Conserving Local Breeds

An annotated bibliography

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4 June 2013
Introduction

This annotated bibliography is the product of a research team of six undergraduate students from Iowa State University, Ames, Iowa, USA. Each of the six students have primary majors within the College of Agriculture and Life Sciences and were selected for a class, The Dean’s Global Food and Agriculture Leadership Program, in the spring of 2013 to participate as part of a research team for the Food and Agriculture Organization of the United Nations (FAO). The general outline of the project, including deliverables, was established via a conference call with the clients in late March. The team and their professors focused their last month of class on preparation specific to the project. Upon arrival in Rome in May, 2013, the objectives of the project were refined with FAO leadership from the Animal Production and Health Division (AGA).

The growing threat of extinction that local breeds of livestock face is a primary concern to AGA\textsuperscript{1}. These breeds provide value to producers and consumers alike, but are being replaced by commercialized breeds at an alarming rate. This is of concern because local breeds provide economic value as well as social and environmental value, including their ability to help sustain rural livelihoods—especially for peoples in low-income countries. Local breeds also help address issues from biodiversity and climate changes, to the empowerment of women. The primary objective of the research team was to identify and review literature on the multiple values of local breeds and how those values can be captured to provide producers with an incentive to maintain the genetics of these breeds.

Methodology

Searching for the literature

Literature in three major thematic areas was selected to be reviewed for the project: local breeds, value chains, and global development issues. In addition, a major research objective was to assess the degree to which extant research covers the intersection of these key themes.

\textsuperscript{1} FAO. 2007. The State of the World’s Animal Genetic Resources for Food and Agriculture, Rome, Italy. Pg. iii
The initial step that the research team took to identify literature for the project was to search the primary agricultural research databases including AGRICOLA, CAB Abstracts, and Science Direct. The search engine Google Scholar was also used to take advantage of its access to many other databases. These databases were searched in April and May of 2013, with the majority of the articles being annotated during the second half of May. A list of “Key Terms” was established by the research team with input from FAO staff in AGA. A full list of the common key terms is provided below. Combinations of two to four of these terms, as well as specific species of livestock, were used to identify articles that met the objectives of the project. Academic journal articles, working papers, government publications, and conference proceedings were the types of sources that were considered for annotations.

**Selecting the articles**

The abstracts of articles that contained the established key terms were read to determine if the study was in line with the specific areas of interest. A decision was made at the beginning of the project to not include FAO work within the annotated bibliography to allow the team to focus their efforts on collecting materials that FAO may not already be familiar with.

In accordance with project objectives, when selecting articles for the bibliography we gave preference to articles that provided examples of value creation for the owners of local breeds over articles that only discussed genetic conservation programs. As well, we gave preference to studies that focused on livestock smallholders in rural areas over large-scale livestock production. Articles that were published after the 2007 State of the World’s Animal Genetic Resources report\(^2\) were considered to have more value to FAO and 70% of the annotations were for articles published after 2006.

**Annotating and Classifying Articles**

After an article was considered to be in line with the scope of the project, it was read by a team member and an annotation was completed following a standardized protocol that had been created at the start of the project. The guide called for the same questions to be answered in the same order for each of the annotations in the bibliography. Annotations include a citation in

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FAO house style, the author’s profession, and the region in which the research was conducted. It goes on to give the species studied, the products or services in focus, and how value is being created—if applicable. The author(s)’ main research goal and the research methods were identified. Key results and discussion were summarized, and statistically significant results were identified if applicable. Each annotation ends with an outline of the major conclusions.

Articles that were selected to be annotated were described by a series of nine classifiers:

- **Country/Region:** The area where the research was conducted.
- **World Bank Classification:** The 2012 ranking of the country as low income, lower-middle income, upper-middle income, or high income. http://data.worldbank.org/country
- **Livestock Species:** Species that are the focus of the article.
- **Key Terms:** The most common key terms included combinations of: animal production, biodiversity, breeds, business model, certification, cluster, conservation, ecosystem services, environment, geographical indicators, indigenous, livestock systems, local, management, market, poultry, preservation, specialty product, standards, sustainable, value chains, and value.
- **Service/Product Provided:** Output of the breed studied, including: dairy products, draft power, ecosystem services, eggs, fiber, hide, and meat.
- **Type of Service/Product:** Classification of how the product is used: Provisioning (goods produced or provided by ecosystems), Regulating (benefits obtained from regulation of ecosystem processes), Cultural (non-material benefits obtained from ecosystems), and Supporting (services necessary for the production of other services). http://rosenberg.ucanr.org/documents/IV%20Safriel%20figures.pdf
- **Type of Benefit:** The benefit that the producer would experience, ranging from higher output values to lower inputs, as well as employment, training, and social status.
- **Data Collection Method:** The type of data in the article: qualitative, quantitative, or literature review.

The annotations were proofed by a different team member to reduce errors and to help ensure consistency. They were assembled in one document in alphabetical order by the last name of the lead author.

In this article, authors Alexandre et al., of various universities and countries, discuss the management and production systems of goats in the tropics. Based on their research, which consisted of evaluating systems and presenting relevant case studies, there is not a set location for a “study site”. The studied specie is the Creole goat that facilitates the service of food products: meat and milk. This study does not measure the value of the products, but instead, it takes a look at the factors that influence the quality of the specie’s service.

Within the article the authors aim to offer guidelines that will help pilot the farming system through the management of influencing product quality factors like reproduction, feed resource, integrated health control protocol, and breeding improvement adaptations to the local sectors. These guidelines are designed with the farmers in mind; from their perspective of improving management and increasing production.

The article concludes that many factors take part in the management and production of goats, and so the specie’s success needs be thought of as a function of both the individual and collaborative interactions of genetic resources, biophysical environment, cultural technology, and local & global economic and sociopolitical regulations. The article summarizes that in order for goat management and production to be effective; these factors need to be combined. Also, the local knowledge of each component, the collaboration within professionals from each component, will enable everyone to measure the resulting response of the factor in all fields.

Key Terms: Value Chains, Tropics, Caribbean

This article was written by A. Al-Nasser, *et al.*, from the Aridland Agriculture Department, Food Resources Division, of the Kuwait Institute for Scientific Research in Kuwait. The article focuses on the ostrich value chain and the promotion of ostrich products, such as meat, feathers, leather, oil, eggs and eggshells in Kuwait. It also examines the major obstacles to promoting the new industry and to improving the livelihoods of ostrich farmers, including heat stress, lack of knowledge about ostrich feed ration formulation and management, and low market demand. The authors provide information on ostriches, specifically the black-neck ostriches from South Africa, and their importance as an alternative meat source for consumers in Kuwait. The role of research in developing ostrich production in Kuwait is also discussed. Ostrich production began in Kuwait in 1994 and has expanded substantially. Surveys of ostrich farms in Kuwait were conducted. Producers focus on breeding and increasing the number of birds. The researchers concluded that more public awareness is needed to increase demand, including educating consumers on the health benefits and quality of ostrich meat. Workshops, symposiums, and seminars are also recommended.

*Key Terms: Animal Production, Biodiversity, Business Model, Geographical Indicators, Management, Poultry, Specialty product*

Anderson, of Imperial College London in the United Kingdom, produced an article on the importance of animal genetic resources (AnGR) for the rural poor. Although this article does not focus on a particular breed, species, country, or value chain, it does provide factual information on the roles AnGRs have for the rural poor around the world and how conserving local breeds and biodiversity is crucial in improving livelihoods. Anderson discusses the many benefits, goods, and services AnGRs offer the rural poor whether this is through transport, food, a form of insurance or savings, fiber, social and cultural functions, such as improving one’s status, as well as many others.

This article argues that AnGRs have much to offer the world’s rural poor, but it also discusses how the biodiversity of these animals is at stake. Conserving local breeds, and at times crossbreeding them with commercialized breeds or ‘improved’ breeds, will be an essential part of maintaining biodiversity, as well as preserving the important characteristics that make these AnGRs so valuable to the rural poor. These characteristics were displayed as, but are not limited to, being well adapted and possessing the ability to adapt to harsh environments and having a strong cultural significance. The article did briefly mention that local breeds may not always appear to be as productive as ‘improved’ breeds, but their adaptability, resilience, cultural significance, and diversity, make them essential breeds to conserve for biodiversity and other purposes. The author strives to inform the reader of the importance in conserving these breeds and their effects on the livelihoods of the rural poor.

The findings of this review suggested that AnGRs must be conserved because of the many benefits, goods, and services they provide to improve the lives of the rural poor. Also, they are a key element in biodiversity. The author argues that by not conserving local breeds, genetic erosion will continue to threaten the poor and will have lasting, negative effects.

*Key Terms: Conservation, Local, Livestock, Breeds, Sustainable, Livelihoods*
This article was written by Antos et al. from the University of Agriculture in Kraków, in Kraków, Poland. Their research is being conducted on five populations of Polish local chicken varieties and five chicken purebreds. Of the local chicken varieties, two of the flocks are native crested chickens from Ryczki village and Hucisko village in southeast Poland, two flocks of miniature chickens from Podolszyna Ordynacka village and Pichów village, and one flock of crestless chickens from Subcarpathian region. The five purebreds are Leghorn, Sussex, Rhode Island Red, Greenleg partridge, and Minorca. A total of 80 chickens from ten populations were used in the study, eight chickens per population. The chickens were genotyped to look at genetic variability, especially between species, and to preserve genetic diversity. According to FAO in 2007, 33 percent of chicken breeds are classified as being at risk of extinction.

Fresh blood was collected from each specimen at the University of Agriculture in Kraków, Poland, to obtain genetic information for gene profiling. DNA was quantified and fragments were visualized to compare DNA and the length of microsatellite alleles in each locus in order to quantify genetic variability, especially between species. Local populations were found to have low genetic variability, in contrast to purebreds, although they had higher genetic diversity. Each of the purebreds originate from different countries and have different breeding histories, with no evidence of close genetic relationships between local varieties and local strains. The results from the study suggest the separateness of the local varieties and indicate a strong need for breed protection to preserve the genetic diversity.

**Key Terms:** Biodiversity, Breeds, Conservation, Poultry, Local, Sustainable

This review paper looks at the current status of conservation of indigenous livestock genetic resources in Zimbabwe. Assan, from the Department of Agriculture at the Zimbabwe Open University in Bulawayo, Zimbabwe is the author of this paper. The review also uses research that was completed in Zimbabwe. Research goes over livestock as an entire system of the country of Africa, but specifically uses three breeds of indigenous cattle of Zimbabwe: Tuli, Nguni, and Mashona. It talks about their importance to the contribution of food security and smallholder households livelihoods. The goal of the review was to highlight the need to conserve indigenous livestock genetic resources while obtaining maximum benefits from local livestock. There was no research conducted for this review, but rather Assan took examples of cattle breeds that have been successful in maintaining a presence as a local breed. Tuli produces meat of exceptional quality and the Tule Breed Society was created in 1961. A Nguni herd has been created to sustain genetic resources. The Mashona Breed Society created a breeding scheme in 1990 to try and broaden the genetic base of the breed.

The detrimental effects of widespread crossing with exotic breeds or strains of livestock that are not adapted to the harsh, semi-arid environment have been experienced in some rural areas where numbers of local animals species have dwindled. Causes of genetic erosion in indigenous livestock genetic resources may be influenced by changes from traditional livestock agriculture to modern techniques of agriculture. Some of these livestock systems are only threatened, while others resort to the use of crossbreeding techniques. The author argues that the starting point for conservation is the establishment of a new and accurate baseline data on indigenous livestock genetic resources which is fundamental for sound planning and development of sustainable programs. The status of livestock genetic resources is poorly understood and loss of genetic diversity through natural disasters and indiscriminate crossing of local breeds and strains has not been reported and is difficult to quantify.

*Key Terms: Livestock Systems, Production, Value*

This local value chain, researched by W. Ayalew *et al.* from both Ethiopia and Germany, is located in the Eastern Ethiopian highlands. The study focuses on indigenous goat flocks and their meat and dairy products they provide for the local community. The goals of the authors are to showcase a concept for the economic evaluation of livestock production to capture the utilities of livestock and the multiple limiting resources employed. It uses an example of smallholder goat production in Eastern Ethiopian highlands as a concept that indigenous goats can be made economically more rewarding to the smallholder farmers by improving traditional husbandry practices based on experiences.

Surveys and purposive sampling were used for the study to collect data. Household producing goats and their products and services were trained with better management practices to show how they could improve their effectiveness and success. Improved management resulted in significantly higher productivity on land and labor. The added benefits generated were 80% higher per unit. Sufficient evidence to accept the hypothesis that indigenous goats maintained under improved management of smallholder livestock flocks generate higher net benefits per unit of cultivated land and labor used.

**Key Terms:** Indigenous, Management, Production

Banovic et al., from agriculture institutes and veterinary medicine facilities in Portugal, examine the relationship between quality labeling of products and rural development in the country. The study uses local cattle breed products, as well as products differentiated by geographical indicators, as evidence to show that increased quality and safety labeling can help promote the development of these local breeds and rural areas. To identify the effects of quality labeling and standards, the authors use consumer surveys, and assessments of breed populations and products. There is also some classification by geographical region. The research aims to recognize methods for rural development in Portugal.

Portugal is considered to be of lesser agricultural value in Europe based on poor soil quality and decreased agricultural activity. The number of cattle breeds was decreasing because of urbanization and mechanizations. More cattle producers were selecting individuals based on the amount of product, meat or milk, they would produce. However, these preferences to intensive cattle production, using industrialized breeds, were not increasing the competiveness of Portugal’s beef industry. Portugal remained at the bottom of the European Union nations, negatively impacting rural areas and populations.

Consumers were demanding more quality and safety standards creating a market for value added products with strong identifiers of origin. These would include reassurance and certifications of origin, breed, quality, and safety. Labeling provides promotion of rural development, protection of product names, and increased information provided to the consumer.

The study found that this new development resulted in more diversity in cattle production and an increase in the value of labeled beef. The system still needed management, organization, formal shipping and harvesting requirements, a regular supply, and an ability to fill major markets.

Key Terms: Breeds, Certification, Geographical Indicators, Price, Standards, Value

Barjolle *et al.* are from Switzerland and compiled a review of material concerning Geographical Indication (GI) and Protected Designation of Origin (PDO) without a specific region given. The authors state that the development of registered GI or PDO products increases the efforts of preservation for local breeds or varieties. The goals of the paper are given as efforts to review literature available, summarize some of the case studies funded by the Swiss government, and to compare potential impacts across these studies. Ten research methods of various degrees of being qualitative and quantitative are discussed based off of the literature that was reviewed. Discussion about the methods is provided with the conclusion that there is not just one way to approach research on GI.

Fourteen case studies were reviewed for comparison on the levels of economic, social and environmental impact. A method is described for scoring the various elements on a scale from 0 to 6. For the products with established GI in the study, economic impacts are the most important. More specifically the increase in local employment receives the highest score. The authors conclude that the majority of observed and expected impacts of GI are economic or economic-related issues. However, they issue a caveat that there are dangers of basing GI or PDO entirely on an economic foundation. There are results that show smallholders of local breeds suffering when creating too much monopoly power. If the region of origin is not well established, competition among smallholders can be lost.

*Key Terms: Local, Breeds, Value*

Bhagya *et al.*, discuss the importance of non-descript local buffalo breeds in the semi-arid climates of India. These local buffalo breeds are not classified, but do provide important benefits including increased resilience and adaptability under harsh, low-input conditions. The authors hope to provide evidence to support the classification and recognition of the local buffalo breeds for use in government programs in these regions. They conducted surveys of buffalo performance, utilized data from local veterinary databases, and obtained phenotypic measurements of individual local animals to acquire the quantitative data necessary to analyze the breeds’ performance and place individuals into the breed-groups.

In India, there is a large amount of indigenous buffalo breeds. However, only two are recognized and can be used in government development programs- the Murrah and a genetically improved version, the Graded Murrah. Both of these breeds require more care and inputs than the typical indigenous buffalo. Additionally, they must be stall fed with hay, rather than grazing on natural vegetation in comparison to other indigenous breeds. Under the harsh conditions in semi-arid climates with populations of low socioeconomic status, the Murrah buffalo used for development have high mortality rates and low performance records, causing large debt burdens. The use of these two breeds has historically been the focus of India’s development program, but under the unfavorable conditions, the unrecognized buffalo breeds may provide a more effective method of animal agriculture development and food security.

*Key Words: Breed, Environment, Local, Indigenous, Livestock Systems, Value*

Authors Boyazoglu, of Aristotle University in Greece, and Morand-Fehr, of the Laboratory of Nutrition and Food in France, produced a review article over sheep and goats around the Mediterranean and the products they produce, particularly dairy and meat products. This article does not discuss a particular type of value chain; however, it does explain the importance of goat and sheep in this region and the challenges to keep the value of these products high enough to remain sustainable and able compete with the global economy and industry.

As mentioned before, this piece is a review article, so the authors did not conduct any of this information themselves, but it was all supported by other sources. This article claims that sheep and goat production offers distinct products with unique characteristics, such as flavor, that cannot be found in products produced by other species such as dairy cows. The authors describe three ways animal products can be classified in terms of quality—hygienic and sanitary quality, dietetic and nutritional quality, and gustative and gastronomic quality—and they also display the benefits goat and sheep products offer for human digestion and absorption. Additionally, the typical products produced by these breeds is discussed, as well some of the challenges goat and sheep products may face in the current industry. The findings suggest that proper policy, aimed at protecting these products through higher production and sustaining the development of specialized and niche products for well-established markets, is essential in the success and continuation of utilizing sheep and goat for their products in the Mediterranean area.

Key Terms: Goat, Conservation, Value Chains

This paper covers a local value chain researched by J. Cañon *et al.* in Spain, Portugal, and France with researchers and authors from the same three countries. It studies European beef cattle and how they can provide genetic conservation for future breeding and management practices. The goals of the authors include assessing genetic variation within and between breeds and groups of breeds, and defining a diversity measurement to rank breeds for conservation practices.

Research was conducted by taking samples of fresh blood from 25 males and 25 females in a conservative buffer. A microsatellite marker analysis was used to quantify cattle genes and their productivity for future generations. The mean number of alleles per locus per breed in this study was 6.5 alleles. These molecular markers provide a tool for measuring genetic differentiation between breeds of domestic species.

This study was conducted to show the preservation of variability with the hypothesis of correlation between genetic variation and population variability. The microsatellites can be used to construct a measure of diversity through genetic populations and their relationships. Future breeding practices can be based on this broader knowledge between genetics and their populations.

*Key Terms: Management, Conservation, Local, Breeds*

Carpenter and Larceneux are from Bordeaux Management School and GregHec, Groupe HEC respectively, both located in France. The authors are investigating the decision-making process of consumers when buying products with labels linking them to geographical areas in the European Union. The study is designed to evaluate value creation by brand equity represented with labels when the consumers are informed on the labels’ meaning. A literary review was conducted before the study and the results are discussed. It was realized that an independent third party’s involvement in the regulation process greatly increases the confidence that consumers will have in a brand. This consumer trust is the most important factor contributing to the label’s success.

Their study focuses on the Protected Geographical Indication (PGI) label that is offered by the European Union. Two hypotheses were proposed by the authors to test the conceptual framework of the value created by labels. They can be summarized to say that labels operate as a credible sign to improve perceived quality and that when explained to consumers the label enhances values associated with the product. Four types of labels on two different products were presented to random consumers: 1 a standard label; 2 a standard label with a regional label; 3 a standard label and a regional label and the PGI label without any explanation; 4 a standard label and a regional label and the PGI label with an explanation of the role of the EU in guaranteeing the product’s geographic origin.

A Likert scale of 1-7 was used by 488 respondents to rate how well they agreed with provided statements concerning perceptions of the products with one of the four labels. Adding the label without explaining to the consumers did not have a significant increase in the success of the product. It wasn’t until after the meaning of the label was explained that there was a statistically significant increase in the ratings that the product received. Tables are used to present the full set of data.
The authors conclude that labels are a way to increase profit for producers, but are only effective if proper efforts are taken to explain to consumers what the labels mean. They argue that these results should encourage EU policy makers to increase activities to communicate information about geographical indication and other labels.

*Key Terms: Geographic Indication, Value*

Chiduwa *et al.* studied a local value chain in the semi-arid farming area of Chirumanzu, Zimbabwe. The authors of the paper are from South Africa and Zimbabwe as well. The study focuses on the indigenous Mukota breed of pigs of Zimbabwe. They provide meat products, genetic resources, and the improvement of livelihoods. The local breed is also less reliant on external inputs. They can survive and reproduce on a low plane of nutrition. The objective of the study was to determine the herd dynamics and efficiency of local pigs in a semi-arid area of Zimbabwe.

The study was conducted in Chinyuni ward of Chirumanzu district of Zimbabwe. A structured questionnaire was first used to collect data from community leaders and agricultural extension officers. For monitoring herd dynamics, 32 pig herds from a total of 100 farmers were assessed monthly from October 2005 to September 2006. Farmers were trained and kept records of herd dynamics and other factors.

Mortality was the major contributor to exits from the herd, indicating some inefficiency in the rural pig production system. The number of adult pigs in the herd was relatively constant across all seasons. This study concluded that there is a need to develop strategies that reduce piglet mortality, establishing appropriate conservation breeding programs for local pig breeds, and enhancing pig production efficiency in rural pig households.

*Key Terms: Indigenous, Production*

Cicia et al. are faculty members from two Italian universities and are investigating the total economic value (TEV) of preserving a local horse breed, Pentro, in Italy. This breed of horse is considered important to the local environment and culture due to its long history in the region. The benefits are compared with the costs of an in situ conservation program by means of a bio-economic model. The authors are thorough in their explanation of what the study was meant to evaluate. A mathematical model is presented to show how a conservation program could get the local breed off of the endangered species list in 15 years. Tables are provided with estimated costs and returns for a conservation program. An appendix describes a possible payment scenario as well.

The suggested actions by the authors would almost certainly require support/funding from government entities. Payouts from the program will not be realized immediately, but the authors argue that they will come in the long run. The in situ conservation program is the primary focus of the proposed action and would be instrumental in getting the Pentro breed off of the endangered species list. The conclusions are supported by the proposed model, but there is no way to know how successful a program of this type would be without implementing it on some level.

Key Terms: Local, Preservation

This article was written by N.T.K. Cuc, *et al.*, faculty associated with universities throughout Germany and Vietnam. Their research is being conducted on nine Vietnamese chicken breeds and two breeds of Chinese chickens. Samples of the nine Vietnamese breeds were collected in eight districts located in northern and southern parts of Vietnam. The two Chinese breeds were used as reference populations, and were introduced into Vietnam in 1995 and 2003. The nine Vietnamese breeds include: Ri, Tau Vang, Ho, Choi, Ac, H’mong, Mia, Te, Dong Tao, and Chinese breeds include: Hoang and Luong Phuong. The objectives of the study were, “to estimate the conservation potential of Vietnamese local chicken breeds and to investigate optimal allocation of [hypothetical] conservation funds to minimize loss of genetic diversity between these breeds.”

Using an algorithm, the optimum allocation of a specific quantity of conservation funds was calculated to maximize genetic diversity conservation within the breeds. A questionnaire was also administered to 15 households per breed, to collect data on general socio-economic factors. The probably of extinction of the Vietnamese chicken breeds was estimated using factors such as: total population size, breed distribution, disease control, organization of farmer, and socio-cultural importance, among others. The probabilities are assumed to reflect the probability of extinction of each breed in the next 30-50 years if no conservation measures are taken. The variables studied were based on the survey results from households in the field. A hypothetical conservation fund was discussed, that reflected different approaches to breed conservation of the nine breeds. It was found that the Te, Dong Tao, and Ho breeds were found to be at the greatest risk of extinction. The authors also noted the cultural importance of these nine breeds, which must be taken into account when making conservation decisions. The total results suggested that if no conservation efforts are made with Vietnamese local chickens, approximately 48% of them will be extinct within 30-50 years. Breeds can be maintained by conserving and prioritizing the breeds with the highest conservation potential, also considering the cost-effectiveness and the effects of conservation programs of each breed.

Dao et al. are from the Centre for Agrarian Systems R&D and the Vietnamese Academy of Agricultural Sciences located in Vietnam. The case study investigates methods to increase incomes for smallholder beef cattle farmers in poor areas of Vietnam. The goal of the study was to improve quality and quantity of H’mong beef through institutional developments involving both horizontal and vertical integration. A diagnosis of current beef farming practices was conducted to develop a region for the pilot model. Groups of 25 households were created to improve economies of scale for selling and transportation of the cattle. The processing chain past the farm gate was evaluated to identify opportunities for vertical integration and supply agreements were set up when agreements could be reached. Quantitative data was collected between 2007 and 2009.

On average, each household that was in a group sold 2 cattle in 12 months, which is reported as ‘much quicker’ than before. Groups were able to pool capital, labor, buying/selling activities, and other resources. The research team created standardized processes for fattening cattle within mountainous regions and in producer groups. Training, workshops, and promotional events were put on by the review team for farmers and other agents along the processing stream. A ‘certificate of origin’ label was also created for H’mong beef produced in the region. The most important impact of the study was increased average number of animal marketed each year—sale of cattle serves as the primary income from operations for most households. The quality of the beef also increased for producers within the groups formed by the study which also increases total revenue. In their conclusion, the authors recap and make recommendations for continued success of the program. They also cite the challenges that face the program and suggest processes to address them. Increased capacity of harvesting facilities and veterinary services should be implemented in the area.

Key Terms: Indigenous, Livestock, Value

Authors Dhawan *et al.*, with the aid of several government officials, members of the Food and Agriculture Organization of the United Nations (FAO), university professors and others, were able to conduct a study on the impact poultry value chains can have on pro-poor development throughout four districts in West Bengal, India. Although this publication was published by the South Asia Pro-Poor Livestock Policy Program (SA PPLPP), a joint initiative the National Dairy Development Board of India (NDDB) and the FAO, it is stressed that this publication does not express the views of these organizations.

This qualitative field study, which was executed in 2007, analyzed the strengths and weaknesses of this particular short value chain through interviews with the participants within this value chain. Additionally, data was also collected from a company known as Keggfarms, which established and implemented this rural poultry value chain. Through women empowerment, improving nutrition, increasing food security, raising incomes, and many other examples, this publication displays the various benefits that have been achieved by the rural poor with the use of a local breed in their value chain. Also, despite a somewhat concentrated source of data and interviews, this publication does not hold a particular bias, as it provides areas of improvement and recommendations for those who want to replicate this successful value chain.

*Key Terms: Sustainable, Value Chains, Women Empowerment*

Doitchinova and Kanchev are faculty members of the University of National and World Economy located in Sofia, Bulgaria and are conducting research within Bulgaria. Species that are included in this report include: cattle, sheep, goats, pigs, and poultry. The article was not originally published in English, so there are instances when the translation was not smooth. The goal of the authors is to provide a status report and analysis of the state of stock breeding animals in Bulgaria. Data is presented in the form of tables and charts that had been collected through surveys and reports. The conclusion that the stock of breeding animals is decreasing significantly is supported by this data. Bulgarian animal agriculture producers consist of a few very large producers, and many very small producers. Data shows that the average size is increasing with time (a lot of consolidation is taking place), but it is still small.

The authors discuss the low price that producers receive as a main factor hindering the development of animal agriculture in Bulgaria. Beyond this, there is a very high retail price of processed meat and animal products that hampers the demand for these goods. The authors propose that a full technological modernization of producers is necessary to support family farms and to give them access to a marketing channel. They suggest the establishment of niche markets to increase the demand for these goods. This would include changes in government policy.

*Key Terms: Livestock System, Local, Preservation*

Dong et. al., researchers from universities in United States and China and members of government agencies in Nepal, studied the yak production practices in Nepal as local value chains. This research was funded by the National Natural Science Foundation of China. Yak are an indigenous breed that supply milk, meat, fiber, and hide in northwestern Nepal. The authors aimed to identify the benefits of the species and good practices as well as identify challenges and areas that could be improved. The research was done using household surveys and appraisal techniques to gather basic information about households, feeding, grazing, herds, and veterinary care. This data was analyzed using qualitative and quantitative methods to determine the status of yak in the region.

The authors found that the yak herds fill an important niche in the area by seasonally grazing up and down altitudes across different physical, climatic, and vegetation types. Yaks are both durable and adaptable enough to be able to subsist on this grazing techniques, while other breeds could not be productive. In fact, this system is most suitable for yak production. However, a recent increase in national border security in Nepal’s neighboring countries has caused a decline in the availability of new genetic material, resulting in more inbreeding and a decline in the quality of Yak breeding stock. Yak in Nepal are pure breed, but crossbreeding practices with cattle are becoming more common, as this increases milk and meat yield. There remains a demand to conserve the pure yak genetics to produce purebred bulls and cows for specific hybrids.

*Key Terms: Indigenous, Management, Livestock System*

Drucker is an employee of the International Livestock Research Institute located in Ethiopia and reviews case studies of local breed preservation that have been completed in Mexico and Italy. The three case studies focused on pigs, horses, and “various breeds” when determining net value of a conservation program using the Safe Minimum Standards (SMS) approach. The author’s goal is to adapt the SMS approach and to determine if it is capable of providing results of relevance. The author outlines the SMS approach’s qualitative and quantitative characteristics and states the econometric models used.

The results of the three case studies are summarized and discussion is provided. The estimated cost of conservation varies widely between locations and species. It is noted that exotic breeds regularly outperform local breeds in good conditions, so this loss in productivity makes conservation cost estimates large. It is important for governments to recognize the value of maintaining indigenous breeds and to put in place subsidies for these conservation programs. The European Union has many such subsidies in place so the author claims that the relative cost of conservation is lower than what the case studies reveal. The author argues that indigenous breeds can outperform exotic breeds in harsh environments and should be preserved there. SMS costs calculated in these studies are based on assumptions, caveats, and comparability problems addressed in the article. The author concludes that the SMS system provides a useful basis to calculate “ballpark” conservation costs when making conservation decisions.

An attached appendix covers modeling an SMS for animal genetic resources. Each parameter is explained and a matrix is displayed showing the relationship for calculating maximum loss if conservation is or isn’t in place.

*Key Terms: Value, Indigenous Breed*

Author Dyrmundsson, of the Farmers Association of Iceland, produced an article about sheep and goat production and its sustainability in Northern Europe. This article did not specify a particular breed of sheep or goat, but it did discuss the important roles they play in sustainability, whether that is through livelihoods, the environment, and so on. Drymundsson supports his case through various sources and by examining the 2003 CAP Reform Agreement and the prospective WTO trade agreements, but he did not conduct his own research. As argued by this article, sheep and goat farming practices in Northern Europe are often environmentally friendly—through proper grazing management and avoiding overgrazing,—are accepted both culturally and socially, and are essential elements for sustainable development. Additionally, these practices also attribute to biodiversity within these local adapted breeds.

However, Drymundsson explains negative and positive predictions for sheep and goat production as it competes with pig and poultry production and as consumer demands decline for sheep and goat by-products, such as wool and skin. Also, this article discusses the new policy changes by the European Union (EU) and the World Trade Organization (WTO) negotiations and how this will affect goat and sheep farmers and their ability to maintain their livelihoods. Drymundsson argues that goat and sheep farming is much more sustainable and should be looked at more carefully than just economic benefits in comparison to other breeds because its practices are environmentally friendly and it coincides so well with local conditions and needs. This is why policies that support rather than hinder sheep and goat farmers is so important.

*Key Terms: Geographical Indicators, Local Breeds*

Egerszegi et al. are faculty in the field of Veterinary Medicine at research institutes in Hungary and Germany. The group analyzed the history, utilization, and reproductive performance of an indigenous Hungarian swine breed, Mangalica. The breed was all but eliminated since the 1970’s on account of changing consumer preferences and popularization of industrialized breeds. However, after examining over thirty studies from the time period, the authors found the native pig breed still has potential in Hungarian swine production.

Mangalica pigs can be raised as free-range, feeding in pastures and in forests. They serve as a reliable source of insurance for the producer, as the breed stock has social and economic benefits. In remote areas, raising Mangalicas has been noted to have cultural advantages, too. The Mangalica pig breed is the fattiest in the world, with the two main outputs of this pig being lard and meat. Because of recent health concerns, many consumers are reducing intakes of cholesterol and fat, both of which are heavily concentrated in the Mangalica’s meat. However, it is believed that the breed’s meat and lard could be utilized in the processing of smoked and other specialty meat products, such as sausage.

Because of the low population numbers and advocacy for the breed during the last four decades, the breed is thought to be of low selection quality and maintains a relatively small amount of genetic material. The authors note that with a proper breed association structure, the Mangalica is on its way to restoration and adds value for the producer. To do this, breed standards were made and implemented and all purebred individuals are supposed to be documented. The Mangalica pig breed in Hungary is considered as a success of a premium local breed.

Key Terms: Animal Production, Breeds, Labeling, Local, Standards

Ekiz et al. are from universities in Turkey that conducted research on the quality of goat kid meat in the region. Kids of an indigenous breed, Gokceada, were compared against the dairy breeds of Turkish Saanen and Maltese. The goal of the research was to compare meat quality of the kids harvested at 80-90 days that had been raised in an ‘improved production setting’ instead of natural grassland. The method of harvesting the kids is recorded in great detail as well as the measurements that were taken along the way. Tables are provided to highlight the results and to show significant differences. The physical characteristics such as size, color, and pH content were measured. Multiple tasting characteristics were assigned to samples by experts based on a one to eight scale.

The indigenous breed, Gokceada, had significantly lower yield numbers than the two dairy breeds due to its smaller frame and body size. Gokceada kids fell between the two breeds when scoring for pH as well as a number of the tasting characteristics. The indigenous breed scored lower on the color scale because it has more of a gray color that can be off-putting to consumers. The authors conclude that the dairy breeds should be considered by growers who have access to ‘better’ breeding and feeding conditions.

This article highlights some of the obstacles that indigenous breeds face with collected data. Expanded markets for the kids of the Gokceada breed would increase the value of poor breeding and feeding areas. Gokceada kids were not last in all categories, so there is an opportunity to exploit their comparative advantages in some production systems and consumer markets.

Key Terms: Indigenous Breeds, Value, Quality

This article was written by Faustin, *et al.*, from Benin and Australia. Their research is being conducted on the short, local value chains in four rural villages in two districts, Dassa district in Central Benin and Toffo district in southern Benin on the African continent. The species of interest is the indigenous chicken, as the paper aims to provide information about indigenous chicken production, assess preferences for chicken traits, and understand why various traits are preferred. Nearly 300 households in Benin were surveyed to determine preferential traits. The authors hypothesised that in order to improve the livelihoods of local farmers, exotic breeds can only be gradually introduced, as higher productivity should be pursued alongside the conservation of chicken biodiversity to still maintain the desirable traits of the indigenous breeds, such as disease resistance.

According to the article, “Data were obtained using a semi-structured questionnaire. In-depth interviews were held in October/November 2006 upon which the design for the choice experiment was based, i.e. the selection of traits.” Out of the 300 households surveyed, 147 were in Dassa and 153 in Toffo, specifically, Gnonkpìngnon and Deqe villages in Dassa district, and Houngo govè and Zèko bopa in Toffo district. Preferences of the respondents were recorded and variables included: good disease resistance, high laying rate, good hatching rate, high rate of survival at independence, high hatching frequency, precocity in laying, good mothering ability, docility, body weight, color of plumage, and market price. Reasons for the different preferences were included. The authors compiled the responses and identified the most preferred traits and combination of traits. Based on responses, they also made recommendations for ideal breeding programs to increase value. The authors found that chickens are valuable for religious and cultural reasons in addition to being a valuable nutrition source. They also found that increasing utility while also conserving highly-valued indigenous traits is vital and cost-effective. More importantly, outside agencies need to understand what the farmers value in order to incorporate
the most effective breeding programs. The authors noted the importance of increased record-
keeping and better control and monitoring of breeding. Identified constraints include low
percentage of farmers with a deep knowledge of distinguishing different chicken breeds and the
unauthorized introduction of new breeds into current flocks. The authors propose, “greater
investment in visits by extension services to train farmers in breed characterisation and flock
management.”

Key Terms: Animal Production, Biodiversity, Conservation, Indigenous, Local, Management,
Poultry, Sustainable, Value Chains

Faye and Konuspayeva, affiliated with universities in France and Kazakhstan respectively, identify the value of non-cattle milk (NCM) globally. By examining the milk of ass, camel, goat, horse, sheep, water buffalo, and yak, they examine both the challenges and values of NCM. Milk from the above species has different nutritional value, as well as higher yield potential in unfavorable conditions. NCM is predominant mainly in developing and emerging nations and is sometimes believed to have medicinal properties, although that is not confirmed by scientific research at this point. Many times, NCM is more valuable in the processing of a certain dairy product, like Buffalo milk in Italian mozzarella, because it has a different composition that cow milk.

As the population continues to grow at an accelerated rate and emerging nations create an increased demand for animal protein, the role of NCM in the milk industry may become increasingly important. In emerging and developing nations, these alternative milk-producing species provide a nutritional product under less favorable and less intensive management practices. NCM consumption as a percentage of total milk consumption has doubled over the past fifty years. There are differences in value chains of the NCM produced depending upon the region. Some areas have subsistence farms, while other dairy products go to large markets. The different nutrient products are one factor in the processing. Many NCM’s have a higher fat content and different mineral profiles, making them better suited for certain dairy products.

The four challenges the researchers found to currently be obstacles for NCM’s are increasing milk productivity, establishing niche production, development of milk processing systems, and increased knowledge of NCM’s. There is a high yield potential, but because most of the product is produced in areas with low socioeconomic and development statuses, there is still a low yield.

*Key Terms: Indigenous, Livestock Systems, Management, Market, Processing, Specialty Product, Value Chain*

Author, Fernandez, a Faculty of Veterinary in Montevideo, located in Uruguay, which is also where the study was conducted. The livestock species covered are pig, cattle, equine, sheep and goat, and the products they provide: milk, meat, tallow, leather, and wool. The value that is being given to the Pampa pig is based on its high content of intramuscular fat, which makes it adequate for the production of sausage-products. Cattle’s value is based on the meat product that is obtained from a pure breed and its morphological and phenotypic characteristics. Equine, Creole Horse, obtains its value from the functional and morphological characters that favor its role in the field. The Creole sheep, obtains value from its lean meat, prolific and active temperament and its longevity, as well for the incorporation of its fleece in the preparation of crafts. The Creole goat obtains value from its production of meat, but due to its lack of specialization in producing either milk or hair its rearing had been abandoned in past years.

The author’s main research goal is to present the local genetic resources of the previously mentioned species and does so by producing an article whose results are based off of information from other research studies. The author does not offer either methods or the dates for data gathering; therefore the kind of data that was collected cannot be identified. This article displays that, although introduced, exotic species may be more appealing when guiding livestock markets, efforts towards characterizing the genetics of local breed species in Uruguay are increasing. Doing so will contribute to achieving conservation programs that will allow to re-discover the productive value of each species.

*Key Terms: Ganado, Conservacion, Sociedad de Razas*

Authors Gandini, a faculty of veterinary medicine in Milan, Italy, and Villa, of the Italian Breeders Association in Rome, Italy, argue, in their article, that cultural value, as well as other values, can play a significant role in the conservation of local livestock breeds, especially in Europe. Although this article is applicable to all of Europe, the authors do spend some time focusing on nine local Italian cattle breeds and their cultural and possibly economic value. In their quest to identify cultural—and other values—the authors have created an analysis to try to explain which local breeds are of the most value and should be conserved.

With the use of other sources, the authors created their own methodology to give a qualitative report on which local breeds are of most value—cultural, historical, economical etc.—and should be conserved first. The authors support their information through roles local livestock breeds place in agricultural systems, the landscape, as well as culturally and socially. The findings of this article suggest that it is necessary to conserve local breeds because of their immense role in a society’s history and culture. Additionally, it is argued that diversifying the products from these local breeds can be sold at a higher price than other products, and the farming of local breeds can be used to preserve cultural landscapes, as well as be a source of rural tourism. Local breeds are essential not only for economic and diversity factors, but also for maintaining culture.

*Key Terms: Geographical Indicators, Adding Value, Local, Breed, Conservation*

Grimaud *et al.*, faculty members at universities in Uganda and France, examined the reproductive and milk performance of dairy cattle in Uganda. The study compared groups of exotic, indigenous, and crossbreeds, as well as 5 different farm practices, classified by the size, production type, and mechanization. Using 24 farms and about 900 animals, the researchers surveyed the farms, started identification systems for the animals, monitored calf growth by weight, measured milk production, and monitored herds with pre-designed software programs. All groups were fed natural vegetation. Since the study was conducted across the country, both climate and landscape varied. With these variations, the occurrence of each breed differs across the region. Indigenous breeds were predominant in pastoral and mountainous regions, while Holstein were most common in all others.

All groups appeared to be affected by the seasonal variations in the Ugandan climate, and seasonal variation in production is similar among the groups. The modern farming system with Holstein cattle produced the most milk and had the best reproduction under scarce conditions. Especially in temperate climates, the introduction and cross breeding Holstein cattle into Uganda’s dairy cattle system is considered a success. However, over eighty-five percent of milk produced and marketed in the country is from indigenous cattle. Indigenous breeds have more growth in the pastoral and mountainous regions.

Both indigenous and exotic breeds face challenges in Uganda. Feeding scarcity and the seasonality of production commonly hinder production. Additionally there has been a recent downward trend in cattle production in Uganda, on account of increased pressure on grazing land by crop farming, dependence on the cattle for wealth, and selling the extra cattle to avoid overgrazing of pasture ground.

*Key Terms: Animal Production, Breeds, Livestock Systems, Management, Value Chain*
Creole goats are a local breed of Guadeloupe, a French region in the Caribbean Islands. In this study, seven researchers from two governmental agencies on the island examine the current breeding programs of the local goat breed to develop suggestions for its improvement. Through interviews with farmers regarding general farm information, goat farming practices, commercialization techniques, and opinions of the decision-makers on farms, that there are many improvements to be made in the farming of both the purebred Creole and crossbred goats.

The researchers determined the Creole breed was valued for resilience to harsh environments, increased ability to thrive with low inputs, and maternal qualities. The breed is also highly resistance to disease, but this was not a quality that was highly sought after by the farmers. Benefits provided goats on the island include cultural satisfaction, meat, milk, fiber, and manure. The local breed was at a disadvantage to crossbreds on the island in two regards. The Creole goats are thought to be less advanced and the males are typically smaller.

Combining the information collected about benefits of both the local purebred Creoles and the crossbred goats, a breeding program was developed. One group of farmers would raise the purebred Creole goats for maternal breeding stock to sell to the second group of farmers. These farmers would raise crossbred goats using purebred maternal does and crossbred bucks. The success of the new program depends on better breeding management to ensure the pure breeding of the Creole goats in the first group and better identification of all goats on the island.

This study confirms the value of the Creole local breed on the island and provides an example of a breeding program practice incorporating a local breed into a short value chain. If successful, this model could be implemented on other islands in the Caribbean and for Guadeloupe’s local sheep breed population in the future.

Key Terms: Animal Production, Breeds, Livestock Systems, Local

Authors Halima et al., all of universities in South Africa, conducted a study in north-west Ethiopia on indigenous chickens. These chickens, as do many animals, provide food and income for many people in north-west Ethiopia, as well as the rest of the developing world. The authors’ main goal of this study is to express the importance of the conservation and use of indigenous chicken breeds, and they also describe the benefits—both socially and economically—conserving these breeds can have, as well as some of the challenges they face, such as predators, disease, and being replaced by exotic, non-indigenous breeds.

The time of data collection for this study was not cited; however, the authors retrieved data themselves through a total of 300 interviews. These interviews consisted of a checklist and questionnaire, and were conducted with individual farmers, with the aid of a local extension agent. Also, the study districts were divided by agro-ecological zones and by considering indigenous chickens, as well as accessibility. The authors also based their sampling method off previous studies found in other sources.

The information collected allowed the authors to gather a plethora of findings, providing information about the socio-economic status of farmers, production, selection, and culling information, flock size, and much more. This article concluded, in order to conserve these indigenous chickens, which already provide a value-added incentive to their owners, and in order to continue improving farmer’s livelihoods, women must be educated and become more involved in chicken and egg training and education. Also, it is argued that more funds and education is needed to battle several challenges and to conserve these indigenous chickens and keep them from being replaced by non-indigenous chickens.

*Key Terms: Local, Breed, Conservation, Standards*

Halimani et al. are from universities in the South Africa and Zimbabwe. Their study was conducted in South Africa and focused primarily on local value chains. The qualitative study discusses the value of services and meat that is being created by local pig breeds. The authors’ main goals are to discuss the state of swine genetic resources in Southern Africa and to develop strategies for their conservation. They do so by implementing a literary review to provide a background of local breeds in Southern Africa and their role in increasing livelihoods.

The authors argue that local pig breeds add value by alleviating poverty and supporting the rural economy. Local pig breeds are also beneficial by: 1) Converting agricultural residues and household wastes into meat products and manure, 2) Withstanding harsh conditions, low-intensity management systems, and rugged terrain. 3) Being able to survive on small pieces of land in population dense areas or on areas of ground that are not suited for row crop production, and 4) Showing better resistance to parasites and diseases that are common in their area than exotic breeds do.

In addition to the prior benefits, the development of niche markets for the products of local breeds can help to create incentives to keep that breed in production. By enhancing breeding programs (and conserving the genetics of the local breed) higher quality meat products will be produced to be sold at higher prices. Gathering feedback from the consumers of each local breed and implementing changes within that production system is vital.

The authors conclude that pig genetic resources need to be conserved in Southern Africa, because they play a key role in improving livelihoods. There is, however, a significant gap in policy and support from local government to facilitate what needs to be done. “In situ” conservation techniques should be used to conserve local breeds and niche markets should be established for their products to help cover the costs of conserving said breeds.

Key Terms: Breeds, Local, Value Chains

Halimani et al. from universities in the South Africa region published this original research primarily about Zimbabwe. The study is on the value of meat and characteristics that local pigs have for smallholders with low income and low inputs available. The goals of the authors are to determine what characteristics of local breeds are of the most value to owners from various income levels. A structured questionnaire was administered to 199 individuals from three different regions of the study’s focus and statistical inference was used to measure significance. Multiple parameters were found to be statically significant and charts and table are used to display results.

Local breeds were preferred by a majority of owners at all income levels. There was a disproportionately high women to men ratio in lower income level groups. The study focused a portion of its results on this gender inequality gap. The survey also asked growers to rank the constraints they face as smallholders of pigs when supporting or growing their herd. Inadequate feed, inadequate housing, and disease/parasites received the highest rankings. Availability to markets was a major constraint for growers who were not in the lowest income category. These growers are using the pigs as additional income more than they are for household consumption. The authors conclude that additional markets for the products of local pig breeds are needed to increase the economic value for smallholders.

*Key Terms*: Smallholder Pig Production, Local Breeds, Conservation, Value

This article was written by Haunshi et al., from India. Their research is being conducted on a short, local value chain in Umiam, a village in the state of Mahalaya, India. The species of interest is the native and improved varieties of chickens: the native Miri and Mizo-local breeds and the improved Vanaraja and Gramapriya breeds. The authors compare and contrast the local and improved breeds and test consumer evaluation of the eggs and meat, specifically for sensory attributes, egg qualities, composition of eggs, and semen qualities. It was the authors’ goals to determine if and how the introduction of improved varieties would affect consumers’ preferences for the eggs and meat, or add value and increase productivity.

The authors set up an experiment with birds from each breed. They measured egg quality parameters, specifically: egg weight, shape, whole egg, albumen and yolk volumes, yolk to albumen ratio, and percentage of albumen. They measured sensory evaluation of meat samples, such as appearance, texture, flavor, juiciness, and overall acceptability. Lastly, they tested and evaluated semen. The study concluded that,

“native and improved varieties did not differ in composition and appearance of eggs and sensory attributes of meat except for egg weight, egg volume, albumen volume and yolk volume, percent albumen and yolk volume, aroma, flavor, and overall acceptability of eggs. The native and improved varieties did differ in sperm concentration and semen volume but the number of spermatozoa per ejaculate remained the same in both groups.”

The authors found that locally, there is a common belief that eggs and meat of native chickens taste better and are nutritionally superior to exotic chickens. Therefore, native chicken products are worth twice as much. They authors recommend improving the native varieties by introducing exotic strains which look similar to native strains to improve productivity. Therefore it is important to preserve the meat and egg qualities of the native chickens to maintain the price advantage.

*Key Terms: Animal Production, Biodiversity, Breeds, Local, Market, Poultry, Price, Value*

Henry *et al.*, researchers with backgrounds in veterinary medicine and genetics, surveyed the current state of genetic diversity in Brazil. They looked at both indigenous and local breeds in the area from species of alpaca, cattle, donkey, goats, guinea pigs, llamas, and sheep. At the time of the discovery of the America’s, alpacas, llamas, and guinea pigs were native to the then isolated region and are the indigenous breeds. Around the 1500’s, the other species were introduced and now have become the local breeds in Brazil, as they have adapted to the climate and geography.

Over the past two hundred years, imports from temperate regions, such as Europe and North America, to increase productivity have led to crossbreeding of the local breeds. Currently, farmers state there is no economic appeal to raise the local and indigenous breeds, and this had led to a decrease in breeds. The Brazilian government have begun to create programs to reverse this trend by documenting current breeds to make “breed clusters”. They are aware of the necessity of this project, but require additional support and resources.

*Key Terms: Breeds, Conservation, and Local*

This article includes research of a local value chain completed by Herold et al. from Stuttgart, Germany and Vienna, Austria. Research was conducted in Northern Vietnam on Ban pigs, an indigenous and local breed of the area. These pigs are harvested for their meat which is currently being consumed mostly by the pork producers rather than a larger market. The goals of the authors are split into three different sections of the study: They want to evaluate the current characteristics and traits that farmers are having success with, they want to try new crossbreeding strategies to create learner pork to provide to the market, and they want to create organizational settings for the marketing and breeding they will be trying to improve.

The methods used to conduct this research were largely supported by a cooperative data collection from the National Institute for Animal Husbandry in Vietnam and the University of Hohenheim in Germany. The collection process used a pig performance test used on 328 households that produced pork in Northern Vietnam. For more of the specific data collected for the study, a survey was conducted to compile breed and trait preferences of local producers. Statistical data was collected as well to see which breeds were most successfully bred to the local swine and produced the best results. Genetic parameters are presented for the Ban pigs to show their results when crossbred with other breeds.

The survey to find preferred traits and characteristics discovered that carcass quality and values of performance are not up to the optimum level and need to improve in future breeding to be more successful. Based on the results collected from the new breeding schemes provided through models created by the authors for this paper, these guidelines can be used for improving alternative breeding schemes, but success will vary and depend on geographical location and available resources. For organizational strategies of local breeds, a short food supply chain is suggested. Horizontal integration and networks would also be beneficial to these breeding programs.

Key Terms: Indigenous, Supply Chain, Livestock, Local Breeds

Hoda and Marsan, both affiliated with universities in Albania and Italy, respectively, examined the genetic variance among and within three local breeds of Albanian sheep. The three breeds provide wool, milk, and meat in the mountainous areas of the country. Using genetic markers in the DNA of individual animals in each of the breeds, the difference between each of the breeds was identified. The quantitative genetic information and data was analyzed.

It was determined that in the sample tested there was little variation among the breeds, but a high level of variation within the breed among individuals. This is characteristic of two things. First, the low variation among breeds is indicative of a poor breeding management or lack of a formal breeding program, or high gene flow between breeds. This is reflected in the lack of infrastructure and education on breeding in the area. Additionally, the findings suggest that a high instance of inbreeding may be occurring in the population. High variation of genetic material within a breed is a positive finding, as this represents the importance of the three breeds in animal genetic resource conservation. This translates to a growing need for local breed conservation in these Albanian breeds, as well as other breeds cited to have similar genetic data measurements such as local breed flocks in Switzerland and India, among others.

*Key Terms: Breeds, Local, Management*
Examining the effects of an indigenous breed of cattle in Southern Ethiopia, Homann, a doctoral candidate at Justus Liebig University in Germany, identifies the impacts of the breed and management techniques on the local natural resources and socioeconomic status of pastoralist population. Boran cattle, a native Ethiopian breed, provides high productivity for the climate conditions with higher body weights and are more adapted to flexible use of natural resource systems such as water and forage than conventional breeds.

Using this study, Homann aimed to show that the indigenous knowledge of the local population is no longer sufficient because they are in need of additional support because of climate changes and subsequent ecosystem alterations. Productivity is defined, in this research, as the animal producing the most meat for the given nutrient and water availability. Support for this hypothesis was developed through the research methods including qualitative and quantitative measures. The study qualitatively analyzed the population through interviews of target groups, workshops, and verbal longitudinal comparison of natural resource conditions over a 30-year period. Land mapping using GPS, intensive interviews with household heads, and determination of herd size and densities were utilized to provide quantitative data for further statistical analysis.

The results of the study supported Homann’s hypothesis. Important for the further study of the value of indigenous breeds, the findings are an example of an instance that under conditions of high awareness, education, and proper management practices can make indigenous breeds of livestock the most productive.

*Key Terms: Biodiversity, Breeds, Indigenous, Management, Sustainable*

Jiang *et al.* are from two agricultural universities in China and they conducted research on the meat characteristics of a local pig breed, Yanan, in Southwest China. There are over 100 local pig breeds in China that have many positive production and consumption characteristics. However, these breeds have inferior growth rates, frame size, and lean meat percentages when compared to exotic breeds that are used in large scale livestock production. The authors’ goal is to compare the carcass and meat qualities of Yanan (YN) pigs with a hybrid cross of Landrace and Yanan (CY) in order to preserve the Yanan genetic resource. Thirty barrows of each breed were selected at a similar weight (20 kg) and raised in a controlled environment and fed the same ration. At 120 kg all pigs were slaughtered to evaluate the carcasses. Carcass size, muscle length, back-fat thickness, and dressing percentages were measured as carcass characteristics. Color and pH was measured at 45 minutes and again at 24 hours. Marbling scores, drip loss, and muscle fiber area was also recorded. Data was statistically analyzed with a simple linear model.

The results are displayed in tables with measurements and statistical data. The purebred YN breed samples were lighter, shorter, and contained less lean meat. They had thicker back-fat and smaller loin muscle area. However, the purebred had higher levels of subcutaneous fat. Each of these results were statistically significant at the $p = 0.05$ level. pH values at 24 hours were not statistically significant between the two breeds, but the purebred had higher color scores at 24 hours. Overall, the authors conclude that the Yanan pigs have high meat quality characteristics but poor carcass characteristics. They suggest that, from there results, it would be possible to utilize the indigenous Yanan breed in commercial production to serve high quality taste niche markets.

*Key Terms: Indigenous, Breeds, Value*
The three authors of this article Kahi, Rewe, and Kosgey are each a part of research institutes and universities in Kenya and Japan and their paper includes examples from countries such as Venezuela, Kyrgyz Republic, Germany, and Morocco, among others. This article does not specify a particular species, but the use of a community based organization for the genetic improvement of livestock (CBOGIL) is recommended for any species or breed. The value being created for the producers includes increasing genetic productivity in order to improve livestock quality. The goals of these three authors is to share the benefits and values of a CBOGIL and make recommendations to help conserve local breeds by the use of genetic resources.

Specific research is not included in the article because, instead, the article gives several examples of countries that have used the CBOGIL model to increase breed conservation. With no statistically significant results, the given examples provide evidence for creating meaningful differences. The documentable results can be shown by the use of several graphs and figures provided throughout the article giving a visual example of how the CBOGIL model should be used in order to be most successful. They also showed a specific part of the model broken down so that the reader can have a better understanding of the entire process. The conclusion of this paper provides several pieces of advice for those interested in implementing a form of the CBOGIL model. To be sustainable, livestock producers must be willing to try new practices and collaborate with other producers to make the most of their resources. Human capacities and agricultural infrastructure are two crucial parts for CBOGIL success.

Key Terms: Sustainable, Developing Countries, Local Breeds

Kakar, Verider, and Younas, researchers with academic backgrounds in animal science and veterinary medicine from Pakistan and Sweden, examined the importance of dromedary camels in the largest Pakistani desert, Cholistan. Here, the two main indigenous camel breeds Marrecha and Brela, were analyzed for their value in providing milk, meat, fiber, hide, and transportation, while adapting to the harsh climates of the desert. The purpose of the study is to find evidence that these breeds can be utilized as a tool against poverty and protein deficiency in the nomadic populations of the area.

The Cholistan desert, a region of the South Punjab, has a wide range of temperatures spanning over 80 degrees Fahrenheit and reaching over 120 degrees in the peak of the year with rainfalls below 8 inches. The camels are able to produce milk and transport heavy loads in these conditions, while surviving on a diet of the bushy and woody vegetation not able to be utilized by other livestock. This allows both the camels and people to maintain a lifestyle coevolving with the ecosystem.

As the climate of the region becomes increasingly extreme and dry, due to global climate change and instance of desertification, the study claims Marecha and Brela camel breeds will be integral to food security and health of the local people. Each breed is known for a different product- the Marecha for transportation services and Brela for meat and milk. Conserving the genetic material of these breeds allows for more efficient use of the camels, according to the researchers. After examining the information, the study concludes with a call for increased collaboration between government and science to use camels to eradicate poverty and increase food security in the region, while adapting to the changing climate.

*Key Terms: Biodiversity, Indigenous Breeds, Value Chains*

This article was written by Syeda Khaleda from the Division of Spatial Information Science, Graduate School of Life and Environmental Science, University of Tsukuba, Japan. In this paper, the poultry sector value chain in the Gazipur district, located near the capital city of Dhaka in Bangladesh, has been analyzed, using primary information collected through a field survey of the microentrepreneurs. The main focus of the article was to examine the poultry value chain in Gazipur, Bangladesh and the obstacles and constraints to sustainably developing the area to improve the livelihoods of poultry farmers. The author defined the value chain, the poultry life cycle, the microenterprises (MEs), and the basics of the poultry industry in Bangladesh. The value chain included several activities, such as breeding; feed production; input supply, such as feed, sexing chicks, and medicines; poultry production; collection and trade of eggs and live birds; slaughter; processing; final sale and consumption. Each aspect of the value chain is described in further detail.

There were 166 commercial poultry farms MEs surveyed to collect basic information about poultry farms in Gazipur district. This was done to identify obstacles and ultimately provide recommendations to help overcome them. The main obstacles identified included: problems related to supply of input materials; problems in terms of production and profit; problems related to marketing of products; inadequate support service; inadequate and poor quality infrastructure; and occurrence of natural disasters. Additionally, the poultry industry employs about 50,000 small farmers, which has contributed substantially to the rural economy. The poultry industry has the potential to expand immensely if the identified obstacles can be overcome. After field surveying dozens of farms, the author based her conclusions on their responses to accurately reflect both what the farmers want, and what can feasibly be done within governmental regulations.

The recommendations that the author made seem to be in the best interest of poultry farms and seem to be based on responses acquired from farmers, as well as historical evidence. With
minimal graphs, charts, and data, the author put together concrete evidence supporting the need for industrial development, marketing, lending policy, insurance, extension and outreach, and better organization. The author pointed out the importance of governmental relations, as the government has great authority on agricultural policy and support.


This scientific study, focusing on a national value chain, was written by T. Kochoia. T et al. all from Ethiopia where they are also conducting their research, in Alaba of Southern Ethiophe article researches sheep and goats in the area and how to improve the efficiency and profitability of production for local producers. The goals of the authors are to show marketing constraints in the local economy and provide suggestions for improving the livelihoods and incomes for the local farmers and producers.

Researchers used interviews with producers and consumers, discussions of focus groups, as well as a survey questionnaire. The producers that were interviewed or completed the surveys were selected randomly, but the district was split into different section based on the sheep or goats that they owned. Even with the challenge of limited resources, access, and knowledge, the authors found that both sheep and goats are crucial in the smallholder mixed farming systems in this region based on the value they add to local economies. Utilizing the value chain approach, they show an effective method to analyze livestock production and development of these.

With the lack of opportunities to export outside of their own market, improving the local economy and awareness of the market would make a huge positive impact on Southern Ethiopian sheep and goat producers. The authors suggest a value chain intervention in order to alleviate the current stress on local producers and open up the chance to be a part of the more formal market.

*Key Terms: Sheep, Value Chain, Market*

Kohler-Rollefson, Rathore & Mathias completed a literary review of articles on increasing the value of local breeds to livestock keepers in South Asia. Short value chains are cited for goods and services produced by camels, sheep, and buffalo. The authors’ goals were to present some recent literature on the value of local breeds, as well as discussing the current status of Livestock Keepers’ Rights.

The authors begin by citing research that shows that local breeds are more suitable for harsh conditions due to their ability to forage for food. This can also decrease the demand for processed feedstuffs whose production can be harmful to the environment. Results of studies reviewed here also show that these breeds are more resistant to diseases and heat stress than exotic breeds. How local breeds also play a crucial role in their environments and an example of habitat loss is briefly discussed in this review. The authors conclude that to help growers realize economic benefits of using local breeds there should be formation of markets for special label products from these animals.

The second portion of the article goes into depth on the background and creation of the Livestock Keepers’ Rights. There are seven key elements or ‘cornerstones’ that have strong support of countries within Africa and the region of study. However, the European Union, United States, and Australia did not support making the goals official. The authors conclude that to move the Rights towards international acceptance there needs to be studies on the extent of customary livestock rights in individual countries—including the potential for national recognition.

*Key Terms: Value Addition, Local Breeds, Indigenous*
rare breed management programs: Between conservation and development. *Livestock

Lauvie *et al.* are from various research organizations throughout France and they conducted a
literary review of case studies on rare breed conservation activities within France. The authors
focus on 18 specific conservation programs that were in place between 2004-2005 to try to
answer the question: “in practice, has conciliation between conservation and development been
achieved.” The cases were selected to provide an as diverse as possible representation of the
information available so horses, donkeys, cattle, sheep, goats, chickens, and pigs are represented
in the review. Meat, dairy, and leisure are the primary goods provided by these breeds.

As well as reviewing the literature of the 18 conservation programs, the authors also interviewed
one stakeholder from each of those studies. The individuals who were interviewed were chosen
for playing a significant role in their organization’s respective conservation program. Results
showed that development initiatives of conservation programs can strengthen the program or
lead to points of tension. A successful development project will make the breed more attractive
to farmers. Short term economic profitability is important to farmers and may not be directly
aligned with genetic conservation. Development programs can be formed at various levels from
national government to a group of local growers. The plan for implementation should be
thoroughly discussed by the breeders and other stakeholders involved in the program.

The authors conclude that many different factors (population, sociological, economic
dimensions, and genetic) contribute to the diversity of management practices for rare breeds. A
major constraint for similar studies is the amount of time required to collect adequate and
accurate information on these programs. The authors stress the importance of finding points of
tension between conservation and development programs of rare breeds. Tables are used to
describe the conservation programs that were reviewed. These programs are cited as examples
in the results and discussion sections.

**Key Terms:** Animal Production, Conservation, Local Breeds, Preservation

C. Lazzaroni and G. Moriano, both from Italy, focus on a local value chain within their country for this paper. Research to provide evidence was also collected in north western Italy. The study showcases three local breeds: the Piemontese Fawn Hen, the Saluzzo White Hen, and the Carmagnola Grey Rabbit. All three breeds provide better meat quality and higher incomes for more sustainable livestock production methods. The goals of the authors were to help create and promote a Consortium to improve marketing strategies and increase awareness of the three local breeds included in their study.

The aims of the Consortium are: the protection of biodiversity of the local tradition; the preservation of the purebred Caramagnola Grey Rabbits, valorization and promotion of the local breeds productions; the technical assistance for their partners; the application of the production rules for the involved breeds among the partners; the labeling of the slaughtered animals; and the inspection and commercialization stages. The Consortium has provided potential breeding percentages, ready-to-eat products, and consumers tastes and preferences for the different products.

Meat in oil, meat sauce, and pate are the three products that came from the local breeds. New products, like salami from the Carmagnola rabbits, are still in need of research and testing to see if they could be successful in the meat production market. A website has also been created to increase awareness of the Consortium and publish its activities.

Key Terms: Production, Local, Breeds

Authors Lebbie, of the International Livestock Research Institute in Kenya, and Ramsay, of the National Department of Agriculture in South Africa, explain the importance of small ruminant genetic resources (SRGR) in Sub-Sahara Africa (SSA). This article describes the benefits of SRGR as being socio-economic, cash income, resistance to risks and shocks, as well as others, and this plays a critical role in livelihoods and rural agriculture in SSA. SRGR provide these benefits through several ways, including the products made from them such as their wool/hair that can be used, for example to make cashmere, and meat. Authors, Libbie and Ramsay, did conduct their own research, and supported their argument through other sources, making this article qualitative. One may consider this a rather old article, as it was published in 1999 and data and research was retrieved and conducted during the 1990s; however, it still provides knowledgeable information about SRGR in SSA and how value could be added to their animals and it can be argued, that these measures could still be applied today.

This article analyzes the distribution and diversity of SRGR within SSA, such as where sheep populations are more prevalent, where goat populations are higher than others in certain geographical locations, and so on. Additionally, production systems and conservation and management strategies, such as in situ, ex situ, public management and private sectors among others, are also explained, giving the reader a good understanding of the part SRGRs play in SSA. The authors conclude that there are many challenges for SRGR conservation, and conservation of indigenous SRGR breeds, and that adding value to these animals, is what will not only benefit the people of SSA, but it will also conserve these breeds.

Key Terms: Goat, Local, Breed, Conservation

Lemke *et al.* conducted research in 2001 and 2002 in two villages located in northwest Vietnam. Their research focused on the gross margin and net benefit of smallholder pig producers within four groups of producers from two villages in the region. Each village had a group that was considered ‘demand-driven’ that was located close to the village and had access to markets and additional feed resources and a group that was ‘resource-driven’ because the growers lived far from the village and could not readily buy additional inputs. The authors hypothesize that semi-intensive pig production with exotic breeds would increase revenue but not net benefit of smallholder producers who cannot produce all the inputs needed for exotic breeds.

Socioeconomic, cropping management, livestock management, pig production, and product utilization data was recorded from surveys issued four separate times to each of 64 households within the 4 production groups. Tables and charts in the article display the data in detail. Income, expenses, and non-cash factors were used to calculate gross margin, net benefit, and benefit-cost ratios. The study considers income from sale of animal and manure. Descriptive statistics were used to test for significant variation.

Few farms away from town that are utilizing the local breed, Ban, kept their own boars. Considerable inbreeding was reported within the Ban population. Near the village, pig husbandry was typically performed by women. These production systems were more likely to purchase feed and other inputs to replace the more labor intensive management practices. The feed ration composition was drastically different between the groups near a village and the groups who were not. This is attributed to the ability to purchase feed and energy inputs.

Results confirm that feeding was more intensive in the ‘demand-driven’ regions near the villages. Total pig production was higher near the village, but so were variable costs. The authors present their findings that net benefit was highest for local pigs, intermediate for cross breeds, and lowest for exotic breeds. However, when factoring the opportunity cost of
labor the net benefit of each genotype is negative. There are non-monetary benefits of raising pigs such as social status, risk diversification, and manure production that make pigs important to rural value chains. The authors conclude that their hypothesis was confirmed that exotic breeds in demand-driven production systems return higher revenue, but the input level demanded is more than resource-driven producers would be able to sustain. Resource-driven production systems had better benefit-cost ratios than the exotic breeds.

*Key Terms: Local, Breed, Economic Benefit*

Lemma, of Wolaita Sodo University in Ethiopia, wrote this overview pertaining to climate change and animal biodiversity in Ethiopia. Although various species and breeds were mentioned throughout this article, this piece provided a broad review about animal genetic resources (AnGRs) as a whole and their importance when adapting to climate change, and argues that genetic diversity must be conserved in order to adapt to changing climates and markets. In this paper, the author’s main goal is to discuss up-to-date information on the knowledge of livestock biodiversity as well as “some potential options of climate adaptations and biodiversity conservation in Ethiopian context”.

This article explains livestock production systems, some conflicts and opportunities animal genetic resources face, and lastly, conservation and the utilization of these breeds is also explained. The author discusses several components when conserving and utilizing local breeds in Ethiopia, including different conservation methods such as in situ and ex situ. Additionally, categorizing which species were most threatened and endangered and in need of be conserved first was also mentioned. This article concludes that animal genetic resources must be conserved carefully in order to improve livelihoods, food security, and adapt to a changing climate. The adaption to climate change by these breeds is crucial and will have lasting effects.

*Key Terms: Biodiversity, Conservation*
This article was written by Grégoire Leroy, et al., faculty associated with universities throughout Europe and Africa. Their research focuses on identifying chicken genetic diversity of local village chickens across a sample of western African countries. There were 472 local, village chickens that underwent genetic testing in 23 provinces across Cameroon, Benin, Ghana, Côte d’Ivoire, and Morocco, as well as 129 commercial chickens, for a total sample size of 601 chickens. The relationship between geographic distribution and genetic diversity was analyzed. Commercial lines of chickens were also genetically tested to compare to the local varieties to measure interrelatedness. Genetic diversity was analyzed within and between the chicken populations. DNA Research was conducted at the biotechnology Laboratory of the University of Ghana.

The focus of the study was to determine, “the amount of genetic diversity… the search for a possible correlation between the genetic structure and agroecological distribution, and the detection of a possible gene flow between local populations and commercial lines.” Blood samples were taken from each chicken and genetic information was compared in a variety of graphs and charts. High heterozygosity levels were reported for all local populations, and evidence of gene flow was found between commercial and local chicken populations in Morocco and Cameroon. It was observed that this may be due to long-term improvement programs in those countries. Local chickens form a highly variable gene pool, and factors such as climate, farming systems, and cultural practices may influence genetic diversity. It was also noted that Local chicken products sell for higher prices than commercial chicken products, due to consumer preference.

Key Terms: Biodiversity, Cluster, Local, Poultry, Price

This case study focuses on the question of grazing in Bharatpur completed by Michael Lewis from the History Department at Salisbury University in Maryland. The information provided is based on the cattle and their effect of ecosystem services, more specifically grazing and natural resource management. This case study challenges the attempt to search for universal conservation truths to be imposed throughout the world.

The Bombay Natural History Society (BNHS) completed a study in Bharatpur that showed nature reserve management decisions had been predicated upon assumptions that have never been tested. Lewis also discusses a ten-year study done in Bharatpur for all aspects of its ecology that revealed the issue of having no wall or boundaries for the cattle of the area allowing exotic breeds to mix with native cattle.

For generations of ecologists and park managers, in the United States and India, the destructive nature of livestock grazing was so apparent that it never even needed to be discussed. The best argument against international ecological advocacy is that it has often not worked. The futility of imposing one vision of how to save nature across the globe, no matter how dire the environmental crisis seems to be is the main point of focus for the review done by Lewis. More studies need to be completed to provide more evidence for both sides of the argument being discussed for ecological advocacy.

*Key Terms: Ecosystem Services, Livestock, Cattle, Management*
This paper, a case study by Helene Lie, et al., from Norway, examines the feasibility of sustainably maintaining or increasing the supply of goat milk products, mainly yogurt, in Mgeta, Tanzania to add value to the local economy and improve the livelihoods of residents. The authors’ goals are to help determine the feasibility of goat milk production while examining the obstacles and proposing solutions to overcome them, in addition to highlighting the value and benefit of goat milk yogurt production. The authors interviewed a variety of local residents, studied the production process, and engaged themselves in local market research. Twawose, a small dairy goat co-operative in Tanzania was a primary focus. Specifically, “Data collection for this study was conducted during two field visits in 2010 and 2011, involving 107 interviews with 120 Twawose members and management, experts, customers, and other dairy goat farmers in the region. In-depth, semi-structured, and group interviews were conducted by the first author, with use of translation, to obtain a clearer picture of the case. Interviews were complemented by secondary data from previous research from the same area, financial reports, and records of milk and herd demographics.”

The authors have found that the number of farmers with goat herds has increased and goat milk increases by about 50% in value when processed into yogurt. This value-added commodity has led some farmers to be able to pay for their children to go to school or improve their homes. While there are still a number of obstacles to milk and yogurt production, even simply keeping the milk cold, Twawose is still able to be profitable. One bias might be the promotion of Norwegian dairy goats, since the authors are based out of Norway. They were able to research and determine the effectiveness of dairy goats and milk production, and provided feedback with improvements and solutions to a great amount of obstacles. There are a variety of ways to upgrade or replicate this value chain. By pooling resources of the farmers and with support from outside entities, is it possible to run and maintain a local dairy value chain.

**Key Terms: Animal Production, Breeds, Sustainable, Geographical Indicators, Local, Management, Price, Processing, Specialty Product**

Ligda and Georgoudis, faculty members of a Greek university, studied the potential of the expansion of indigenous buffalo in Greece. Through certification and standards implementation, the two researchers hoped to increase the value of buffalo production in the Kerkinikake region of the country. Because of changing socioeconomic conditions and mechanization of agriculture, there has been a population decline over the past decades. Through surveys and later management and processing interventions, the study examines both the current state of the region’s buffalo industry and opportunities for value addition and expansion.

Buffalo are valuable to livestock production in this region because they can utilize forage and geography that other animals cannot productively adapt to, as well as improved disease resistance. Additionally, they can subsist on natural vegetation. Limited reproductive selection has allowed for this adaptation to the climate and geography of the region and maintained high levels of genetic resources in the population.

The researchers found that many consumers had been substituting cattle milk for buffalo milk, reducing the demand for one of the buffalo’s main products. Of the two main outputs (meat and milk), only meat was being sold at the market, while the milk was being consumed by the producer’s household. However, it is believed that both the milk and meat could be used in the up and coming specialized meat market in Europe. This new trend market defines quality by considering the product’s uniqueness, cultural impact, processing techniques, and gastronomy (ability to be used in recipes and cooking). To market local buffalo milk and meat in these markets, more certification and standards would need to be implemented to guarantee strong management practices and quality. Additionally, a continuous supply of the products would need to be harvested in a uniform manner. Breeder’s associations and institutional support could be an effective way to implement this.

*Key Terms: Animal Production, Biodiversity, Business Model, Certification, Environment, Standards*

This article was written by Meizhen Liu, *et al.*, from China and the United Kingdom. Their research is being conducted on a short, local value chain in the Bayinhushu village of the Saiyinhuduga Sumu, Zhenglan Banner, Inner Mongolia of China. The research focuses on how and to what extent chicken farming can protect grassland from degradation and increase the income of local farmers. In addition, it contrasts chicken farming and sheep farming and the value it provides to local farmers. Specifically, the breed of chicken is known as, “Laiwuhei chicken” and the sheep is known as, “small fat-tail sheep” in Chinese. The authors acknowledged the issue of overgrazing and land degradation in north China and proposed ways to reduce, or reverse the damage. Their approach considers replacing major consumers of grassland ecosystems, such as cattle and sheep, with animals such as chickens. The specific experiment discussed in the article tested whether chicken farming can reduce degradation and yield more profit than the traditional sheep rearing.

Plots were fenced for two treatments: sheep raising and chicken farming, and the control, where there were no animals and plants grew naturally. Types and density of plants in each plot were analyzed, as well as biomass above and below the soil. Weights of chickens and sheep were taken periodically, and the amount of feed consumed was recorded. At the end of the experiment, meat content and monetary inputs for chickens, outputs for chicken and sheep grazing were separately calculated to estimate economic efficiency, which was also compared to the control. It was found that chicken farming, using the methodology, yielded three times the aboveground biomass and twice the root biomass compared to sheep farming. Moreover, chicken farming yielded a six-time greater return than that of traditional sheep grazing, as it was noted that both chickens and hay could be sold. The project showed that chicken farming eliminates many of the issues associated with raising larger livestock, such as sheep, and is economically more efficient and less degrading to the ecosystem. It also showed that chicken farming could be successful at raising the income of local farmers.

*Key Terms: Ecosystem Services, Livestock Systems, Local, Management, Poultry, Preservation*

Lu *et al.* are from an agricultural university in China and are studying meat flavor of Chinese indigenous pigs compared to that of an exotic breed. The six breeds in the study are: Lantang (LT), Dahuabai (HB), Laiwu (LW), Rongchang (RC), Tongcheng (TC) and typical hybrid pig breed Duroc/Landrace/Large White (DLW). The authors claim that most Chinese consumers assume that indigenous breeds have more flavorful meat than exotic breeds but there is not enough supporting research to validate this claim. Therefore, the authors’ main goals are to investigate and compare the flavor and the chemical composition of the six breeds. Six barrows of each breed were slaughtered at the same facility and samples were taken for chemical and taste testing. Crude protein, amino acid, and volatile aroma levels were measured and quantified for each of the 36 samples. A panel of 10 trained members performed a sensory evaluation by ranking flavor intensity and flavor-liking on an 8 point scale. One-way analysis of variance was performed to evaluate statistical significant differences between breeds.

The exotic breed (DLW) has the lowest muscle fat content of all breeds, as well as the highest crude protein content. Almost all of the amino acids were highest for DLW as well. Sensory analysis concluded that the exotic breed had the lowest flavor intensity and flavor-liking of the six breeds studied. The results of the volatile aroma analysis corresponded with these results. One-way analysis showed that 23 of the 95 volatile aroma compounds were influenced by breed type. Many of the flavor attributes were highest in the Dahuabai and Laiwu breeds. The authors’ results support the conclusion that although exotic breeds grow faster and produce more protein, their meat is less flavorful than that of the indigenous breeds. In theory, consumers would be willing to pay a premium for the meat of these indigenous breeds.

*Key Terms: Indigenous breeds, Value chains, Flavor quality*

Lunt et. al., of various Australian universities, investigated whether or not livestock can play an important role in conserving ecosystems, through removing them from historically grazed areas or not, as well as how different strategies can determine the effects of livestock grazing. The authors of this article did not conduct research themselves and produced a review article with little to no data, but displayed much support from various sources. Through their quest to understand the importance and results of livestock grazing in particular areas, the authors established a conceptual framework to help ecologists and conservation managers to decide whether livestock should remain or be removed from certain land in order to avoid land degradation and decreased biodiversity in plants.

Through their research, this article concludes that, depending on the specific environment, livestock grazing can have a positive influence on ecosystems and biodiversity. However, the authors emphasize that several issues play a significant role on whether or not livestock grazing should be done away with or implemented for conservation issues. There is not a clear consequent of livestock grazing for every circumstance, and positive impacts are largely due to strategies, grazing history, the palatability of dominating species, and the productivity of the specific site at which the grazing is taking place, as well as other issues that need to be considered.

*Key Terms: Ecosystem Services, Livestock Conservation*

Authors Madzimure, *et al.*, of universities in Australia and the Republic of South Africa, produced an in-depth, quantitative study on the ability of indigenous pigs in South Africa to raise income, increase food security, and overall, improving the livelihoods of small-scale farmers. Study sites and data collection were obtained through the aid of a university, State Veterinary Services, farmer representatives, government officials, the Department of Agriculture (South Africa), interviews with key informants, and households, making this a well examined study with several factors being taken into account.

With the use of Statistical Analysis Systems (SAS) and data collected from August to December of 2009, this quantitative study was able to confidently support the authors’ conclusions with hard evidence about the probability of success for small-scale farmers, including the obstacles along the way. This would lead one to seriously consider the deductions of this study because it not only displays the importance of conserving these indigenous pigs, but also shows how their findings may be helpful when creating a restocking program, which may easily be implemented after outbreaks of disease.

Despite this, this study was specifically done in South Africa pertaining to South African small-scale farmers who owned these particular indigenous breeds. Although potential for success was found here, this study may not be an example for other small-scale farmers, who hope to increase their income and food security, in other parts of the world.

*Key Terms: Indigenous, Conservation*

Mapiye, *et al.*, are members of universities in South Africa that conducted quantitative research on local value chains in their country. The focus of the study was the Nguni breed of cattle being used for milk, meat, and sale. The authors’ aim was to evaluate the impact of production and socioeconomic factors on constraints faced by the owners of Nguni cattle. In 2007 a survey was issued to 218 household heads from 18 communities located in the Eastern Cape Province that were selected using stratified random sampling. The results are displayed using a series of tables that highlight results that are statistically significant. Each of the commonly reported constraints has a discussion section. An odds ratio for a household experiencing feed shortage is predicted and the statistical model is reported.

Cash was reported as the primary purpose for raising cattle. Adult men were primarily in charge of taking care of the cattle. Shortage of feed is the most significant constraint faced by farmers across all regions. Rangeland is the primary source of feed for cattle in this area. This was followed by disease and parasites. The Nguni breed provides value here because it is more resistant to diseases than exotic breeds. Cross breeding, however, is endangering the effectiveness of these resistant traits. Lack of access to veterinary or extension services is a constraint, as less than 5% of the respondents have access to one or the other on a monthly basis. Of these respondents, 75% said that they would be willing to continue participation in Nguni cattle projects.

The authors conclude that the odds ratio estimate of households experiencing feed shortage and disease problems were the highest. Farmers’ socioeconomic conditions should be considered when planning programs for breed conservation within smallholder farmers. The respondents reported that cash was the primary reason for keeping cattle so it was surprising, as a reader, to not see results concerning market availability as a constraint.

*Key Terms: Breeds, Indigenous, Local, Value*
This review focuses on a local value chain evaluated by C. Mapiye, et al., from South Africa. Research was also collected from communal areas of South Africa. The research is done on Nguni cattle and their products. These products include milk, draught power, manure, hide, meat in certain stages, and other services. They can also keep their condition fairly well during the winter months. The goals of the authors include showcasing the several products and services provided by Nguni cattle by providing examples of those products and services they have and how they can be utilized by the local market and its consumers.

The Nguni breed has the genetic potential to perform better under harsh production environments existing in the communal areas. This empowers farmers to increase the chances of adoption of Nguni cattle production technologies in rural areas and ensure their viability and sustainability.

*Key Terms: Specialty Product, Value chain, Local, Breed*

Martinez, *et al.*, government officials and university faculty members in Chile, researched the effect of management and nutrition inputs on local and exotic livestock breeds. The group compared the impact of hoof trimming, winter feed supplementation, and de-worming on weaning weights of 2 exotic and 1 local breed lambs. The two exotic breeds were Suffolk and Romney. The local breed, Chilota, is descended from the sheep originally introduced to the islands in the 1500’s that were not managed and adapted to the local climate and environment. The study was conducted in the Archipelago islands where the climate is temperate, but conditions are wet and swampy. The Chilota breed is characterized by higher genetic diversity, good reproduction, higher lamb sucking abilities, and higher resistance to internal parasites than the Suffolk and Romney breeds. Additionally, Chilota can better use the low-quality diet of trees and shrubs available on the islands.

Low inputs of management and feed, as well as high rainfalls make livestock production challenging in this region. Typical problems include feed shortages, parasites, and foot lesions. To analyze the effects of the inputs, the study split each breed into two groups- one that would receive treatment and one that would not (control group). The results showed that the local breed had higher performance and lower injury, as well as greater adaptability. This conclusion is supported by the Chilota’s higher weaning weight data in the test groups without winter supplements, without deworming, and their lower risks of moderate and severe lesions without hoof trimming. With these limited inputs, the local breed lambs outperformed the other two exotic breeds.

*Key Terms: Breeds, Environment, Local, Management*

Mendelsohn, of Yale School of Forestry and Environmental Studies in the United States, produced a review arguing reasons to conserve domesticated local breeds around the world. Throughout this article, the author briefly mentions various motives for conserving indigenous breeds, but the main reasons and benefits that are focused on are environmental and landscape benefits, conserving genetic stock or biodiversity conserving lifestyles, and conserving local breeds for the sake of their existence. The author claims that economic and political depletion are largely at fault for the decline in conserving domesticated local breeds due to certain subsidies and policies and grain prices, making it, at times, more economical and easier for farmers, worldwide, to use non-local breeds. This article represents ways that policies can help encourage farmers to use indigenous breeds as well as other ways for individuals, nations, and international policy and support can help conserve these breeds. Awareness and support is key in this author’s position for conserving these breeds and believes once people are aware of these breeds potential wealth, they would be more likely to participate in conserving them, and this would also give conservation managers a better understanding how to conserve these breeds—through utilizing their potential.

This article, as mentioned previously, is a review. Neither interviews nor surveys were conducted to support the author’s case, but this article was simply supported by other sources. Despite this, the author’s findings suggest that with policies and subsidies, farmers will be less likely to abandon local breeds, and will instead keep local breeds from becoming extinct. However, this article proposes that, for domesticated local breeds without particular economic value, conservationist must draw on social or cultural benefits in order to protect these breeds.

*Key Terms: Conservation, Indigenous, Breeds, United States*

This article was written by N. Moula, *et al.*, from Leige, Belgium. Their research focuses on the economic potential of the Famennoise chicken to the long value chain, specifically regarding growth and egg production traits. Research was conducted at the Food Science Laboratory of the University of Leige in Belgium and the Catholic University of Leuven at the Egg Quality and Incubation Research Group. The Famennoise breed is endangered, but has many egg production traits that could potentially improve the poultry industry as a whole, which the authors point out in the article. One hundred eggs from the Famennoise hens were collected; egg length, width, total egg weight, albumen weight, yolk weight, eggshell weight, albumen pH, maximum breaking force, eggshell thickness, and yolk to albumen ratio were measured. 59 animals were also used to test live weights, growth rates, feed conversion ratios, and mortality. Values recorded were compared to industrial bird and egg qualities as well as terroir bird and egg qualities.

In areas of yolk to albumen ratio, and eggshell maximum breaking force, the Famennoise breed was shown to rank very well, and have good potential for improvement. Growth performances were also good, and were found to be very competitive with terroir breeds, although not comparable to industrial breeds. Mortality rates were comparatively high for the test groups. The authors note that a specific way to increase value would be to develop an official quality label and market it as a specialty product. Moreover, the traits of the Famennoise could be improved if crossed with industrial strains. Lastly, the authors emphasize the importance of biodiversity conservation in poultry production.

*Key Terms: Animal Production, Biodiversity, Breeds, Conservation, Indigenous, Local, Poultry, Specialty Product, Value Chains*

The article authors, Munoz del Real, G. *et al.*, are from the Universidad Autonoma de Baja California, Mexico which is the same country where the study was conducted. The species discussed are both sheep and goat livestock whose products value can be increased based on the production strategies and, management implemented prior and during marketing such as the storing of product materials, their processing, implementing consumer feedback, product design publicity and the producers relationship to investors.

The author’s goal is to generate adequate strategies that will add value to the livestock production process through the broad analysis of primary and secondary actions that result from the classification of sheep-goat practices in each value chain sector. The data used in this study is the 2000-2005 results of a Rural Development Program of the Baja California Alliance for the Countryside. Meanwhile the study of such data was conducted from January 2006 until December 2007. The research methods of this study consist of interviewing program beneficiaries from Mexicali and Ensenada, organizing the information as primary and secondary activities, followed by the examination of statistical data with quantitative analysis of descriptive analysis.

The obtained results show that sheep-goat activities are practiced for their secondary activities such as employment generation and application of technology, instead of for primary activities such as production process and presenting a product. Also it is observed that producers do not possess knowledge of the marketing stages of their product nor follow up on the hygiene of the facilities or have a distribution strategy based on the animals’ purpose (for sale, breeding, etc.) within their facility. This article demonstrates that the producer- beneficiaries of the program does not consider that their production required the modification of internal processes to lower costs that would eventually lead to the company’s value-added.

*Key Terms: Value Chain. Livestock*

Museumwa, *et al*., officials with the South African Departments of Livestock and Agricultural Economics, identified the challenges faced by and benefits of the Nguni cattle production in South Africa. The Nguni cattle are a local breed that supply milk, hide, meat, manure, and draft power, providing producers labor power for crops, manure for fuel, and money from the sales of other outputs. By reviewing the research of other studies, the authors identify the value and obstacles of the Nguni breed. The exotic cattle breeds in South Africa are thought to be superior because of their larger body size, but typically do not perform well in the marginal climates of the region. Additionally, low input costs, high instance of disease and low amounts of management further lower the productivity of the cattle.

Nguni cattle could help make the region more food secure and reduce poverty in the communal areas of South Africa. In these areas, low average rainfalls make the households more dependent on the services and products generated by the cattle. The Nguni breed and other comparable local breeds have possibilities in these communal areas and in niche markets. They are more resilient to disease and parasites, both important qualities in areas with poor breed and marketing management.

The South African government recognized the potential of this local breed in 1998 and implemented a development project. This “pay it forward” program provided villages with a starter herd of two Nguni bulls and 10 yearling heifers to start a herd. After five years, the village was expected to gift this “nucleus” herd to another local village that met the requirements of the program- fenced grazing areas and a management committee.

Nguni cattle now provide local villages with a method of inflation-free banking, a form of collateral, and a piece of insurance. They also are valuable reservoirs for gene conservation that could be used to meet the future challenges of the changing climates. Currently, products are sold privately to other households, to butchers, or to middlemen. The program hopes to expand
to allow the products to reach natural beef markets that are growing in response to the new food trends in Europe. Cooperative trusts and boards for small-scale farmers are working as advocates for the Nguni breeds. Recent successes include contracts with high fashion designers and Mercedes-Benz automotive for use of Nguni cattle hides in their products.

Key Terms: Animal Production, Breeds, Business Model, Draft/Draught, Local, Management, Specialty Product, Value Chain

Nedambale, Chokoe, and Maiwashe surveyed the current state of Farm Animal Genetic Resources (FAnGR) in South Africa. Based upon agreements that South Africa had made in 1975 to preserve and protect biodiversity, there is a high quantity of information on the topic of indigenous and local breeds in the country. This has increased awareness of this issue and led to identification of many of the local indigenous breeds through village livestock surveying. The authors cited Zulu sheep as one important indigenous breed that had been identified in this manner.

FAnGR conservation is important in rural areas of the country, where limitations such as isolation, low income, poor infrastructure, limited resources, and lack of information create challenges. Breeds that are adapted to the harsh climates, are tolerant to the local parasites, and can withstand tropical diseases can be valuable tools to improve health and food security of the human population in these regions. This presentation provides examples of many indigenous breeds that have been shown to have these qualities.

In the past, the most effective method of FAnGR conservation has stemmed from breed societies. However, these are not always available, so the authors call for policy building to fill in the “gaps”. Mandates to conserve biodiversity may be the most effective next step. More information is needed to develop best practices for sustainable breeding programs.

*Key Terms: Animal Production, Biodiversity, Breeds, and Management*
This article was written by Tatiana A. Novoselova, Miranda P.M. Meuwissen, and Ruud B.M. Huirne from the Institute for Risk Management in Agriculture, Wageningen University, Hollandseweg, The Netherlands. This paper examines the literature on technology adoption from a chain perspective and outlines the analysis of new technology adoption from the whole-chain context. This paper focuses more specifically on the adoption of genetic modification technology in livestock production chains including among feed suppliers, producers, processors and consumers. The authors discuss the decision-making process for both the consumer and producer: deciding whether or not to incorporate genetically modified organisms (GMOs) into their livestock production systems and the mentality behind purchasing and consuming those products. In various parts of the world, products made with GMOs are not widely accepted, such as in Europe and Scandinavian countries. In other parts, they are widely accepted, such as in the United States and Canada. By highlighting consumer and producer benefits and concerns, and the research behind incorporating GMOs into the food chain, the authors are demonstrating what goes into the decision-making process at various parts of the production chain and why GMO acceptance exists in different parts of the world.

The greatest concern is the acceptance of genetic modification by consumers. Moreover, prices of GM seed can be 35% higher than those of conventional seeds. Another key factor that must be considered is the level of regulation concerning GMO-related products by a specific government or trade agreement. The main conclusion of this literature review was that more research needs to be done on the adoption of genetic modification technology in livestock chains. Every aspect of the production chain needs to be analyzed to study the distribution of costs and benefits of GM technology along the chain.

The authors present their goals of reviewing past studies and establishing a framework for analysis in the introduction of the article. A large number of past studies are reviewed and cited within the text and are discussed in detail to develop a base for the authors’ claims. They make
the claim that there is not a lot of information available on the integration of genetically modification technology in livestock value chains as a whole. This claim is backed by all the sources they have cited that only focused on a specific segment of the livestock value chain. Past studies are often incomplete because they are either demand or supply oriented, but do not successfully integrate the two to understand the impacts on the whole chain.

*Key Terms: Business Model, Livestock Systems, Market, Price, Processing, Standards, Supply Chain, Value Chains*

S.J. Nsoso, G.G. Mannathoko, and K. Modise are from the Department of Animal Science and Production at the Botswana College of Agriculture in Gaborone, Botswana. Research was conducted in the Ramotswa village of Botswana. The study focused on the indigenous Tswana breed of pigs. They are an adapted genetic resource that can be used for food security, income generation, and poverty alleviation by resource poor farmers. The goals of the authors were to monitor the production, health, and marketing of indigenous Tswana pigs in Ramotswa over a 12 month period.

The research was conducted in the Ramotswa village in Botswana with farmers that only owned indigenous Tswana pigs that were identified by conducting a random survey throughout the village. Farmers were then interviewed using a formal questionnaire that included a variety of questions. The results showed all farmers managed their pigs extensively and pigs were mostly fed with brewer’s grain from the local brewing industry. Most farmers didn’t control mating so litters of piglets were born throughout the year. The main consumers of pork in Ramotswa were the local community members.

Farmers in the village kept Tswana pigs for meat and lard production. These farmers should be encouraged to improve management, husbandry practices and productivity of the indigenous breed. More research should be done to improve the overall productivity of indigenous Tswana pigs in order to conserve them through utilization.

*Key Terms: Indigenous, Marketing, Production*

This article was written by Tobias O. Okeno, Alexander K. Kahi, and Kurt J. Peter, from Germany and Kenya. Their research is being conducted on a short, local value chain within six counties in Kenya. Specifically, the study was conducted in Siaya, Kakamega, Turkana, West Pokot, Bomet, and Narok administrative counties in Kenya. The species of interest is the indigenous chicken, looking at the whole production system, and identifying threats and opportunities for holistic improvement. The authors assessed the farmer’s husbandry practices, and through group discussions with farmers, interviews and observations, measured farm size, land ownership, livestock species, flock size, and reasons for keeping chickens. Moreover, they identified characteristics about the farmer, including age, level of education, occupation, gender, and household size. Lastly, they looked at the further details of management practices, such as nutrition, health, housing, extension services, and constraints to indigenous chicken production. All of this data was analyzed with a view of providing information to develop improvement strategies.

It was found that the majority of farmers did not have access to extension services, and disease and parasite outbreaks were common during different times of the year. There is also a need to look for alternative feed resources to reduce competition with humans for grains—termites as a food source were proposed. By implementing services such as vaccination programs, and better health and feed management, flock sizes may be increased, and performance may improve. The authors have shown that indigenous chickens are a central part of rural household income and nutrition, consistent with comparisons to other developing countries, such as Ethiopia, Nigeria, and South Africa. Lastly, they suggest that a sustainable genetic improvement plan, with farmers’ objectives in mind, be implemented to improve indigenous chicken productivity.

Key Terms: Animal Production, Indigenous, Local, Management, Poultry, Sustainable, Supply Chain

This article was written by Eme E. Orlu and Gabriel N. Egbunike, from the Rivers State University of Science and Technology (Nigeria) and the University of Ibadan (Nigeria), respectively. Their comparative research focuses on breed and seasonal influence on testicular morphometry, gonadal sperm reserves, and extragonadal sperm reserves in the barred Plymouth Rock and Nigerian indigenous breeds of the domestic fowl. The research was conducted in hopes to genetically improve the local Nigerian indigenous breeds. Research was conducted in the Niger Delta region of Nigeria and covered a two year period between 2006 and 2008. In addition, the study aims at determining, “how often and for how long a cock can be used for mating without having any depression in herd fertility.”

Twenty sexually mature barred Plymouth Rock and twenty non-descript Nigerian indigenous breeds of chickens were used in the experiment. Five of each breed was used for lumber massage by ejaculation in each of the four seasons of the year. All the birds were used and were harvested on the same day, following ejaculation, and dissected, ten birds total per season. Reproductive organs were used for analysis. Testes weight and density, epididymal weight, respective volumes of each, and Tunica albuginea weight were measured. Moreover, sperm storage potential, measurement of extragonadal sperm reserves, and sperm storage efficiencies were measured.

The relationship between the morphometric parameters, gonadal and extragonadal sperm reserves were analyzed with linear regression. Season did not exert a significant influence on morphometric parameters, and had no significant effect on the gonadal sperm reserves, extragonadal sperm reserves, or their efficiencies. There was a significant, positive correlation between body weight and testicular weight. Additionally, testicular weight is highly significantly correlated with other morphometric parameters and organ weights. The barred Plymouth Rock had a higher body weight and testicular weight, as well as significantly higher gonadal and
extragonadal sperm reserves. The authors recommended crossbreeding barred Plymouth Rock into the local indigenous Nigerian breeds in order to increase sperm production and reserves.

*Key Terms: Breeds, Cluster, Indigenous, Local, Poultry*

This thesis is by Vandree Julian Palacios Bucheli, a candidate to a Masters degree in Agricultural Sciences with emphasis in Agricultural Business Development at the National University of Colombia. The conducted research took place in Camëntsá del Valle de Sibundoy in Putumayo, Colombia. More specifically, they performed a socioeconomic analysis in the indigenous safeguards of Tamabioy and San Felix of Sibundoy. This thesis analyzes all components of agriculture production, which include agro-forestry, agriculture and livestock. Specifically, the livestock focused sections within this 126-page thesis have been annotated.

The studied livestock species in this study include the European rabbit, mallard ducks, the domestic pig, the red jungle fowl and the guinea pig, out of which the last three are most adaptable to the study site. The services obtained from these are that of milk production, milk-based products, eggs, meat, liquidity in sales/markets and breeding. The value that comes with these products is that of food security to the indigenous people that produce them, while being able to continue supplying to nearby communities.

Within this thesis, Palacios aims to produce a socioeconomic analysis of the agriculture production systems in the indigenous safeguards of Tamabioy and San Felix. The author works towards this goal by addressing the research objectives of characterizing the production systems chosen for the study, realizing a comparative socio-economic analysis of those systems, and by identifying the currently existing agricultural production in the safeguard site. The author achieves this by performing a non-experimental and descriptive investigation as well as by gathering primary data through surveys and interviews of the production unit owners and farm-house families, and observations of the study sites. There was also the use of secondary data such as cartography, which was used to locate the study sites. During the study, the way the author looked at the sites is by observing their state, whether the site is solely a house garden, a combination of the garden and livestock, solely grain, or solely livestock.
The results of this study is that only 7% of families have livestock production, the smallest percentage of production systems by the families, yet it is the system that takes up most of the land use, with an average of 1.96 hectares. In regards to food security, livestock is not producing more than house gardens, but it does provide the most economic stability in Tamabioy. In comparison to San Felix, livestock generates employment stability, thus making up for the low point in food security. In order to enhance the livestock system, the author recommends imperial grass species be implemented as these can enhance the quality of the milk products as well as that of generated compost. He also recommends that to benefit both families and livestock, forest trees should be used as fences. Doing so would generate the benefit of firewood, wood for humans while providing foraging and shade to the livestock.

*Key Terms: Especies de Valor Indígena, Ganado.*

Pattison, Drucker and Anderson, from various universities in the United Kingdom and Australia, conducted a study on Pelón indigenous pigs in Yucatan, Mexico. At the time of this study, this indigenous breed was listed as “endangered,” and through various conservation schemes, the authors anticipated that the breed would be listed as “not at risk” status within ten years. Research was compiled through the use of other sources that had also collected data in this area, as well as research conducted by the authors themselves in 2002, through surveys and interviews, making this a quantitative article.

Authors analyzed the differing cost estimates for different conservation approaches, and weighed the positive and negative aspects and possible conflicts that could arise. Two of the main strategies that were stressed and suggested were the strategy of establishing an open nucleus scheme and transitioning from a household-based to a community-based conservation scheme. Both presented different costs and benefits, but both were believed to be able to successfully conserve the breed through local participation. Through their research, the authors found that through governmental policies, and subsidies, local participants who were willing to conserve and breed this pig, without compensation, would play a significant role in the success of preserving this breed.

Key Terms: Local Breed, Conservation, Sustainable Livelihoods

Oswin Perera, a university professor from Sri Lanka, wrote about specific threats to indigenous breeds in the six Southern Asian countries of Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka. In this presentation, he examined the threats to specialized local breeds of the common species of the region: cattle, water buffalo, goats, sheep, pigs, poultry, and yaks. These animals provide many products and services to the population of the region.

Perera discussed species development over the past 10,000 years. During this time, diversity of both plants and animals increased as natural selection and regional adaptations took place. However, over the past 200 years, increased understanding of breeding management and the genetic science behind it has caused diversity to decrease quickly, as animals are bred for specific traits. This has led to the common commercialized breeds of livestock that are bred for productivity. These breeds need intensive management practices that are typically not available in developing areas. Therefore, Perera argued that this is the role and value of local breeds.

To better utilize the local breeds of these areas, improvements can be made and challenges must be overcome. Perera listed commercialized breeds as a major threat to the extinction of many local breeds. With proper management of human issues, economic development, technology, policy, and management programs, the local breeds can be revitalized. According to the presentation, local breeds are needed to meet the food and health needs of the world population. Perera’s program for conserving the animal genetic resources of the local breeds included a plan that will utilize the diversity in the short term and maintain it in the long term.

*Key Terms: Animal Production, Breeds, Conservation, Indigenous*
Author Sagari Ramidas, co-director of Anthra, an organization of women veterinary scientists who work on the issue of livestock development, provided examples of what conservation of indigenous and local breeds can do for women in the developing world. Aseel poultry and other local breeds, offer sustainable livelihoods, empowerment, and control to women in East Godavari district, Andhra Pradesh, India. Unlike many other agricultural settings in the developed world, Aseel poultry is entirely owned and controlled by women in this area.

Although a decline in this species predicted unfortunate consequences for these women and their families’ livelihoods, several strategies were implemented, using modern and local knowledge and collective action, with a particular emphasis on women. These strategies allowed several benefits including an increase in household income, nutrition, and food security. The success from these backyard poultry systems was not only successful for those involved, but it also spread to other women in other villages, and was fruitful enough for outside organizations to completely pull out and leave the local women to continue their work on their own. The success Ramidas found is not only supported by other author’s findings, but also by data collected from 1996 to 2008. Even though this article does not specifically offer the benefits and functions of a value chain, it does, however, display the importance of including women in livestock breed conservation and production.

*Key Terms: Indigenous, Sustainable, Livelihoods*

This analysis done by J. Ramljak, et al., focuses on a local value chain in Croatia with researchers coming from both Croatia and Germany. The analysis is of the three indigenous cattle breeds in Croatia: Croatian Buša, Istrian cattle, and Slavonian Syrmian Podolian cattle. The study focuses on possible genetic resources as well as cultural and traditional values. The goals of the authors are to characterize genetic diversity and structure between and within the three indigenous breeds, relationships with other breeds in the region, and discuss breeding programs and strategies for each of the three breeds.

51 individual cattle were sampled in 2006, which very closely represents the entire population of the indigenous cattle in Croatia. In order to expand the data, the analyses have been carried out by comparing results with previous analyzed breeds. Alleles were classified in levels according to their frequency in order to determine more effective breeding strategies and practices.

These cattle had roles in shaping landscapes and were extremely dominant in their farming areas until the middle of the 20th century when they gradually decreased in population. All three played important roles in the country’s history and still represent a historical witness. The value of local traditions and cultural aspect play a part in keeping these three indigenous breeds alive and thriving. This study can serve as an example of for other countries interested in entering global markets. Local breeds and their conservation values should still exist in order to maintain that historical and cultural awareness.

*Key Terms: Indigenous, Breeds, Conservation, Preservation*

Research completed by R. Ripoll-Bosch, *et al.*, focuses on a local value chain in an area of Northeastern Spain. Authors are from both Spain and Norway. The study is focused on autochthonous sheep breeds, more specifically the Orjinegra breed used mostly for lamb meat production in Spain. Research was conducted in the Providence of Teruel in Northeastern Spain where the Orjinegra breed is rustic, precocious, and well adapted to local rough conditions. This study aims to typify sheep farms with an autochthonous breed in less favorable areas and elucidate the existing links between economic performances and select sustainability indicators, such as productivity, self-sufficiency and diversification of production.

The analyzed data was obtained through direct interviews with over 35 farmers belonging to the sheep breeders association. Interviews were conducted in 2009 and questions included topics such as: family structure and labor, farm size, facilities, land use, herd size, structure of reproductive and feeding management, technical performances, and several other factors. Results showed a high level of variability among farms based on the answers to the indicators of the study. Cluster analyses were also used to analyze livestock systems at different levels of production.

It is generally accepted that intensive systems improve animal productivity leading to better economic results, but that was not shown by the farms in this study. Farms of the high input intensive group were able to get significantly higher animal productivity rations, but at the expense of large variable costs which resulted in low economic margins. The results of this study may not be directly extrapolated to other sheep breeds and locations.

*Key Terms: Breeds, Animal Production, Livestock Systems*
This study showcases a local value chain researched by A.M. Rodrigues, *et al.*, from Portugal with the data also being collected from Portugal. The study focuses on beef cattle and their meat production as well as their ability to convert renewable resources into edible food for human consumption. The authors are providing data to show the importance of using extensive livestock production systems to increase environmental and landscape protections, as well as contribution to the decrease of the human and physical decertification of rural areas.

Research collected for the study is mostly qualitative describing how an extensive livestock production system works and what benefits they have to offer to local breeds. As examples for evidence, the authors present the characteristics of the Portuguese extensive production system to show the differences in the northern and southern systems. The research provided in this article states that support of indigenous breeds is necessary for several reasons: to conserve genetic inheritance, diversify agricultural activities to ensure the use of natural resources, increase farming to prevent depopulation of rural areas, promote production systems that conserve the environment, and sustain characteristics of indigenous breeds to add cultural and retail value.

*Key Terms: Production, Local, Breeds, Livestock System*
Authors, Lylian Rodriguez and T.R. Preston, from the Finca Ecologica in the University of Tropical Studies in Vietnam studied the importance of local breeds and their feed resources in the country of Vietnam. The main observed breed is the Mong Cai pig from which milk and manure products are obtained. The authors’ research goal was to demonstrate that indigenous livestock breeds have a reciprocally dependent relationship to the local feed resources (crops) when integrated appropriately. The gathered data was taken in 1995 during the author’s residency on the Binh Dien and Xuan Loc villages. The data was the results of a participatory approach with the local farmers from those villages, with the purpose that it would help identify the value and importance that the villagers place on the pig specie and their feed. This method was chosen from the discussions the authors had with “the People’s Committee and People's Committee and the Women's Union to consider and develop the ideas”.

The results of this study show that by replacing cereal feeds for the local pig breeds, their performance and quality of the products can be increased, thus benefiting the consumers, the breed, and the crop system. An example of this is the use of sugar palm juice to feed the pigs, which leads to a less labour-intensive system and the production of manure that is converted to fertilizer for fish ponds and local plants. Based from this interaction, it is encouraging to identify the most favourable local feed resources per local livestock breed keeping in mind that one system’s loss is the gain of another leading to an optimization of the entire system.

Key Terms: Local Breeds

Roothaert, Ssalongo and Fulgensio are employees of organizations in Uganda that are assisting poultry growers in the region with increasing the value of their output on a short value chain. The article is a review of new practices that have been implemented by Ugandan farmers with the assistance of various NGOs. The efforts include crossbreeding with indigenous chicken breeds to increase the production of meat and utilizing new incubation techniques to increase the number of chicks hatched per year. The main objective of the original study was to “decrease poverty among subsistence farmers.” Poultry keeping is typically an activity for women in developing countries so the study hoped to improve the livelihoods of female or orphan headed households.

The results of the incubation program increased the number of hatches per year to as many as seven—compared to just two or three times a year for non-programmed birds. The goals of the crossbreeding were to capture the improved growth and size characteristics of the exotic breed while maintaining the flavor and disease resistance aspects of the indigenous breed. The resulting R3 genotype was 12.5% Bovan layer, 25% broiler, and 62.5% local chicken. There is discussion on the process and results of the implementation of the new technology. Table 2 covers the breakdown of gross margin for using 40 of the improved birds. There is an estimated increase of income of 1,050 US$ by implementing the suggested method.

Discussion on the socio-economic impact of the program is based off of the table. Challenges to the program that are inherent in the culture, such as illiteracy and theft, are pointed out. The authors conclude that there is a recognized local need to improved poultry production and the Ugandan farmers are willing to incorporate new technology when properly educated and support is available.

*Key Terms: Indigenous, Breed, Service, Livelihood*

Safiudo *et al.*, veterinary faculty at University of Zaragoza in Spain, examined the influences of breed on the quality of meat and carcass. The research was supported by the grupo Promotor del Lechazo de Aranda. Sheep from three local breeds and one cross-breed group were studied. The local breeds were of Spanish origin and included Churra, Castellanga, and Manchega, which normally provide meat and milk. This study looked specifically at the meat of suckling, or one month old, lambs.

To determine quality, the researchers utilized quantitative and qualitative methods, including visual assessment and carcass measurements. They evaluated fatness, color, butt/chest measurements, and live and dressing rates. Data analysis was done on live lambs as well as 48 hours following harvest on the carcass.

The results showed that breed influenced many aspects of the carcass and meat quality including fatness and dressing percentage. Although all of the carcasses were commercial acceptable, there were significant differences in the meat quality for different breeds. All of the lambs had similar live weights, but the Marchenga’s had consistently larger carcass weights than the other breeds, resulting in the highest dressing percents. Fat color was less desirable in some groups, as was the amount of fat present on the carcass. This information is important when evaluating the appropriateness of local breed’s products for a market, as well as using it as a factor in determining the value of the breed.

*Key Terms: Breeds, Local, Processing, Value*

This case study, written by Scali *et al.*, provides evidence of genetic diversity within the Cinta Senese breed. All authors come from Italy and research was conducted in the Tuscan region of the same country. The breed being analyzed for this study is the Cinta Senese, and indigenous pig breed from Tuscany. CS pigs can provide a payment of premiums for breeding and create a controlled maintenance of breeding for the entire breed. This study lays a basis for the development of a traceability control system of Cinta Senese along the entire production chain.

Biological samples were collected from 86 males of the CS breed and were used to provide genotype determination and sequencing of the PCR product. The case study also supplied clustering and phylogenetic trees based on allele frequency and by comparing different genotypes.

Fixation idiocies showed a generally high level of genetic differentiation between breeds, with quite significant differences across several loci. The possibility of establishing a defined genotype for the CS breed allows farmers to set an accurate management of breeding programs for genetic improvement and breed genetic identity preservation over time. Rare allele identification in the CS breed renders it possible the molecular traceability of CS meat over other major white breeds of pigs.

*Key Terms: Livestock, Clustering, Management, Pigs, Indigenous*

This article, written by Berta et al., from universities in Chile, focuses on the preferences of beef consumers in Chile. The authors use statistical methods to measure the importance of origin, price, and animal welfare information when consumers are making their purchasing decision. A survey was administered to 770 residents from two separate regions who were the primary purchaser of beef for their household. Origin of the beef was found to be more important than either price or packaging information. This helps to partially confirm the belief that price is not the primary determining factor of attitude about meat.

The methods of the study are reported clearly in the article along with multiple tables displaying results that were statistically significant. The authors report that the study shows that consumers are becoming more concerned about information on how the animals were treated prior to being harvested. Based on the survey responses, the Chilean population appears to have a growing concern about animals being treated humanely—and that information being presented somewhere on the packaging. The two study regions were broken down even further and trends were noticed within sub-regions.

This study reinforces the importance of value created by accurate information on the humane treatment of animals intended for human consumption. The authors conclude that efforts to improve information on animal welfare should not solely be improved for meat that is destined to be exported to developed countries. Consumers in developed countries have been the focus of similar studies, and show that these consumers are also primarily concerned about origin, followed by information on animal welfare.

Key Terms: Animal Welfare, Beef, Origin, Value

Authors Scintu and Piredda, of the Institute for Livestock and Dairy Sardinia in Italy, produced a review over goat and sheep milk products in the European Union. This review explains the importance of biodiversity and typicity when conserving particular goat and sheep breeds. The authors describe certain European Union regulations that have been put in place through The Council Regulation (EEC) which was implemented in 1992 including Protected Geographical Indications (PGI) and the Protected Designation of Origin (PDO). Both of these rules can and are used to not only benefit consumers and their preferences, but also to help protect local breeds by differentiating the products they make through typicity.

The authors did not gather any of their supporting information through interviews or surveys, but appeared to have simply researched the topic through the use of other sources. Along with their sources, the authors also used information from the EEC to support their argument to conserve local breeds through typicity.

This article provides information on milk composition within the EU, Rennet, and Microbiology, which gives a sure standing on the importance of these products and the importance that consumers know how and where these products were made. The findings suggest that biodiversity can be attained through differentiating these products through their unique characteristics that cannot be found in other areas, and using them reach economic sustainability. Through marketing these products based on their geographical location and particular attributes, biodiversity will be enhanced and people will economically benefit from these products.

*Key Terms: Local, Breed, Conservation, Standards*
George Scotter, a Canadian government official, studied the reindeer industry in Scandinavia and Russia in 1964 to determine the value of bringing that region’s indigenous species back to Canada. He first became interested in the topic because the animals were able to utilize vegetation in areas that would otherwise go untouched. He examined both the management systems as well as the regional value chain associated with the meat industry of the breed.

In his travels, he found that the reindeer were able to subsist on forage from the mountainous and deeply forested areas that other animals could not graze. Additionally, the reindeer had a mutually beneficial relationship with the logging industry. As the reindeer graze on lichen found on tree bark and the forest floor, they provide openings in the lichen cover. These openings allow for increased germination of tree seedlings.

Scotter found that reindeer are important for the health of the forest and increasing the value received from the land in less desirable geographies. The meat, milk, and hide provided by the animals have created industry demand for reindeer, and the ecosystem services they provide for the forest are especially important in a region where logging is central to the economy. As the breed continues to expand and develop, a need for better management of breeding practices is important. The quality of the animals is declining, as the reindeer become smaller in weight and stature. Scotter’s recommendation for better breeding includes conservation of the local breed genetics by pure breeding to have a source for better crossbreds to increase the competition of the herds.

**Key Terms:** Ecosystem Services, Environment, Indigenous, Management

Seabury *et al.*, faculty at Texas A&M University and North Carolina State University, compared the instance of occurrence of a genetic marker that is associated with the susceptibility of cattle to Bovine Spongiform Encephalopathy (BSE). The study was supported by Texas A&M University. To collect the genetic data, the researchers evaluated 132 cattle sires used for Artificial Insemination (AI). These bulls were from the United States, represented 39 breeds, and were unrelated. This group was compared to a group of 48 German bulls of local breeds from Germany.

To collect data, the researchers collected blood samples and analyzed the samples for PRNP promoter and genetic markers. This was done with a polymerase chain reaction procedure. The quantitative data that was collected then underwent statistical analysis to determine if there were significant differences in the BSE susceptibility of the German local breeds when compared to the American bulls of commercialized breeding.

The researchers found there was little variation within the group of German cattle. However, there were large differences between individuals in the U.S. sample of AI sires. The US sample group had a higher average frequency of the occurrence of the intron allele than did the German group. The intron allele is associated with higher susceptibility to BSE.

*Key Terms: Animal Production, Breeds, Local, Value*

Soini *et al.*, researchers from the Economic and Food research agencies of the Finnish government, examined the conservation policies implemented by Russia and the former Soviet Union for Yakutian cattle. Yakutian cattle are an indigenous breed found in the far east region of Siberia, Sankha. These cattle are traditionally raised by households of low socioeconomic status for the milk and meat they provide. The manure and draft power of the cattle are also utilized in some cases. They are a low input breed that is well adapted to the climate of the far north latitudes.

The Yakutian differ from many of the other local breed, for they have been a subject of conservation efforts since the 1950’s. Most of these conservation efforts were headed by the Russian Federation, and included many actors such as the local community, regional government, and non-governmental organizations. Currently, the breed is conserved by law, and this program is subsidized by the Republic of Sankha, the local regional government. There has been a recent trend in genetic conservation to revert to community-based, participatory approach. This constitutes a decentralization of conservation policies from a federal to more local level.

Through qualitative interviews and surveying, the authors hope to examine the conservation of the Yakutian cattle in the current state of economy and society to analyze the limitations and effectiveness of government involvement at the various levels. Interviews will be conducted with local residents, scientific specialists, and Russian politicians. Local media will also be reviewed. Local breeds are a form of “rural capital” in many communities, as they provide social capital, cultural benefits, and insurance for households.

For these reasons, locals want breed conservation programs. In fact, much of the society in northern Russia is centered on livestock production, but the northerners are not as respected by the rest of Russia, so the agenda is not heavily supported nationally. Governance can make a conservation program more sustainable than sole reliance on a community approach. In a breed
conservation effort, there are many actors that all support the cause but for different reasons. The challenge is to integrate global conservation aims with local development challenges.

*Key Terms: Conservation, Draft/draught, Indigenous, Management*

This article focuses on a local value chain written by A. Solis et al. all coming from France. Research was conducted in the Basque Country and Nafarroa Cantabrian-Pyrenean area. The study focuses on four different native breeds of horses: Pottoka, Jaca Navarra ponies, Euskal Herriko Mendiko Zaldia, and Burguete horses which are all mainly raised for consumption. The goal of the research is to estimate the genetic diversity of the four breeds, investigate the effect of genetic bottlenecks, and estimate the amount of genetic differentiation between the breeds. A total of 417 animals representing the four native breeds were analyzed and 12 microsatellites were genotyped in the different breeds. The allelic frequencies and average exclusion probabilities were estimated as well.

The levels of gene variability were slightly higher than those of European or American horse breeds. Local breeds raised by traditional methods displayed higher genetic diversity than more highly selected or specialized breeds. The reasons for the conservation of the four native breeds include: cultural interests and representing a strong link of the past in the Basque Country, the two meat breeds are of economic interest to make the maximum use of the natural environment and help maintain rural populations, scientific interest of horse domestication that occurred in Western Europe. Further analyses of these breeds of native horses with other molecular markers might provide relevant information regarding the origin and evolution of the domestic horse in Europe.

*Key Terms: Breed, Indigenous, Conservation*

This publication was published and distributed by the Ethiopia Sanitary and Phytosanitary Standards and Livestock and Meat Marketing Program and covers the issues of standards and meat exporting in Ethiopia. This short publication mainly discusses the importance of productivity as well as the quality of meat and live animals when exporting. Livestock is a crucial part of Ethiopia’s economy, exports, and the livelihoods of the people who live there.

The Ethiopian government, along with several partners, has made certain steps toward improving Ethiopia’s current meat and export state. A few examples of this include the USAID funding the Ethiopia Sanitary & Phytosanitary Standards and Livestock & Meat Marketing Program in 2005 and Ethiopia Meat & Dairy Technology Institute in January 2008. This publication claims that funding such as this has helped improve their productivity and quality, as prices and exports have increased overtime. Lastly, an opening of a new slaughter house was also displayed and believed to have positive effects as it is more advanced and developed.

*Key Terms: Animal Production, Labeling, Certification, Value*

Strydom is from the Agricultural Research Council of South Africa and did a review of literature on the quality of beef from indigenous breeds in South Africa. Natural selection has led to the evolution of these breeds to be more resistant to disease and better suited to survive in harsh conditions. The author argues that the beef quality of these indigenous breeds is similar to -and in some cases better than- the beef of exotic breeds from Europe.

There is a background and discussion on the structure of the South African beef industry. Feedlot production has led to producers selecting exotic breeds that can be raised in feedlot environments. The indigenous breeds have slower growth rates, smaller body frames, and less intramuscular fat. The author provides a general discussion on the research that has compared beef quality of indigenous breeds to that of exotic breeds. Results of previous research are provided in tables for discussion.

The author’s last focus is on the genetic characteristics affecting tenderness of beef produced. Although there is evidence of tenderness being different between breeds, there is significant variation in tenderness within breeds. Previous studies have shown that indigenous breeds can be bred and selected for genes for improved tenderness. Strydom concludes that previous trials indicate that producers can choose indigenous breeds that will fit their production system if conditions are not optimal. Meat quality analysis shows small or no difference in beef between indigenous breeds and exotic European breeds. Finally, results show that there are high frequencies of genes that are favorable for tenderness in the indigenous breeds of South Africa.

*Key Terms: Indigenous Breeds, Quality, Value*

Taberlet *et al.* are researchers in the fields of Animal Production and Natural Resources from universities in Iran and Italy. In 2007, the group examined previous genetic, sociological, and economic research on genetic resources in cattle, sheep, and goats. Based on the information they encountered, they found the Animal Genetic Resources (AnGR) of the three species were highly endangered. Although, there is a high population size for most breeds, these individuals are most industrialized breeds. As reproductive management programs continue to select for phenotypic and production characteristics, the *Effective Population Size* (Ne) continues to decrease to alarmingly low numbers. Artificial insemination and other new technologies accelerate the rate of decline of genetic resources available. The Ne measures the genetic variability of the breed based on markers in the DNA. The low Ne numbers indicated an immediate need to conserve local breeds and to increase AnGR in commercialized breeds. This phenomenon parallels the wildlife extinction heavily publicized in the media today, state the authors.

This issue is prevalent in highly developed and developing areas. Threats to AnGR are far-reaching and include economic pressures, changing agricultural practice, and production intensification. Additionally, the practice of valuing livestock based solely upon production (milk and meat), increased barriers for international trade of livestock, recent disease epidemics, and dilution of local genetics by exotic breeds are exacerbating the issue. Resistance to disease and harsh climate conditions possessed by local breeds are quickly lost. The low Ne has caused a re-emergence of hereditary diseases in large breed populations. In developing countries, there is a cultural inability to manage small populations. It is hard to quantify the long-term benefits of conserving the local breeds, as usually only short term benefits are identified. Since the traits that will be valued as favorable traits in the future are unknown, it is important not to be eliminating them by selecting for current traits today.

*Key Terms: Animal Production, Breeds, Conservation, Livestock Systems, Management*

The author of this article is Mariana Tadey from the National University of Comahue in Bariloche, Argentina who has conducted research at the Patagonian Monte desert in Argentina. The species covered in this article include horses, cows, sheep and goats that shared the paddocks where the study was conducted. The service that is observed is the ecosystem service of indirect effects that livestock presence has on the success of pollination. The importance of understanding such effect is that as the number of livestock per paddock increases there will be a reduction in the levels of pollination in the vegetation in the area. This relationship can reduce the production of seeds, which in the long run can impact plant density in the area. A decrease in plant density could be critical if the species is valuable as feed or other services to the locals (non-human animals included).

Tadey’s research question is to determine the relationship between cattle load and pollination levels in vegetative species based on the idea that as cattle load increases, pollination levels decrease (negative relationship). She aims to determine the factor that drives such relationship; whether it is the organization of pollinators or the area coverage by the plant species. In the study, Tadey collected primary data from 2001 until 2004. This study’s data was comprised of the number of pollen tubes in the collected flowers of five observed vegetative species, as well as the type of livestock and their density in the paddock. The data was gathered by going out to the site and collecting the sample size of flowers and by interviewing the livestock owners to obtain the cattle load by paddock. The obtained results showed that the livestock effect on pollination is determined by the changes in plant cover, and whether or not the effect is a positive or negative one depends on the already established relationship between plant cover and pollination.

In this study, the author considers many factors that could’ve influenced the results, and based on those she offers them as a form of recommendation for future studies in this topic. Tadey concludes that the obtained results in the effects of livestock on pollination will also vary per plant species as each may have a different pollen dispersal and reproduction method in addition to other factors such as climate change, pollinator behavior and pollen quality.

Tegene, Gebremedhin, and Hoekstra, from an Ethiopian development project, assessed the current supply and production systems for livestock in the country. Using surveys, previous data, and institutional influences and support, they have made a qualitative report. The authors intend to use this report to better identify the challenges in the system to make improvements. Currently, Ethiopian livestock production is usually subsistence agriculture, meaning the producer is the consumer. There is limited market access and infrastructure and poor government support and regulation. Extension, research, financing, and marketing are almost non-existent, especially in rural areas. In order to make progress, system restructuring needs to occur to shift subsistence to market systems.

In many areas, there is a comparative advantage in local animal genetic resources. Regions where livestock production occurs are usually considered as marginal or low potential regions, resulting in low governmental support financially and politically. Performance of the exotic breeds in these areas is not viable, as input costs are high and the animals are not well adapted to harsh climates. They also require additional labor and veterinary costs. Higher mortality is characteristics of the breeds when compared to the local breeds. Ethiopia has a large population and instance of local and indigenous breeds. For example, the poultry population in Ethiopia is over 90% local breeds. The report argues there needs to be a transformation from a focus on output to a concentration on outcome and impact in livestock production.

*Key Terms: Animal Production, Livestock System, Supply Chain*
This study researches a local value chain with the use of a cluster analysis conducted by D. Thilmany et al. from the United States with their research being taken from the state of Colorado within the United States on behalf of the Colorado Homestead Ranches. The research focuses on beef cattle, but more specifically natural beef products and the service of local production practices as a service that adds value that consumers will be willing to pay a higher price for. The goals of the authors are to research willingness-to-pay for natural beef products in Colorado by using a cluster analysis.

Data has been collected for an online national survey conducted by the National Family Opinion Organization in April of 2004. Research found for this article came from 416 of the 1288 responses that were returned. The survey collected information about consumer shopping behavior and gave the authors the chance to review both factor analysis and consumer analysis. Factor analysis provided to main factors that affected consumer behavior. Concern about production practices and willingness to pay were most influential. For consumer analysis, customers were categorized into five different clusters. 12.5% were quality seekers, 13.2% were health and natural practices, 29.6% were moderate consumers, 22.6% were empathetic value seekers, and 22.1% were price conscious. Demographics also created a large influence on results of the data that was collected and used.

Customers surveyed for this study are motivated by several different factors, depending on which cluster they belong to. Potential strength of production methods, such as natural beef products, should be utilized in order to create product differentiation criteria.

Key Terms: Cluster, Cattle, Value Chain, Marketing

This research focuses on a local value chain along with a global influence from breeds from outside the country. The authors E. Ugarte et al. are all from Spain, as well as the research is based completely in Spain. The study talks about Spanish dairy sheep, their dairy products, the maintenance of human populations and positive economic activity, and the ecological importance of their traditional production systems. The author’s goals include providing data that shows the effectiveness of crossbreeding local breeds with high-yielding breeds from other areas and regions.

Research provided in the study shows population versus production in Spain and the overall population of dairy sheep in the country. Most research provided is qualitatively collected and provides a review of previously researched data. Productive superiority of foreign breeds is not compatible with the maintenance of traditional livestock systems under extensive conditions. Crossbreeding with local breeds has increased, but they have weakened the pool of purebred local breeds. Livestock systems nowadays must be strengthened to produce higher yields for animal production.

The ecological role that local sheep breeds have played cannot be forgotten as they take advantage of natural resources that otherwise could not be exploited. Geographical indicators for sheep products also provide a service and value addition to the specific livestock system. The presence of foreign sheep breeds in Spain is evident and needed, but it could be logical to have both indigenous and high yielding breeds of sheep that are compatible with each one occupying a particular productive environment and using different livestock systems.

*Key Terms: Breeds, Local, Environment, Management*

Un et al., faculty at universities in Turkey and Germany and supported by the Research Fund of the University of Istanbul, studied the susceptibility of three local breeds, or Turk cattle, to Bovine Spongiform Encephalopathy (BSE). The group hoped to compare the disease susceptibility of the local breeds with those of other more industrialized breeds of cattle. The local breed cattle typically require low inputs and can live and reproduce without human help. Poor feeding and housing conditions, as well as multiple climate changes are frequent in the area and tend cause high morbidity and mortality rates in conventional breeds.

Using fifty unrelated individuals, each of the three main local breeds: South Anatolian Red, East Anatolian Red, and Turkish Gray, the researchers used DNA isolation and polymerase chain reaction methods to gather quantitative data from blood samples. Susceptibility to BSE can be identified from genetic variances in DNA. Low susceptibility is associated with the 12 bp indel ins allele. From statistical analysis of the information found through the above methods, the researchers were able to identify a higher frequency of low susceptibility in all three Turk local breeds than has been identified in a typical cattle sample group in previous studies.

The local breeds have lower production numbers, but may still hold value because of this low disease susceptibility. Additionally, genetic selection is the sole method to eradicate prion diseases, like BSE.

Key Terms: Animal Production, Breeds, Local, Value

The authors Verrier, E. et al., from institutions in both countries of France and Guadeloupe conducted research in the French Northern Alps on the Abondance and Tarentaise cattle from which milk and milk-based products can be obtained. These two cattle species obtain their value based on their moderate to high adaptation and functional traits when it comes to the species’ 1) ease to walk and the impact that walking for long distances has on dairy production, 2) heat resistance, 3) ability to intake and valorize rough dry forages, 4) fertility and longevity, 5) resistance to mastitis and 6) grazing activity under harsh conditions when on high altitude pastures.

This article’s main goal is to comprehend how the values of these species can be used to favor their conservation. The methodology implemented to either acquire these two case studies, or the criteria under which such case studies were chosen is not presented in the article. In addition to the absent methodology, the time period of when the case studies were assessed is not mentioned.

The important result is that the authors are able to support the idea that a specie and its products can obtain value as a result of the interaction between the characteristics of the breed and any limitations or constraints it may encounter in nature. This advantage of building value from that interaction is excellent in creating or even increasing the appeal of niche products, in addition to serving as support to economic profitability and conservation of the breed. The success of a niche product relies on the country’s culture or the interaction of nature and specie, but also in the current status of the country in regards being classified as developed, or developing. Lastly, the authors emphasize the fact that performing specie conservation solely on the specie’s genetic variability is not justified, but that one should take into consideration the uses of the specie, and its performance and impact on the natural environment and farming system.

*Key Terms: Environment, Limits, Local Breeds*
Authors Vieira, of Unisinos Business School in Brazil, and Traill, of The University of Reading in the United Kingdom, examined the trust and governance involved in global value chains, specifically through studying a Brazilian beef processor. These authors provided information pertaining to the influence of standards and traceability on global value chains through in-depth interviews with individual firms, annual reports, the use of other sources, as well as a “direct observation with the Brazilian beef processor, the EU importer and the retailer”.

Even though this quantitative study did not involve conserving or exporting a particular breed of cattle and was a rather small-scale study, it did display other important characteristics of value chains such as cultural barriers and the importance of education. Also, the authors’ findings showcased the differences in preferences and demands between domestic and international consumers and how these differences have played into the enforcement and regulation of standards and traceability within this value chain.

*Key Terms: Value Chains, Standards, Livestock*

The authors, members of both African organizations focused on animal genetics and European Universities, sought to identify the value of the indigenous Ankole breed of cattle in a time of changing herding practices in southwestern Uganda. The authors used this qualitative study method to analyze the opinions of the region's farmers on the value the breed adds in terms of milk production, as well as blood and urine for home products. Currently, the pastoralists are looking for animals that have increased milk-yield productivity, so that they can lower their herd sizes to account for land shortage pressures.

The researchers found through administration of surveys about basic household information, herd statistics, strategy information, and opinions. The ethnic group studied was the Bahimans of the Banyankore tribe. It was found that farmers valued many of the traits of the Ankole breed including disease resistance, heat tolerance, and low input needs. Additionally, the meat harvested from the cattle was rated as higher quality, and the milk has a higher fat content, important for the dairy products produced by the tribe.

The study concluded that the breed was valuable, as the animals possess most of the traits the farmers want in their cattle breeding stock. Important strategies for the continuation of development are increased management of breeding programs and proper identification of animals.

Key Terms: Breeds, Conservation, Indigenous, Management
Authors Yaqoob and Nawaz, both of the University of Agriculture in Pakistan, explain the importance and potential of camels in Pakistan. This article provides examples of products and services produced by camels in other world regions as well, but a majority of the authors work is emphasized on camels within Pakistan—Dromedaries and some Bactrians. The authors argue that camels are often undervalued and not used to their full potential and ability. Additionally, camels can easily possess an added value for farmers and nomads within Pakistan if their goods and services were properly utilized. Data and research was not collected by the authors themselves, as this was simply a review article.

The authors found that camels have much to offer, even though their population has been decreasing. Camels have a rather low-input cost, while they are able to withstand harsh environments and provide a continuous product throughout different season. This article stresses that camel products are superior to products from other livestock, because its milk is high in Vitamin C, which is important when vegetables and fruits are not easily accessible, and it has a higher phosphorous content than cow, buffalo, sheep or goat’s milk. Also, camel’s milk possesses a longer keeping quality in comparison to other milk. Aside from the nutritional value these species have to offer, the article also describes the value of camels for their meat and transportation. The authors conclude that, if utilized properly, camels hold important socio-economic value, not only for their milk, meat, transportation, and ability to live in harsh conditions, but also because they are also able to be used in the industrial world for their labor, such as drawing water from wells, grinding wheat and other grains, and working mini mills for oil extraction from seed oils.

*Key Terms: Camel, Preservation, Draft, Power*

This analysis focuses on a local value chain written by Zander K. and Drucker A. from Australia. This research was conducted in southern Ethiopia and northern Kenya to represent Eastern Africa. The analysis is on the Borana breed and showcases their cultural and historical value, as well as their role as a staple of the Eastern African culture. They also generate income and provide a daily food supply for farmers and consumer. The goals of the authors include support of decision-making in conservation initiatives for the Borana cattle breed in Kenya and Ethiopia, and also determining genetic distinctiveness of different cattle breeds.

The research conducted for the analysis was taken from 370 different livestock keepers in Kenya and Ethiopia that were interviewed between October 2003 and February 2004. The survey was taken from four Peasant Associations in Ethiopia and a choice model was created to showcase the data collected from the farmers. What-If scenarios were also considered when creating the model.

Identification of economic values that have largely been ignored or poorly defined in conventional livestock economics are of use to both conservationists and breeders. The authors recommend NGOs and governmental extension services could make use of genetic information in order to promote the “right” animals for genetic improvement.

*Key Terms: Local, Breeds, Conservation, Animal Production*

This article was written by E. Zanetti, et al., faculty associated with the Department of Animal Science, University of Padova, in Italy. Their research focuses on identifying chicken genetic variation of local Italian chickens breeds. There were 337 local, village chickens that underwent genetic testing, including a commercial brown layer cross breed for reference. Specifically, the five local breeds were: Ermellinata di Rovigo, Pèpoi, Robusta Lionata, Robusta Maculata, and Padovana, and are part of the “Conservazione e Valorizzazione delle Razze Avicole Venete,” an in situ marker-assisted conservation program. Genetic diversity was analyzed within and between the chicken populations.

The aim of the study was to analyze, “Genetic diversity, genetic relationships, population structure, and molecular ancestry in the Italian local chicken breeds undergoing in situ conservation using microsatellite markers.” Blood samples were taken from each chicken and genetic information was compared in a variety of graphs and charts. The genetic variability of each breed was studied in terms of average number of alleles and molecular coancestry. All breeds showed considerable genetic differentiation. The author’s results showed a high level of genetic diversity among the local chicken breeds with all tests. Breeds were distinct, with no mixture, and homogeneous. One exception found in the study would be the more complicated population structure of the Padovana breed. The authors recommended sampling for molecular analysis combined with monitoring of chicken productivity, as both are important. Conservation of local Italian breeds is justified and recommended.

Key Terms: Biodiversity, Breeds, Cluster, Local, Poultry

The author of this thesis is Dr. Maria de Lourdes Zaragoza Martinez from the Colegio de Postgraduados in Puebla, Mexico and the research presented was conducted in the indigenous communities of the Chiapas State, Mexico. The species studied are the local hens, called “batsi me’alak” in the tsotsil language, and provide the services of egg and meat production, animal and by-product sale income, and traditional medicine. This gives the species a socio-cultural, biological and economic value based on the traditional medicine processes that the indigenous population from the region engages in, the rustic qualities employed to perform production in adverse environments, and the genetic variability within the flock.

With this study the author aims to provide an analysis and characterization to the production system as well as to obtain the phenotypic characteristics and zoometry of the local hens. This goal will be achieved by addressing individual aspects of the previous such as identifying the socio-cultural and phenotypic importance of the hens as well as by describing thoroughly the local hen production system and designing management, conservation and hen-use strategies as a genetic local resource. To obtain sound data to respond to the prior, research was conducted in three-intentional sampling method selected- municipalities from Los Altos Tsotsil-Tseltal of Chiapas: 1) Larraínzar, 2) Chamula, and 3) San Cristobal de Las Casas. Data was obtained through both qualitative and quantitative methods like formal and informal surveys, visual evaluation of the hens, talks with producers, and statistical programs (PASW Statistics).

The author concludes that agricultural production in this indigenous group is a collection of local knowledge, beliefs and customs that are consistent within one another, and that animals are not only a source of food, but a component of socially-cultural practices. This being the contrary to developed countries where rearing hens is a hobby and opens a door for in vivo conservation. Continuity of the characteristics within the hens is at risk due to the genetic depletion that results from specialized breed introductions, leading to the development of management and conservation programs/projects for genetic animal resources. And that these programs to be
developed should be designed with the women in mind as they are the ones who will be implementing them, thus helping in animal production and time management between family, community and work.

*Key Terms: Livestock Systems, Local, Breeds*

Zekic et al., of the University of Novi Sad in Serbia, conducted a study and produced a scientific research paper on indigenous pigs in Serbia. This article does not represent a particular value chain, but simply displays the importance of conservation, along with the costs and benefits of conserving the Mangalitsa indigenous breed. The authors explain the history of Mangalitsa and how it came about through crossbreeding previous indigenous breeds, which are now extinct. It is argued that added value to the Mangalitsa through geographical indication and producing high-quality hams and other products.

The authors wanted to collect data that not only compares the two, but also to support their reasoning for conserving the Mangalitsa breed through marketing its products with geographical indicators. This study took place on farms where Mangalitsa and Yorkshire pigs were produced between 2009 and 2012, and compared Yorkshire and Mangalitsa pigs and their differences in litter sizes, costs, growth to food conversion, among others.

This article concluded that, depending on the case, it is not always economical to breed and conserve Mangalitsa pigs; however, in certain conditions, such as free grazing and extensive housing conditions, tend to be more favorable for these breeds and produced better results. Also, their high quality meat and geographical indications may easily produce economic benefits.

*Key Terms: Breeds, Indigenous, Geographical Indicators*