred to seasonally-inundated floodplains or belts of uncultivated land adjacent to irrigated fields; they were used to produce fodder during the spring and early summer and subsequently served as pasture for prime stock, especially horses and cattle. Such environments were rare south of the Sierra Central.

(2) Pastures or *pastos* referred to a mosaic of scattered plots, of marginal quality, between and adjacent to areas of dry-farming; with a degraded vegetation of grass, bush, and trees, they were cultivated at long intervals but otherwise served for unimproved but controlled grazing, usually concurrent with summer stubble grazing or years of fallow grazing on the adjacent fields.

(3) Communal pastures or *ejidos* referred to unimproved land belonging to specific *municipios* for purposes of extensive grazing, fuel-gathering, wood-cutting, or collecting of wild foods and condiments. All citizens (*vecinos*) of

the community were entitled to free use, and the size of the herds they could run tended to be proportional to their wealth in land and stock. During times of population pressure, such *ejidos* were sporadically cleared by fire (*roza*) and used for one or two seasons of cultivation, followed by five to twenty years of fallow to allow the marginal soils to recover (Bernal and Drain 1975, 126). Better areas of commonage were frequently converted into *propios*, land rented to citizens of the community for cultivation, followed by one to three years of fallow and grazing, depending on soil quality.

(4) *Dehesas boyales* were special pastures, usually with shade trees and water, segregated from the *ejidos* of each community for the exclusive use of plow animals.

(5) *Dehesas*, in the more general sense, were "closed" pastures, i.e., unavailable for communal use. They had been awarded to (or usurped by) the nobility, the monasteries, or groups of citizens to pasture their own stock or to rent out to other herd owners. *Dehesas* varied in size and were typically but not necessarily enclosed or even subdivided by rock fences; clusters of simple living quarters, sheep sheds, and penning areas were often found here. An open woodland of live oak or cork oak was favored, since it provided additional income from acorns (as pig feed), wood, or cork; underbrush was reduced by deliberate burning.

(6) Finally, *montes* referred to extensive unenclosed areas, with spontaneous but variably degraded vegetation, on rough topography. *Monte alto* was secondary woodland, mainly live or cork oak, while *monte bajo* or *matorral* included several types of nutritious shrubs (Martín 1965) amid a tangle of unpalatable woody shrubs or bush.⁹ Although primarily a landscape concept that could include *ejidos* or *dehesas* that were not fenced in, *monte* tended to refer to private or royal *baldíos* that were accessible to transhumants at specified passage or pasturage charges.

These categories demonstrate the close interdigitation of local herding and agriculture, as well as the distinct dichotomy between local and "outside" transhumant livestock. Most local herds were non-migratory (*estantes*) and only moved seasonally on a small scale between *ejidos* or *dehesas*, on the one hand, and *pastos*, stubble fields, or fallow, on the other. When local herds were large or municipal pastures

inadequate, stock was driven to the *dehesas* or *montes* of other *municipios*; this short or medium-distance movement, mainly within the same region or province, was called *transterminante*. Seed crops in southern Spain were planted in October–November or, at latest, in February, and harvested between May and July. Local stubble or fallow pasturage (*rastrero*) was therefore optimal in summer and autumn, so that any drives to pastures in other municipalities took place in autumn or early winter (*invernaderos*). This cycle was delayed up to three months with respect to the *invernaderos* from northern Spain, which arrived in the south during November and began the return trip in April. Summer transhumance (*agostadero*) was much less common, in periodic response to unusual drought, or in the special case of towns and monasteries without adequate access to stubble or fallow.

Although the concept of commonage—communal grazing lands such as the *ejidos*—was found throughout western Europe, the persistence of vast areas of open-range grazing, long after the passing of the frontier, was not. Broad access to *montes* and even *dehesas*, at a price, represented a duality of the cultivated and pastoral spheres, governed by different rules related to fundamentally different claims of ownership. Such use was integral to the circum-mediterranean system, originally codified in Roman law, and differed from the principles of Germanic law applied in the British colonies in North America. This duality, incorporated in the more flexible Iberian concept of commonwealth, favored the rapid development of mobile forms of extensive stock-raising in the Indies, and sanctioned their survival in large, underutilized parts of Latin America until at least the end of the nineteenth century (see Deffontaines 1965). It also provides a vital rationale to explain the evolution of open-range grazing or transhumant herding in colonial Mexico (see Chevalier 1963; Dusenberry 1963; Schell 1986, 19–34).

Iberian stockraising was highly diversified, especially if goats and pigs are included in the discussion. Spanish emigrants were, on the whole, familiar with a wide range of stock options. But more importantly, perhaps, they were also familiar with the many forms of access to private or public land. Their choices, given specific opportunities in the New World, were probably dictated more by local, ecological op-

tions than by a particular Old World, regional heritage. Some examples illustrate the point. Nuño de Gúzman, who, at the request of his Andalusian troops, arranged the first importation of cattle from Cuba and Santo Domingo to the Pánuco 1529–30 (Doolittle 1987), came from a sheep area (Guadalajara) but had spent five years in the West Indies (1514–19) before going on to Mexico. Gerónimo Ruiz de la Mota, who came as an officer from Burgos to Mexico in 1521, was the first head of the Mesta of Mexico City in 1538; yet he ran cattle as well as sheep on his seven land grants. Luis de la Torre, second head of the Mexico City Mesta in 1539 and an *hidalgo* from Ciudad Real—sheep country—had spent fourteen years in Santo Domingo (1508–22), which may explain the curious anomaly that he ran cattle instead of sheep.

Sevilla: Agriculture, Monte and Marsh

Both the complementarity and competition between herding and agriculture can be illustrated by a concrete example, drawn from Sevilla, the heartland of emigration to the Americas. Here the Islamic authors already drew a contrast between the teeming villages of the olive-grove country west of that city, known as the Aljarafe (*Idrīsī*, *Himiyārī*) and the vast pastures of the Marismas (*Rāzī*) (Fig. 7). Sevilla was reconquered in 1248 and its lands and settlements redistributed by the king of Castile 1250–54 in order to reward his army and to promote colonization. The land grants of this *repartimiento* were recorded in detail and have been published (Julio González 1951); in conjunction with several historical studies spanning the fourteenth to early sixteenth centuries (González Jiménez 1975, 1977; Borrero 1983), they provide a detailed picture of changing land use and settlement patterns.

Three categories of land were originally parceled out: (1) a cluster of irrigated tracts on the floodplains immediately adjacent to Sevilla and Alcalá de Guadaíra; (2) a much larger belt of olive groves, with some vineyards or fig orchards and small tracts of irrigation, including the well-watered Aljarafe (550–650 mm annual rainfall, Drain et al. 1971, fig. 3), the floodplain above Sevilla, and areas adjacent to the Guadaira River; and (3) extensive areas of dry-

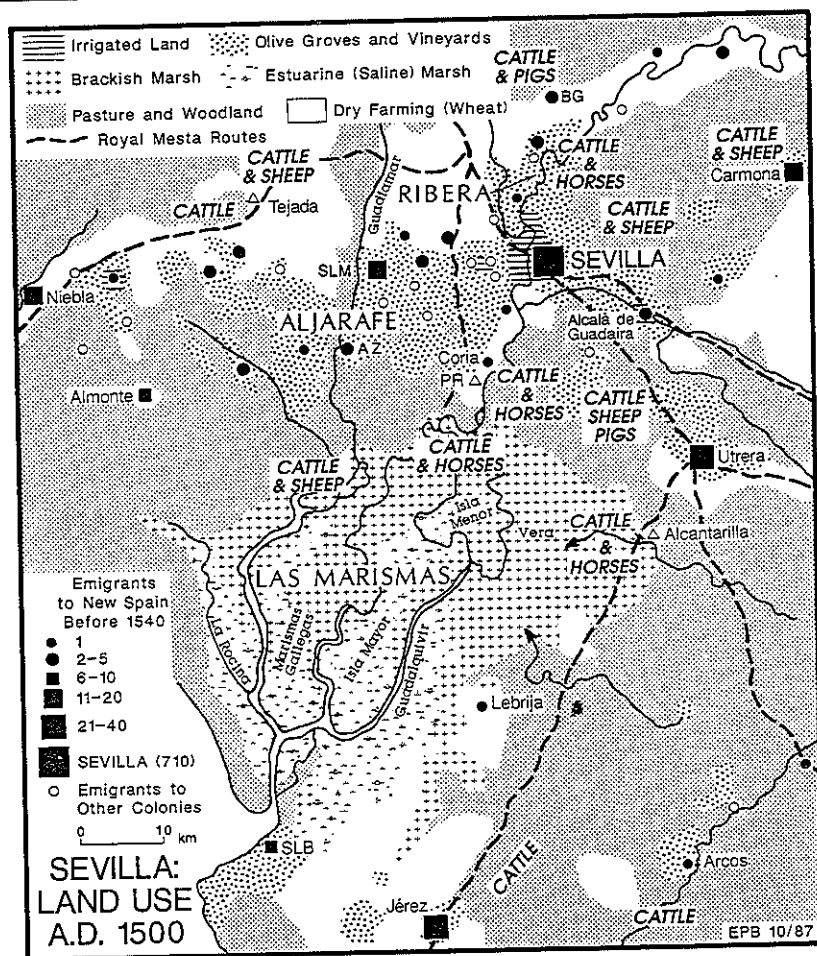


Figure 7. Reconstruction of land use in the area of Sevilla about 1500 A.D. For sources, see text. AZ Aznalcázar, BG Burguillos, PR Puebla del Río, SLB Sanlúcar Barrameda, SLM Sanlúcar Mayor.

farming, essentially wheat, much of it on droughty land (475–525 mm precipitation), allowing cultivation only every other year on the higher ground towards the mountains.

The Marismas were omitted from the individual land grants of the 1250s because they were unsuitable for agriculture with the available technology. Regular tidal flooding in the estuarine marshland was complemented by seasonal flooding in the freshwater marsh zone.

Furthermore, salinity levels in the estuarine marsh are sufficiently high to kill off the sub-aquatic vegetation in mid-summer, while even the soils of the freshwater equivalent are slightly saline (Vannev 1970, 43–73; Drain et al. 1971, 72–79). But, although partly submerged between mid-winter and early May, the freshwater marsh provided prime, seasonal pastures.

The Isla Mayor and Isla Menor were first awarded in 1253 to the City Council of Sevilla

(González 1951, II, 155, 316) as communal pasture land. But in 1272 the king revoked this privilege and granted the islands, plus part of the lower Guadiamar wetlands, to 200 new settlers who were to reoccupy Puebla del Río with their wives and children (González 1951, II, 350–351). This venture apparently failed and control of Marismas, with the income of their pasture taxes, reverted to the Council in 1291 (Ladero 1976; Ordenanzas, 28 verso). Originally, only the citizens of Sevilla had free access to the marsh pastures, but in 1377 the Council granted the *vecinos* of Puebla del Río, Coria, and Alcalá del Río free use of the islands, Aguijón (probably on the lower Guadiamar), Vera, and *la marisma* (the *Marismas Gallegas*), while the herds of Alcalá de Guadaíra, Utrera, Lebrija, and Cabezas de San Juan were given access to Vera (Carande 1972, 159–60). The city of Niebla, which shared a reciprocal pasture agreement with Sevilla since 1269 (González 1951, I, 452, II, 348), was allowed to graze 800 cattle and 30 mares in Aguijón and Vera. In regard to Mesta privileges, the 1377 statute specifies sheep and pigs from Sevilla and its adjacent towns. By 1484 Aznalcázar was included in this arrangement and certain other towns of the Aljarafe were conceded the privilege to pasture plow-oxen in the marsh in 1503 (Borrero 1983, 95–96, 104–5). Other towns and the owners of transhumant sheep continued to pay a standard but unspecified fee for each animal.

Also relevant to the Marismas is that in 1284 the floodplain immediately south of Sevilla was designated as pasture for the fattening of animals to be brought into the city (González 1951, I, 452, II, 362). The *vaqueros* and shepherds of the province were allowed to assemble their herds for local *ferias* on June 24, August 15, and September 29 (González 1951, I, 452, II, 347)—presumably market fairs, similar to those implied in the writings of Ibn Abdūn about 1100.

In contrast to the basic integrity of the pasture realm, the arable lands were intensely subdivided by the *repartimento* of 1250–54. Small grants, to common soldiers and the like, ranged from 1 to 3 hectares of olive groves and vineyards, and 32 to 64 hectares of wheat land. Clerics and more important retainers of the king received 4 to 8 hectares of olive groves and 64 to 256 of wheat country. The largest individual grants were about 25 hectares of olives or up to 1,250 hectares of wheat land. Institutional grants of olive groves and vineyards ranged from

200 to 1,000 hectares, and the king retained even larger areas. In the Aljarafe the number of land recipients exceeded 15,000, but González's (1951, I, 446) tally of total acreage awarded is greater than the actual area of the *municípios* in question, even when the large areas of *monte* are included (see Drain 1977, table 48; Bernal and Drain 1975, 16–17, 60–61).¹⁰ Thus the *repartimento* was overly generous in its definition of land quality and the true areas involved were much smaller.

Since only 4,800 *vecinos* can be verified for the region of Sevilla during the late thirteenth century, it appears that a very small fraction of the original grantees stayed on. The other lands were presumably sold and converted into cash before the soldiers returned home. Even those settlements actively colonized by soldiers with families did not do well. Some hamlets are never mentioned again; others were derelict by the early 1300s and had to be "repopulated," only to fail again a century or so later (González Jiménez 1975); even some of the larger, surviving towns had been abandoned during the early fourteenth century and had to be refounded. Of some 85 settlements of the Aljarafe mentioned in the *repartimento*, only 36 can be verified between 1528–34 (Colón; Ponsot 1980; Borrero 1983, Tables 1, 4).

In addition to depopulation, "disintensification" of agriculture is apparent. For the twelve Aljarafe communities for which we can compare the original land grants with fourteenth or fifteenth century documents, olive groves were downgraded to vineyards in four cases, and to dry-farming in five (see González 1951 versus González Jiménez 1975, 1977). After a century of population growth at an annual rate of 0.53 percent, the total number of *vecinos* was only 5,043. Converting families to inhabitants by a rough factor of four,¹¹ the population on some 750 km² of arable land was only about 20,000 in 1528, i.e., 27 per square kilometer, varying from 25 to 29 in the four districts. Such a density is compatible with agricultural intensification, and probably approached population levels during the Islamic eleventh century. But an annual growth rate of 0.53 percent infers a density of only 13.5 about 130 years earlier in 1400. Such a figure is marginal for "intensification" and helps to understand the earlier trend to settlement abandonment and downgrading of land use. Yet Lower Andalucía by 1465 had outstripped all other Castilian regions

of comparable size in terms of its contributions to the royal exchequer (MacKay 1981), arguing that this area was already comparatively well developed. This suggests that the prime lands of Castile did not regain the productivity of the Islamic Middle Ages until well into the sixteenth century.

The reasons for this faltering population growth and implicit manpower shortage in the Aljarafe during the first two centuries after the Reconquest must have included a lack of start-up capital, the stiff fixed rents and tithes, and consolidation of the large estates (see also Borrero 1983, 139-45). Most of the old landed families of Sevilla established their control over multiple *latifundia* between the 1270s and 1330s (Collantes 1976; González Jiménez 1976), and it is improbable that small freeholders could compete with them indefinitely. Such farmers probably sold out and either drifted to the city or accepted employment as day laborers on the olive or grape-growing *haciendas* or as tenants or sharecroppers on the wheat-growing *cortijos*. This is implied by the eventual consolidation of the Aljarafe population into a smaller number of larger towns (Borrero 1983, 202-6). Recent examples have shown great landholders to be disinclined to invest in intensification (Mayer 1960, chap. 3, 92-96) which may explain the inability of the food supply to grow sufficiently rapidly during the fifteenth century to feed the expanding population of the cities; as a result there were repeated and severe food shortages between 1486 and 1522 (Ladero and González Jiménez 1979; González Jiménez 1976).

The three-field system of improved crop rotation had been introduced to northern Castile during the mid-fifteenth century (García 1973), but it was only adopted in Andalucía during the eighteenth. Another impediment to cultivation was that agriculture could not be expanded onto adjacent grazing lands. These were sacrosanct, and the pasture concessionaires repeatedly appealed to the principle of royal protection against agricultural usurpation of *dehesas* and *cañadas*, so around Tejada and along the margins of the Marismas after the 1450s (González Jiménez 1976; Ladero 1976).

A reasonably accurate reconstruction of land use patterns in the area around Sevilla in the early 1500s can be made on the basis of a major geographical project implemented 1517-23 by Fernando Colón, the second son of Christo-

pher Columbus. Colón described the areas between almost every town and village by multiple itineraries, given in semi-quantitative units, according to a classification of landform and land use types.¹² This database is massive and was compared in detail with the first edition of the 1:50,000 topographic maps (surveyed in the early 1900s) which confirmed its remarkable accuracy as to topography and land quality. Differences in land use are significant in some areas, but always compatible with the partial, contemporaneous historical documentation (González Jiménez 1975, 1977; Borrero 1983). The results are shown in Figure 7, which demonstrates that pastoral land use was much more widespread than during the twentieth century.

Characteristic stockraising economies are also shown in Figure 7, as derived from Colón (3370, 3380, 3391-92, 3399, 6587, 6596), Borrero (1983, Table 11) for the Aljarafe and Ribera, González Jiménez (1983) for Carmona, Franco (1974, Table 6) for Alcalá de Guadaíra, and Bishko (1978) for Jerez and Sevilla proper. The residents of the Aljarafe and Ribera owned 11,000 cattle (38 percent of them plow animals) and 13,200 sheep, excluding the larger herds belonging to *vecinos* of Sevilla and grazed in the area (*Ordenanzas*: 28 verso). The *vecinos* of Carmona owned 5,100 cattle and 18,600 sheep, those of Alcalá 3,077 cattle and 4,245 sheep, and those of Jerez 17,800 cattle and 28,600 sheep.

The size of the herds owned by the *vecinos* of Sevilla are unknown. Many of the sheep were regularly driven along the *cañada* northwest of the city to Tejada, Niebla and the region further west (Borrero 1983, 96-98). But cattle raisers appear to have dominated the local Mesta, the confraternity of stock raisers in that city (see *Ordenanzas*, 115 verso-124 verso). In 1450 herd size in the Marismas was set at 500 sheep with no more than two shepherds, and 500 cattle with up to four *vaqueros* (*Ordenanzas*: 29 verso), although we do not know how many herds of each category were pastured there. That there were many can be inferred from the fact that traveling groups of prostitutes could sojourn with the "ruffian" caretakers of any one herd for only 24 hours (*Ordenanzas*, 123 verso). The herders were forbidden to carry arms in order to avoid deadly brawls and *vaqueros* were only permitted a knife and a pointed herding pole (*garrocha*), used from horseback (*Ordenanzas*, 121 verso). Ear-marking was mandatory within two weeks of an animal's birth, while annual

round-ups and branding were standard practice in the month of May, and representatives of all the communities that utilized the Marismas (including the sierra of modern Huelva province) had to identify their brands at the annual Mesta meeting in Sevilla (*Ordenanzas*, 116 verso-118 verso, 119 verso). By comparison with the size of cattle herds elsewhere in late Medieval Spain, those of the Marismas appear to have been unusually large and handled in an exceptionally extensive manner, supporting the nineteenth century image of semi-feral animals, of poor quality stock, belonging to the traditional Andalusian red-brown breed (*retinto*) (Drain 1977, 115-16).

Stockraising was an important economic component of the Sevilla area in 1500, judging by the great expanse of pasture and by the activity of local Mestas in Sevilla, Carmona, Alcantarilla (serving the hinterland between Utrera and Lebrija), Jerez de la Frontera, and Niebla (primarily sheep and pigs) (Bishko 1978; González Jiménez 1983; Ladero and Galán 1984).¹³ But tying one or the other of these livestock traditions to those emerging in Mexico is difficult. The source of documented emigrants to New Spain before 1540 is shown in Figure 7 (see Boyd-Bowman 1964-68): 710 came from the city of Sevilla and its suburb Triana (3.9 percent *hidalgos*), including seven verified Mexican cattlemen, six sheepmen, and one other stockman; 150 came from all the other towns combined (6.0 percent *hidalgos*), including four verified Mexican stockmen coming from Jerez and one each from Utrera and Carmona.

Among the subsequent herd owners from Sevilla were two knights of the Order of Santiago; the daughter of a lacemaker; a noble lady, who married the viceroy's son in Mexico, and became a powerful rancher in her own right; an *hidalgo* who was Cortes's brother-in-law; and an *hidalgo* who became mayor of Mexico City. Seven were undistinguished *vecinos* of Sevilla, Jerez or Utrera who acquired *encomiendas* and cattle *estancias* in the Pánuco as a result of their services. It is a motley group and there are no obvious patterns.

The other emigrants from outside the city of Sevilla also seem uninformative since very few are identified by profession; the latter group included several soldiers, mariners, and merchants, three missionaries, a carpenter, a blacksmith, and a muleteer. More suggestive is Alfonso de Aguilar, an *hidalgo* of Burguillos, who

emigrated in 1524 and may have raised cattle in the Pánuco for a while; he was followed by two of his sons and two other *vecinos* in 1539. To establish clearer relationships between the Guadalquivir lowlands and stockraising in New Spain it will be necessary to systematically study the land grants in several parts of Mexico for the entire sixteenth century, in the expectation that Boyd-Bowman's remaining biographical volumes will be published shortly.

It is apparent that a significant component of the upper classes of Sevilla participated in the colonization of New Spain. This same urban aristocracy invested heavily in the acquisition of both large estates (Collantes 1976) and large herds (Bishko 1978; also González Jiménez 1983). The statutes of the *mestas* of Mexico City and Puebla appear to be modeled on the Mesta *ordenanzas* of Sevilla (Bishko 1978), suggesting a strong Andalusian impact on stock management in New Spain. It could also be argued that the great Sevillian estates served as a model for the Mexican *hacienda*. The large estates of Sevilla continue to be operated by managers for absentee landlords; they are commercial, rather than subsistence-oriented, with olive groves and vineyards as standard crops, and horse breeding or cattle raising in some but by no means all instances; the labor is provided on a daily-wage basis by landless workers who live in large villages (Bernal and Drain 1975; Drain 1977). There are, then, more than incidental similarities with the large estates of sixteenth-century Mexico,¹⁴ operated by managers with the help of *encomienda* labor to produce sugar and other commercial crops for landowners living in Mexico City.

The potential contribution of Sevilla to the early cattle-raising traditions of the West Indies, the Magdalena delta of Colombia, and several parts of Mexico, is highly suggestive. Many of the emigrants were born in Sevilla and its province; rural economic institutions bear strong similarities to those of early New Spain; most of the cattle stock and many of the *vaqueros* will have come from the Marismas; and the extensive nature of cattle management of the area apparently was unique within Spain.¹⁵ The Mexican evidence seems to support such roots (see Doolittle 1987). Yet only a small part of the early cattle ranchers in Mexico derived from Sevilla, and few direct linkages can be established at this time. It seems pertinent to emphasize the distinction between *ganaderos* and

vaqueros—cattle owners and cattle herders. The former will have decided on which animals to raise (the "what"), depending on the opportunities of time and place. The latter contributed the cultural repertoire of day-to-day operation (the "how") and, at least in the tropical lowlands of Mexico, ultimately determined the management style.¹⁶ Eventually, different strands of Iberian tastes, technology and experience were woven into a new fabric, better suited to another ecology.

Conclusions

The results of this historical interpretation of the Castilian agrosystem on the eve of the conquest of Mexico can now be reformulated and summarized:

(1) There appears to have been a basic continuity between the patterns of livestock-raising in Roman and Islamic times; furthermore, the livestock characteristic of specific areas a millennium or two ago continued to be so during the nineteenth century. Cattle and pigs were and remain prominent in the northern mountains and the western third of the peninsula, sheep still dominate in the eastern half of the interior, while goats are typical of the Mediterranean mountain periphery. Cattle were exploited for dairy products in a few areas and grazed for beef elsewhere. The persistence of these patterns over such a timespan suggests they represent ecological adaptations in regions marginal for more labor-intensive agricultural pursuits.

(2) Long-distance sheep transhumance was unimportant in the Christian kingdoms of the north until after 1150 A.D. and was made possible by military acquisition of the herds of Islamic Spain, where sheep were regularly driven between the Tajo and Guadalquivir valleys. Subsequent evolution of the more comprehensive Mesta system embraced most of Castile. But despite the Mesta and the popular image, late Medieval Spain represented a diversified mediterranean economy, not a great "ranching frontier." Even in the thinly settled and less attractive lands conquered between the Tajo and Guadalquivir rivers, cultivation employed the vast majority of the population. Further, local municipalities made substantial profits from grazing rights, but local livestock

were substantially more productive than pasture revenues from migrating Mesta sheep.

(3) Within the regional livestock economy of Extremadura, cattle and pigs together equaled the income derived from sheep, although cattle herds were mainly smaller than 100 head and rarely larger than 1500. The kernel of Hispanic cattle-herding procedures later used in the Americas can be identified in Extremadura and La Mancha, but the economy of scale to run 5000 or even 20,000 head in the Gulf-Caribbean area was quite different; such New World counterparts were based on a premise of unlimited land, without restriction, and a minimum of available manpower. In Old Spain, cattle were subordinated not only within a diversified livestock-herding system, but also to a preeminent agricultural sector of wheat cultivation and vineyards.

(4) The fundamental duality of cultivation and livestock-raising in the rural economy of Spain is hinted at in the Visigothic law code and becomes concrete in Christian documents of the later Middle Ages. This duality was also expressed in different forms of land ownership. Cultivated land was intricately subdivided and carried clear title, whereas pasture zones remained to some degree in the public domain. The complex rules of individual, communal and public access to land were transferred to the New World, but remain to be fully appreciated in studies of the evolution of stockraising in New Spain.

(5) Sixteenth-century emigration to the Indies came at a time when Spanish rural populations had been expanding for several generations, and when agricultural resources were becoming increasingly scarce. Hence one major impetus to emigration probably selected for the landless younger sons of village-based farmers. But there also were many urban emigrants, with recent rural roots or from a wealthier milieu in which it was fashionable to invest in agriculture or stock. The early transfer of livestock can probably best be understood as the collective result of decisions by individual settlers from many parts of Spain, exploiting opportunities within the constraints of royal policy and local ecologies. But the cultural imprint of the mass of anonymous immigrants will have shaped the details of how things were done in the practice of any particular occupation.

(6) On the eve of Cortes's *entrada* into New Spain, sheep undoubtedly represented the major herd animal in the Castilian interior. Less than fifty years later, great sheep herds had been established in north-central Mexico and a system of large-scale transhumance had been inaugurated (Chevalier 1963; Dusenberry 1963; Algier 1969). Anticipating the conclusions of my own research on the Mexican Mesta, the imprint of Castilian-style sheep transhumance remains highly visible in Mexico in the form of rock-fenced *cañadas*, sheep sheds, enclosed *dehesas*, and penning complexes, as well as in a host of characteristic toponyms. It also bears mention that the scale of transhumance achieved by the mid-1600s rivaled that of Castile in both distance and numbers. But even here I am uncertain as to how exactly the transfer was made, until I have identified the backgrounds for a larger sample of the individual participants.

(7) Given the small-scale and secondary role of cattle raising in Spain, with the notable exception of the Marismas, it is remarkable that the early owners of cattle herds in Mexico were drawn with little regional preference from most parts of Spain. Thus the Iberian roots of cattle herding and open-range ranching in Mexico remain difficult to decipher,¹⁷ without clarifying the different roles of cattle owners and cattle herders. Cattle ranching was evidently not transferred lock, stock, and barrel from one part of Old Spain to certain specific areas of New Spain. Cattle raising constitutes a package of animal breeds, technology, management procedures, products, and economic niches—as to site and markets—already subject to subtle adjustments in different regions of Old Spain. Its regional successes and differential development in the New World must be examined in terms of complex readaptation in a particular place and period.

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Notes

1. Throughout the late Middle Ages, the average cow was worth five sheep, a ratio that consequently represents parity. The Catastro does not include the Basque provinces, Navarra and Aragón, for which the 1865 livestock census (JGE 1868) was used to flesh out the peninsular picture; Portuguese data are for 1900 (Ribeiro 1957). The differences between 1750 and 1865 include a general 15 percent decrease in cattle, especially in Extremadura (66 percent), where sheep increased 79 percent; as a result the sheep-cattle ratio changed from 6.6 in 1750 to 17.9 in 1865. The nineteenth century censuses are less representative because of the rapid expansion of cultivation (53 percent 1800–60, see Nadal [1970]), in part accelerated by the secularization and sale of underutilized church estates (1837–55) which, in Extremadura, represented 21.5 percent of the land (Matilla 1947, app. 35).
2. The strong cluster of Roman and earlier remains, verified archaeologically to the southeast of the Guadalquivir estuary (Ménanteau 1978), seems to support this identification.
3. Prior to the modern system of controls, tidal incursions into the estuarine marshland moved at rates of up to 20 km per hour (Vanney 1970, fig. 12), with an amplitude of up to 2 m (Mayer 1960, 86). The hazards of rainfall and runoff-induced flooding are greatest in March (Vanney 1970, 46; also Colón, 481, 3370). During one notorious flood in 1917, 14,000 cattle and horses drowned in the Marismas (Drain 1977, 115).
4. For Islamic Spain an inventory of Medieval settlements was compiled primarily from Yakūt, Rāzi, Idrīsī, Himyārī, and Udri (see Barceló 1984, 162; Granja 1967; Sánchez 1976; Vallvé 1986). For Christian Medieval Spain the basic sources on contemporary settlements and agriculture are González (1944, 1960, 1975) and Sánchez-Albornoz (1966), supplemented by the record of Romanesque architecture in the villages of northern Spain (see Mehling 1985).
5. The 1797 census (Censo 1801) lists both the numbers of parishes and of all categories of settlements for each province. Using the better verifiable population data of 1787, the extreme case of "dispersion" was León, with 186 inhabitants per parish or 196 per settlement; the extreme case of "nucleation" was Murcia, with 3137 and 3575 people, respectively. In the case of Sevilla there were 2428 inhabitants per parish and 2636 per settlement. These eighteenth century census data were used to initially map the "strongly nucleated" settlement areas of Figure 6 on a provincial basis and the 1:400,000 topographic map

- series was subsequently applied to a grid from which more detailed patterns were derived. True dispersed settlement, i.e., isolated farmsteads, is in fact very rare except in Galicia, Asturias, and the Basque country.
- The proportional pasturage income of the northern districts vis à vis the combined northern and southern transhumant provinces increased from 38 percent in 1511-17 to 50 percent in 1560-87 and 65 percent in 1692-98 (see Le Flem 1972, app. 6B and 6C). Le Flem (1972) has attempted to estimate the numbers of non-migratory Merinos in each *quadrilla* but the reconstruction is unconvincing; his numbers show no correlation with the proportions of pasture income received within the various jurisdictions (his appendix 6B).
 - The pattern of trunk *cañadas* in 1365 also differed substantially from that in the 1500s (Díaz 1978).
 - By 1770 taxable income from pastures and livestock in this part of Spain amounted to only 17.3 percent of the total rural economy (Matilla, app. 40), even though less than 38 percent of La Mancha and 46 percent of Extremadura were cultivated in 1750 (Matilla, app. 33).
 - Fernando Colón c. 1517 distinguishes five major variants: *montes jarales* (spiny), *lenticales* or *romerales* (sclerophyllous), *chaparrales* or *marañales* (scrub oak), *palmares* (palmetto), and *berrocales* (rocky).
 - For olive groves alone the *repartimiento* totals 748 km², compared with 200 km² during the nineteenth century. For the conversion of wheat acreage, González assumes that the *yugada* is an *obra* of 0.25 hectares, whereas in fact a regular *yugada* of 32 hectares is implicit from the proportions of olive to wheat land.
 - Fortea (1981, 62-63) has been able to show that the number of persons per household in rural Córdoba was 3.55, compared with 4.69 in the cities, due to the higher number of people escaping mention in the tax rolls. For Sevilla the corresponding figures are 3.55 and 4.65 (Molinie-Bertrand 1985, 59). These ratios varied greatly from place to place, so that a factor of 4.5 is here used for the larger towns and cities of Table 1, and 4.0 for the smaller towns of the Aljarafe. I have included Tejada and six municipios in the Aljarafe that traditionally belonged to Sevilla, but were later included in Huelva province.
 - Colón's standard landform description includes floodplain (*llano de ribera del río*), level plain (*llano*), irregular plain (*doblado*), strongly dissected topography (*derribadero*), hills (*cerros*), mountain-and-valley country (*sierras y valles*), and *cuestas*. In regard to types of vegetation, see note 9. The work was not completed for all of Spain and never edited; the best and most consistent data are those for the Sevilla area. Ponsot and Drain (1966) give a useful general evaluation, but their map should be used with caution.
 - The 1865 livestock census (JGE 1868) suggests some similarity to the partial data of the early 1500s, so that the numbers of cattle and sheep are given in clockwise order for the districts covered by Figure 7: La Palma (Almonte) 3700/24,800; Sanlúcar Mayor (Aljarafe) 9500/30,000; Sevilla

- 20,200/59,900; Carmona 9300/50,100; Alcalá de Guadaíra 4200/21,300; Utrera 10,000/40,400; Arcos de la Frontera 12,300/38,300; Jerez de la Frontera 18,500/24,900; Sanlúcar Barrameda 2500/2300. The total is 90,200 cattle and 292,000 sheep, but 48 percent of the cattle represented work animals. For Lower Andalucía as a whole, the number of cattle in 1750 (Matilla 1947, app. 40) was 13 percent higher than in 1865, the number of sheep 25 percent higher. Even allowing for a comparably higher number of livestock in 1500 and a 50 percent reduction in plow-oxen (for a smaller agricultural population), it is difficult to argue for more than 90,000 beef and "reproductive" cattle in the area in 1500.
- On the controversy about the socioeconomic function of the Mexican hacienda, and its changes over the centuries, see Van Young (1982).
- Understanding of sheep transhumance strategies and shepherds in Spain is fairly good, despite a lack of cultural ecological field studies. This is not the case for the cattle tradition, other than for bullfighting. In particular, we need an "ethnographic" study of traditional cattle-herding in Lower Andalucía as well as an investigation of stockraising procedures on the large estates.
- The basic stock for the Spanish American cattle were shipped to the West Indies from Sevilla as well as Sanlúcar Barrameda, Cádiz and Pálos in a very short time span (1493-1512), and may have numbered as few as 500 head (Rouse 1977). This suggests derivation from Marisma stock, presumably controlled aboard ship by *vaqueros* of the same area. The seminal introduction of cattle raising to Santo Domingo may therefore have been critically influenced by only a few dozen "ruffian" herders from the Guadalquivir estuary.
- The Canary Islands can also be excluded as a source of cattle and related agrotechnology during the sixteenth century, contrary to the views of Rouse (1977, 28, 31). There were abundant sheep and goats, both long indigenous to these stony and often craggy islands, but cattle were introduced by the Spaniards and remained few in number during the early centuries (Aznar 1983, 295-301).

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