

# ***Pastoralism and ecosystem conservation***

## **Proceedings of the 17<sup>th</sup> Meeting of the FAO-CIHEAM Mountain Pasture Network**

**5-7 June 2013, Trivero, Italy**



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## **Foreword**

This book contains the Proceedings of the of the 17<sup>th</sup> Meeting of the FAO-CIHEAM Mountain Pasture Network - *Pastoralism and ecosystem conservation*, 5-7 June 2013, , Italy, held in Trivero (Biella district) from June, 5<sup>th</sup> to June, 7<sup>th</sup> 2013.

The Meeting was jointly organised by the Department of Agricultural, Forest and Food Sciences of the University of Turin, Oasi Zegna, FAO-CIHEAM Mountain Pasture Network, and Agroscope Changins Wädenswil Research Station ACW .

Here we publish 50 contributions, produced by approximately 70 authors. Eleven different countries from four out of five continents are represented. All contributions to this report have been reviewed by the members of the Scientific Committee.

The presentation is organised into two separate parts, one containing the papers presented orally, and one with the papers presented as posters. For each part the papers are sorted according to the program of the Meeting, i.e. into the following sessions:

Opening session

Session 1 - Ecosystem services of mountain pastures, including quality products

Session 2 - Management of pastoral areas

Session 3 - Agro-pastoral practices for environmental conservation

Session 4 - Grazing behaviour and GPS tracking.

Publishing these proceedings would not have been possible without the time and dedication of the members of the Scientific Committee. We are indebted to all these colleagues.

We express our appreciation to the participants of this Meeting and their effort to share information, skills, curiosity and scientific inspiration for this meeting. We hope this will be the occasion for creating new fruitful collaborations.

The Editors



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# ORAL PRESENTATIONS



## OPENING SESSION



## California Mediterranean Rangelands and Ecosystem Conservation

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### Abstract

Transhumance, irrigated pasture, supplements, and feeds complement rangelands of introduced Mediterranean species. In this changed ecosystem, grazing and pastoral practices can benefit native wildlife and plants. Conservationists and pastoralists work together to combat landscape fragmentation. We visit an oak woodland ranch to see the impacts of land use change, conservation policies, rancher goals, and land, livestock, and ecosystem service markets.

Keywords: conservation policy, ecosystem services, transhumance, oak woodlands, working landscapes

### Introduction: California Mediterranean rangelands

In the 1930s, Ermenegildo Zegna reforested an Italian mountain with a history of grazing dating to Classical times. In California, we are changing rangelands that were once the sole domain of indigenous Californians who managed for hunting and plant harvest. Over fewer than 300 years, the landscape has been “engineered” by livestock grazing, cultivation, fire suppression, and the introduction of exotic species. Rangeland researchers strive to understand this dynamic situation.

About 4.3 million ha of annual grasslands and 2.1 m ha of oak woodlands offer forage for grazing animals (CDF-FRAP 2003). Grasses are mostly Mediterranean annuals. Highly variable rainfall patterns mean forage production varies by orders of magnitude. Forage dry weight varies temporally from 500 to 3000 kg/ha (Huntsinger and Starrs 2006). It is drier and warmer in the south; northern or higher elevation areas are colder and wetter. The cold Pacific Ocean results in a moderated, cooler and moister, climate near the coast. Heterogeneous soils cause high spatial variation in forage production (Jackson and Bartolome 2002.)

Grazing is California’s most extensive land use. Calving and lambing is timed to take advantage of spring growth (George et al. 2001a; George et al. 2001b). Supplemental feeds, selling of calves, transhumance, irrigated pasture, leased pastures, and stock movements help cope with unpredictability and the summer dry period, which is longer than southern Europe’s (Huntsinger et al. 2010a). Transhumance began in the mid-19<sup>th</sup> century, to the Sierra Nevada and northern mountains.

An oak canopy, common throughout the state, creates a moister microclimate and litter that can increase production, influence species composition, improve forage quality, and extend the period of green forage (Frost and McDougald 1989; Frost et al. 1991; Frost et al.1997). Trees may be thinned to prevent suppression of forage production, however, the canopy is often naturally open. Canopy cover of 50% or less does not tend to suppress forage. There is much research on overstory-understory relationships, afforestation, and factors influencing oak regeneration and recruitment, including grazing. (McClaran and Bartolome 1989; Jackson et al. 1990; Marañón and Bartolome 1993; Marañón and Bartolome 1994; Hatch et al. 1999; McCreary 2001; Tyler et al. 2006; McCreary et al. 2011).

### Livestock production

Ranchers are encouraged to manage using residue management: leaving behind a certain amount of ungrazed plant material, or residual dry matter (RDM) at the end of the grazing season to protect the soils and encourage the growth of useful forage species by influencing germination conditions. Recommendations call for leaving 110–960 kg/ha depending on canopy cover of oaks and slope (Bartolome et al. 2002; Bartolome et al. 2007). Management practices vary, including year-long, rotational, seasonal, and targeted grazing (Huntsinger et al. 2007).



Livestock have been in California since 1769, with dramatic shifts in numbers through time (Fig 1.). A history of livestock in California shows huge increases following 1849 Gold Rush when prospectors and associated industries departed, reducing demand for the animals once brought in to feed them, and during WW I. Leasing of government and private land is common, with government land usually around a third to half on average of the rangeland portfolio (Liffmann et al. 2000; Sulak and Huntsinger 2007; Roche, 2013; Huntsinger et al. 2010a). Replacement heifers from California's large dairy industry now compete for grazing lands. Mountain meadows are frequently in federal ownership and some ranchers have summer permits, though few spend summer in the mountains anymore (Sulak and Huntsinger 2002; Huntsinger et al. 2010a). The use of these pastures is shifting to recreation and nature preservation. Rangeland calves or yearlings are sold to feedlots where they are fed agricultural by-products, hay, grain, and other rations for 100 to 150 days and slaughtered at 18 to 24 months of age and 475 to 520 kg. The largest feedlots are near the grain production centres in the middle of the country, though there are a few in California where cattle are fed agricultural residues and some locally-produced grains (Huntsinger and Starrs 2006).

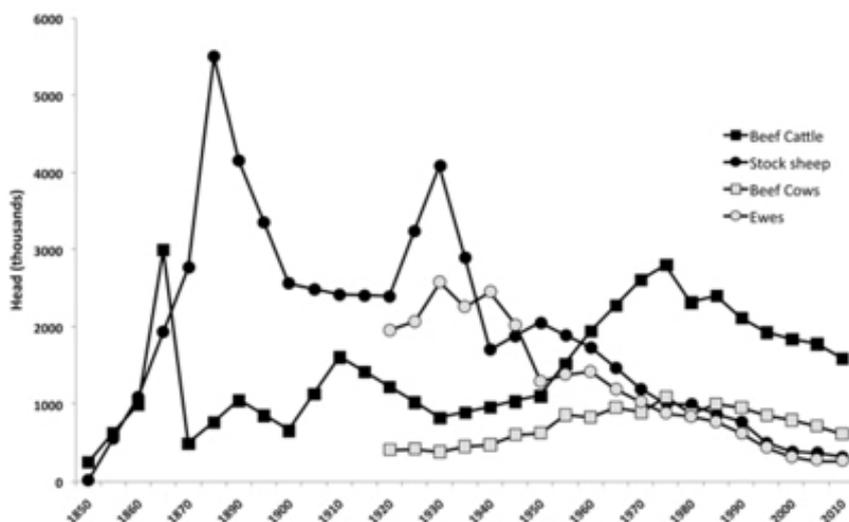


Figure 1: Range cattle and sheep in California, 1850-2010. Beef cows are brood cows, ewes are meat breed brood ewes, and both are often on rangeland. The gap between the number of beef cows and beef cattle indicates the presence of yearlings (stockers) on rangelands or in feedlots. Separate data for cows and ewes was not provided until 1920 (Data recompiled from Burcham 1982, USDA-NASS 2011a and b).

California and Texas have the most sheep in the United States. In 2010, California had 263,000 ewes, down from 770,000 in 1985 (USDA-NASS 2011b). The drop is attributed to low profits stemming from competition from imported lamb, high labour costs, and a decline in lamb consumption. In oak woodlands, with wildlife protections predators have increased (Neale et al. 1998; Conner et al. 1998), and with development, domestic dogs are a growing problem. Lambing is in late fall and spring.

About 140,000 goats resided in California in 2011, including 38,000 dairy animals (USDA NASS 2011b). Goats are used for meat, dairy, and vegetation management. Goats may be herded to control weeds and reduce fire hazard, often on steep hills where other brush control methods would be expensive and difficult. Free-ranging pigs are rare, but the practice has undergone a recent revival for the gourmet market, with at least two producers trying acorn-fed pigs (O'Rourke 2012; Reed 2010).

### Ranchers and land use change

More than three-fourths of ranchers live on their properties and manage the land themselves, and have owned their properties for an average of 39 years. In 2005, 25% of oak woodland ranchers reported that the majority of household income came from ranching. About 22% cited off-ranch wages as a major income source, and another 22% earned most of their income from other forms of self-employment, including investments, pensions, and the like (Huntsinger et al. 2010b). Livestock producers may earn income through marketing



oak trees as firewood and selling access to their land for hunting, but most work off-ranch to support the property (Smith and Martin 1972; Torell and Kincaid 1996; Huntsinger et al. 2010b).

Ranchers readily agree that “income maximization” in the conventional sense is not their goal (Liffmann et al. 2000). Instead, a financially sustainable operation that maximizes landowner autonomy in decision-making, provides a good place to raise a family, allows enjoyment of the natural environment, and is based on work with animals is more important to most ranchers (Liffmann et al. 2000; Huntsinger et al. 2010b). For the most part, ranchers are enthusiastic about the amenities produced from the management of their properties, and aware that society values them, but at the same time, they strongly seek to maintain control over management decisions and practices on their land (Huntsinger et al. 2004). Land prices are consistently above those that can be justified by commercial production value, reflecting the high profits to be earned from development and conversion, but also substantial landowner consumption of non-market benefits from the land (Campos et al. 2009; Torell et al. 2005).

### Rangeland Ecosystem Services

Efforts to conserve and enhance rangeland ecosystem services are at two scales: landscape and pasture, with a constellation of policies, practices, and research for each. The “wide open spaces” of ranch landscapes are important aesthetically, and many other ecosystem services depend upon the extensive and undeveloped land. At the pasture scale, a number of studies have shown that livestock grazing has become a valuable tool for conserving native species. Programs that motivate landowners to manage for the joint production of livestock and increased and multiple ecosystem services can be a powerful approach to ecosystem conservation.

At the landscape scale, zoning is weak in response to the financial power of development interests. For many ranchers land appreciation is a long-term financial asset (Ferranto et al. 2011), planned for retirement and inheritance. Cash-short ranchers sell land to raise capital. Ranchers strongly defend their right to market their land as they see fit. The constant attrition and fragmentation of the resource base undercuts the long-term sustainability of ranching. There is strong competition for available grazing leases (Sulak and Huntsinger 2002), augmented by the administrative withdrawal of millions of acres of federal lands from grazing, and the continued decline in numbers of stock allowed on federal lands (CDF-FRAP 2003; Sulak and Huntsinger 2007). A study in the Sierra Nevada foothills showed that transhumant ranchers have been ranching for a longer time, and are more affected by land use change, than ranchers not practicing transhumance. Most have owned their land for a long time by U.S. standards: 63% of transhumant foothill oak woodland ranchers reported that their families have owned their ranch for more than 100 years (Huntsinger et al. 2010a). Loss of a permit to graze in the mountains can make associate private lands more vulnerable to development due to reduction in grazing land (Sulak and Huntsinger 2002).

Conservation easements are a private sector response to fragmentation and are now the most widely used private sector land conservation method in the United States (Gustanski and Squires 2000). The amount of California land under conservation easements increased by 34% since 2005, and doubled since 2000 (Land Trust Alliance 2010). In exchange for tax benefits or outright payment, a landowner voluntarily agrees to a permanent deed restriction on the property title that prohibits development (Merenlender et al. 2004; Reiner and Craig 2011). Easements allow ranchers to continue ranching, while extracting some of the capital value of the land by voluntarily donating or selling the right to develop (Sulak et al. 2004). Surveys of range and forest landowners in 2005 and 2008 found that approximately 6% had a conservation easement (Huntsinger et al. 2010; Ferranto et al. 2011). California programs spent approximately \$103 million in cash on easements for conservation or mitigation in 2002, much of it public funds, and mostly on oak woodland grazing lands (Rilla and Sokolow 2000).

At the pasture scale the role of pastoralists as providers of ecosystem services that support biodiversity is now recognized (Barry 2011, Huntsinger et al. 2007). In the San Francisco Bay region, half of the available habitat for the endangered California tiger salamander (*Ambystoma californiense*) is provided by stockponds and improved with grazing (DiDonato 2007). In a more complex case, more than half of the foothill habitat for the rare California black rail comes from the leaky irrigation works associated with ranching (Richmond et al. 2010), yet grazing must be carefully managed during the breeding season (Richmond et al. 2012). Trade-offs are typical: grazing reduced methane emissions from oak woodland seeps and springs, but was associated with a decline in insect species richness (Allen-Diaz et al. 2004). Other examples of species that benefit from grazing are endangered bay checkerspot butterflies (*Euphydryas editha bayensis*) (Weiss 1999),



burrowing owls (*Athene cunicularia*) (Nuzum 2005), insects (Dennis et al. 1997), kit fox (*Vulpes macrotis mutica*) (USDA-FWS 2010), kangaroo rats (*Dipodomys stephensi*) (USDA-FWS 1997, Kelt et al. 2005, Germano et al. 2012), wildflowers (Barry 2011), and a host of rare flora and fauna associated with vernal pools (Marty 2005, Pyke and Marty 2005). In some cases grazing exclusion has caused the species being “protected” by the exclusion to leave or disappear (Weiss 1999).

One way to conserve the pasture and landscape is to increase ranch profits. Labelling programs are not well developed, although consumer interest is on the increase. Non-governmental certification programs play a growing role in informing consumers of the ecosystem services associated with buying various products or brands. There are markets for some ecosystem services provided directly by livestock. One example is grazing for control of fire hazard and invasive weeds. Goat companies charge up to \$1300 per ha for this service. Cattle can also be used for fire hazard management (Byrd et al. 2009). On some public lands, lease costs are reduced for habitat improvement and detailed and highly constrained grazing prescriptions have emerged (Germano et al 2012; Huntsinger 2012).

More than two-thirds of ranchers surveyed were receptive to the idea of being rewarded monetarily “to improve the quantity and/or quality of environmental benefits that their land provides to society,” even though many were unfamiliar with the specific term “ecosystem services”. The duration of their commitment, and the payment amount, were important factors in rancher willingness to participate in such payment for ecosystem services programs, with preference for shorter contracts and higher payments (Cheatum et al. 2011). The kind of entity that would offer the payments was important to prospective sellers, with non-profit organizations or private firms strongly preferred over state and federal agencies with regulatory or administrative authority over ranchers (Ferranto et al. 2012).

Federal cost-share programs, a form of payment for ecosystem services including habitat and environmental quality improvements include the Wildlife Habitat Incentives Program (WHIP), the Environmental Quality Incentives Program (EQIP), and the Grassland Reserve Program (GRP). In 2011, EQIP provided \$74 million to California farmers and ranchers for carrying out projects to improve “environmental quality” while WHIP paid out \$3.6 million (USDA-NRCS-EQIP 2011; USDA-NRCS-WHIP 2011). The Conservation Reserve Program (CRP) paid farmers 89.2 million dollars to keep land out of cultivation, though grazing is not allowed on reserved lands (Environmental Working Group 2011). Altogether the USDA Natural Resource Conservation Service spent another \$5.4 million on conservation practices in California between 2005 and 2009, including brush management, prescribed grazing, and upland wildlife habitat (Tanaka et al. 2011).

Provision of wildlife habitat was the service that ranchers in California would prefer to market or be rewarded for producing, and they already report such management, but there was considerable willingness to restore native plants, improve water quality, and increase carbon storage (Cheatum et al. 2011; Ferranto et al. 2011). Ranchers were slightly less interested in increasing oak numbers, perhaps because most are familiar with the difficulties involved and may feel too many oaks will interfere with forage production (Huntsinger et al. 2010). Increasing woody plants is one possible way to increase carbon storage but it increases water consumption and fire risk (Booker et al. 2013).

Many non-market ecosystem service values can be satisfied with a property of a few hundred acres (Oviedo et al. 2012). On the other hand, commercial values from livestock production and other natural resource products continue to increase with property size. Combining these two “valuations” is the basis of the “working landscapes” effort in California to encourage joint production of commercial and non-commercial ecosystem goods and services in order to create sustainable rangeland enterprises.

## Conclusions

I invite you, in my presentation, to join me on a visit to a California ranch, to see the on-the-ground effects of conservation policies, rancher goals, and land, livestock, and ecosystem service markets.

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