

Environmentally Sound Improvement of Livestock Management

The majority of small farms maintain animals. Excepting a few of the developing countries, 85 percent or more of the ruminants (buffaloes, cattle, goats, sheep) and even higher proportions of the donkeys and horses are on small farms.

Animals play both economic and non-economic roles in small-farm systems. Economic returns are derived from meat, milk, eggs, manure, traction, transport, investment, insurance, fuel, by-products, skins, and hides. The proportion of income derived from livestock can be substantial, and of existential importance in the off-season period, a fact too often overlooked

In addition to numerous economic uses of livestock in small-farm systems, animals are an element in complex cultural patterns. Animals are a source of identity and prestige for the families and a means of forming social ties through gifts and exchange with others. Another non-economic return characteristic of many animals is companionship.

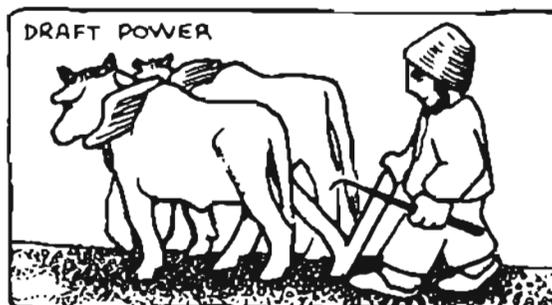
Integration of crop and animal enterprises can increase the total productivity of the small-farm resources and improve welfare; e.g., about 60 percent of the digestible protein and 64 percent of the total digestible non-protein nitrogen nutrients produced would have little value if they were not passed through animals. Animals can graze on land that is unsuitable for cultivation or of little agricultural value. They can eat surplus human foods that would otherwise spoil and can provide a reserve food and (or) cash supply. Furthermore, such integration is important in ensuring sustained productivity and stability in most ecosystems (Rockefeller Foundation 1980).

In this article, which is a compilation of parts of the book 'Environmentally Sound Small Scale Livestock Project' by Linda Jacobs, guidelines are given on how livestock management could be improved in an environmentally sound way.

Trends in livestock management

Many options are available for improving livestock management.

- The availability of feed can be increased by improving the productivity of grazing lands or by using waste products from other agricultural activities.
- breeding practices can be improved or new types or breeds of animals can be introduced.
- water sources can be developed.



- supplemental feeds can be added.
- new uses for animal power can be found.

disease can be reduced. Because of the diversity of agro-ecosystems, livestock improvement methodology varies widely. New information and new ideas for livestock management will develop from a renewed awareness and appreciation of natural systems. Successful application of these ideas to livestock systems will depend largely on local conditions.

- Currently, farming systems involving agroforestry are receiving wide attention. An agroforestry system might consist of a variety of trees and shrubs simulating the original vegetative cover.

Alternatively, the trees and shrubs might be used as borders, windbreaks or fences around pastures and annually cultivated fields. The trees might be intercropped with other crops such as grains or fodder. The trees are selected for their yield of food and non-food products, such as fruit, nuts, fibers, animal forage, and fuel. Animals can harvest the food directly from the trees, or the tree clippings and fruit can be brought to the animals in adjacent pastures or lots.

- Wild or semi-domesticated animals also are being considered as potential members of a farming system. Recent research indicates that native wild species often use local plants more efficiently with less negative environmental impact than do domestic animals. The cropping of wild animals by hunting can be more productive than cattle ranching: for example, the eland in Africa and the capybara, a large rodent in South America, are species that have been considered for inclusion in a gamefarming system.

Some researchers claim that, in Africa, after man cleared, fenced, plowed, seeded pasture and introduced cattle, total meat production fell to 1/60th of the natural level. The reason, they say, is that local animals, by their varied food needs and other habits, were more adapted to the local environment.

- Domestic animals of local origin also may be better suited to their environment than animals that might be introduced from other regions. For example, a recent experiment in Ecuador showed that the guinea pig, a long-domesticated animal of the Andean region, was more profitable to raise than swine or dairy cattle. Yet, in the past, planners in this region had often considered the introduction of rabbits or chickens, rather than concentrating upon improvement of guinea pig production.

Choosing livestock that fit into the environment

The development of a new farming system or the improvement of an existing system should be based on identified community needs. Because many breeds and types of animals are now domesticated, it is usually possible to find one that is adapted to the local environment, available at reasonable cost, and socially acceptable. Thus, the planner seeks to identify livestock with food, water, and labour requirements that fit the local environment. Livestock that can be easily controlled and are within the financial reach of participants can best serve the needs of the community.

Improved livestock production should take advantage of local animals and local situations. Objective study of a specific



CROP AND TREE WASTES FED TO LIVESTOCK

environment can be more rewarding than taking the ideas of another location and (or) another culture and trying to force them to work.

Often, the value of local breeding stock and its adaptation to local environmental conditions is underestimated. They may be resistant to local diseases, have developed ways of coping with droughts or extreme heat, or may have unusual characteristics that are of value to local people. In contrast, a new breed of cattle may adjust poorly to environmental stresses, or may not have the type of hump on its neck that fits the local draft harness.

Feed management

Animals may range for their own food or have their food brought to them. When grazing, given abundant and varied forage, animals are able to select the food they need. If fencing of pastures is feasible, the daily work of herding can be reduced.

Where herding or fenced pastures are not satisfactory, animals can be kept in pens and will have their food brought to them. Such a management system, called 'zero grazing', has proved to be economically rewarding for dairy farmers close to markets. The manager of a confinement system can make use of crop wastes that could not be grazed, can reduce fencing needs, and can gather manure more easily. In addition, the farmer can locate animals close to crops to ease feeding and fertilizing chores. Legumes are excellent feeds for ruminants and often are used in swine and poultry rations as a protein source. Certain legumes, such as peas and beans, are suitable human foods, and their vines can provide feed for livestock, while the roots improve the soil.

Shrubs and trees can also provide food for livestock. The leaves and fruit of woody plants are especially important food sources during the dry season when other plants are dormant.

Crop residues that may be fed to livestock include cereal grain, straw, sugarcane stalks, and excess garden produce. Most of these are considered as roughage, because they are low in protein and usually high in fiber. They will maintain mature animals, but usually are not adequate as the only feed for growing or working animals. Such

feeds should be supplemented with foods rich in carbohydrates, protein, and phosphorus.

To keep costs low, the livestock manager should use locally available supplemental feeds. In addition to the feeds with high nutritive content mentioned above, other possibilities include dried citrus pulp, dried seaweed, and the by-products of sugar manufacture.

Some problems are the result of mineral deficiencies in feed. In Colombia, 50% or more of cattle loss in the plains region may be due to mineral deficiencies.

Range management

Ranges include a wide variety of habitats, such as desert shrub, savannas, and woodlands. These various habitats are the result of differing amounts of rainfall and other weather and soil factors. In extensive rangelands, mechanical ways of managing forage are less practical. Therefore, when livestock managers study rangelands ecosystems, they must concentrate more on environmental interactions to find ways to manage forage.

Where rainfall supports the growth of shrubs and trees, grasslands can be developed by removing the forest canopy and planting grasses. Because shrubs and trees will quickly re-invade these man-made grasslands, management must focus on the prevention of shrub and tree regrowth. If brush removal is difficult in such areas, animals that can make use of browse are often included in the livestock system. But planners in areas endangered by desertification should focus on practices that:

- Increase the amount of plants and plant residues left each grazing season;
- Increase soil moisture levels;
- Encourage preservation of brush and tree species.

Animal Health care

Animal health can be closely related to community health. Because many animal diseases also can infect human populations, the community attitude towards care of animals will have a direct effect on the total health of the community.

Disease can be caused by internal problems, such as faulty body processes, genetic defects, or aging. It can also be

caused by environmental factors, such as scarcity of food, lack of specific nutrients, parasites, stress, and (or) accidents. Management of animal and environmental interactions to avoid disease is stressed here.

To maintain or restore health in an animal, disease processes must be understood. Knowledge of the life cycles of disease-causing organisms such as bacteria, viruses, and various internal and external parasites may help to prevent or reduce their contact with healthy livestock.

Different animal species may vary in their tolerance to a disease. Animal breeders take advantage of this fact in selecting for disease resistance and developing strains within a breed that are resistant to a specific disease. Local animals that are resistant to disease also might be used in such breeding programs.

As breeding programs select for specific characteristics, the genetic variation between different animals in the population may be reduced. Such lack of genetic variability might reduce the genetic resistance to new diseases that might invade the population. When resistant strains are limited, the possibility of a major epidemic is increased: thus sound breeding programs maintain some measure of genetic variability.

The breeding program

We have discussed how the genetic make-up of an animal population may have a direct effect on herd health. In many countries, regional breeds can be found that are adapted to the local climate, disease problems and livestock management practices. These breeds often have traits that should be preserved, such as hardiness, longevity, feed utilization efficiency and (or) desirable reproductive characteristics. Breeding stock that has shown outstanding production in a temperate zone may give disappointing results in the tropics. Temperature extremes can cause stress, resulting in lower productivity. Breeds developed for dairying and the intensive beef industry are not necessarily the best animals for other types of farming systems. For example, small farmers may be more satisfied with an animal that is able to produce without costly supplemental feeding, rather than one that produces milk in large volume.

The goals of an effective breeding program should reflect the total management program and the local environment. Appropriate emphasis needs to be placed on reproductive ability, climatic tolerance, longevity, feed efficiency, growth rate, individual disease resistance, and overall production. The program will seek to eliminate defects such as infertility and structural unsoundness.

Management objectives that can be expected to improve the breeding program include improving the nutritional status of the animals, decreasing losses from disease, and culling unproductive animals. With these improvements, animal fertility will increase and newborn animals will have a

greater chance of surviving.

The treatment an animal receives is in part a reflection of the cultural influences on those who take care of the animal. A system that goes against local beliefs may be unacceptable to that community.

Agricultural systems: putting it all together

Effective livestock management systems must be integrated into the total agricultural and social system.

A major consideration in the integration of livestock into the farming system is the availability of labour. In many small farm systems, labour is scarce during certain seasons. An animal project that competes for labour during this time has little chance of success. In addition, livestock production may demand greater management skills for a reasonable return on money, labour, and land investment. New skills may have to be learned.

Improvements in one part of the system may cause a problem in another part. For example, rice straw from some of the new varieties of rice have lower nutritive value. Animals fed this straw will need additional supplementary feeding. Some new maize varieties have tougher stalks to resist corn borers. These varieties are shorter and therefore produce less fodder. The stalks also have a higher content of lignin, a substance that adds stiffness and rigidity to cell walls making them less digestible by animals.

Community participation

When community members participate in all phases of development interventions, planning, execution, and evaluation, they will be more committed to it and have a sense of ownership. Arousing and maintaining community participation is a challenging task. It is not difficult to communicate with one or two leaders or a small group. However, involving the whole community and helping them to realize what can be achieved is more difficult. Planners and community members may not always agree on the priority needs of a community. Each is looking at the problem from his own point of view. If planners begin a project that addresses needs that are not identified by the community, there will be insufficient support from the community. With the participation of local people, planners can learn which issues are critical in the eyes of the community.

Traditional practices

James De Vries, in *The Heifer Project Exchange*, (Newsletter of Heifer Project International) argues that 'Experts now seem to agree that sustainable agriculture must start from a serious look at traditional practices.' Traditional practices were developed by trial and error in the context of the natural ecosystem. For example, traditional grazing systems allowed forage to regrow and to be conserved for the dry season. Traditional systems of lending animals reduced immediate pressure on the land. 'Many of these practices,' De Vries

continues, 'are no longer suitable because of changing population, land pressure and political forces. However, it is often possible to modify or build on them. They have the advantages of having been proven over perhaps hundreds of years.'

Livestock management adapting traditional methods and working in concert with the natural ecosystem will not only be more likely to be successful, it may also enhance and improve the life support systems on which it depends and contribute to a sustainable agricultural system.

The book '**Environmentally Sound Small-Scale Livestock projects**' by Linda Jacobs, 1987, 149p., is a publication of CODEL, Heifer Project International, Winrock International and VITA. It can be ordered from VITA, 1815 N. Lynn Street, Suite 200, Arlington, Virginia 22209. Price including airmail postage \$13.00.

CODEL INC., Environment & Development Program, provides information and training for NGO field staff on related environment and development issues. Address: 475 Riverside Drive, Room 1842, New York, NY 10115 USA.

Heifer Project International is an organization whose purpose is to assist NGO's and community groups with resources and technical assistance for improved livestock management. Address: P.O. Box 808, Little Rock, Arkansas 72203 USA.

Winrock International Institute for Agricultural Development provides technical assistance and training in livestock management based on extensive research. Address: Route 3, Morrilton, Arkansas 72110 USA.

Some sources on livestock management:

- Aaker, J. & A. Schmidt, 1981, *Evaluation Manual for Livestock Projects*, Heifer Project International.
- AIRD, 1979, *Mulberry Cultivation and Silk Worm Rearing*, 42 p., Asian Institute for Rural Development, 7-A, Ratnavilasa Road, Basavanagudi, Bangalore 560 004, India.
- Albrecht, W.A., 1975, *The Albrecht Papers*, Vol. II, Soil Fertility and Animal Health, 192 p., ISBN 0-911311-07-6, Acres, Box 9547, Kansas City, Missouri 64133, USA.
- Alexandra, J., *Trees as animal feed*. In: Lindegger, M.O. and R. Tap, 1986, *The best of Permaculture*, a collection. Nascimantere, 56 Isabella Avenue, Nambour Qld. 4560, Australia.
- Appropriate Technology, 1986, *A livelihood from livestock*. A special issue from *Appropriate Technology*, Vol 13, No 1, IT Publications Ltd, 9 King Street, London WC2E 8HW, United Kingdom.
- Attfield, H.D., 1977, *Raising Rabbits*, 79 p., VITA Publications Service, 3706 Rhode Island Ave. Mt. Rainier, Maryland 20822, USA.
- Auvvalle, A., Guazeli, M.A. & Pinheiro, S., 1985, *Agropecuaria sem Veneno*, 128 pp., ISBN 85-254-0018-1, L&PM Editores Ltda., Rua Nova Jorque 306, 90.000 Porin Alegre, Rio Grande do Sul, Brazil.
- BOSTID, 1983, *Little-Known Asian Animals With a Promising Economic Future*, 131 p. National Academy Press. Can be ordered from BOSTID (JH-217D), National Research Council, 2101 Constitution Avenue, Washington, D C 20418, USA.
- BOSTID, 1981, *The Water Buffalo. New Prospects for an underutilized animal*, 116 p., National Academy Press.
- BOSTID, 1983, *Butterfly Farming in Papua New Guinea*, 34 p., National Academy Press.
- BOSTID, 1983, *Crocodiles as a Resource for the*

Tropics, 60 p., National Academy Press.

- Breman, H. & N. Traor (ed), 1986, *Analyses des conditions de l'élevage et propositions de politiques et de programmes*. Rp. du Niger; Rp. du Burkina Faso; Rp. du Mali. Étude préparée pour les Secrétariats du Club du Sahel et du CILSS, C'ABC Wageningen, The Netherlands. Institut du Sahel, B.P. 1530, Bamako, Rp. du Mali.

- C.T.A., 1987, *Proceedings of workshops Smallholder Livestock Development* (held in Western Samoa, 1985) and *Small Ruminants Development in Africa* (Montpellier, France, 1986).

- C.T.A., 1987b, *Primary Animal Health Care in Africa*, Synopsis of a seminar held at Blantyre, Malawi, 1985, 28 pp. C.T.A., P.O. Box 380, 6700 AJ Wageningen, The Netherlands.

- Dayrit, R.E.S., 1979, *Swine Raising. The peoples' school training manuals*. International Institute of Rural Reconstruction (IIRR), Silang, Cavite, Philippines 2720.

- Devendra, C. (Ed.), 1986, *Small Ruminant Production Systems in South and Southeast Asia*. Proceedings of a workshop held in Bogor, Indonesia. 414 p., IDRC P.O. Box 8500, Ottawa Ont., Canada K1G 3H9.

- DSA-CIRAD, 1986, *Relations Agriculture -Elevage No 2. Les Cahiers de la Recherche Développement No 9 - 10*, 144 p., DSA-CIRAD, B.P. 5035, 34032 Montpellier Cedex, France.

- Harwood, R.R., 1979, *Small Farm Development, Understanding and Improving Farming Systems in the Humid Tropics*, 160 p. ISBN: 0-89158-699-7, Westview Press Inc. 5500 Central Avenue, Boulder, Colorado 80301, USA.

- Hatcher, G., 1984, *A Planning Guide for Small Scale Livestock Projects*, 80 p., Heifer Project International.

- Heifer Project International, 1987, *Roundtable 'Goats for the Small Farmer - The Introduction of Goats as a Strategy for Development'*, IV Intern. Conf. on Goats, Brasilia, Brazil, 42 p.

- Juma, C., 1987, *Ecological Complexity and Agricultural Innovation: The use of indigenous genetic resources in Bungoma, Kenya*. Public Law Institute, P.O. Box 69313, Nairobi, Kenya.

- Kesi, N., 1987, *Termite consumption offers protein source plus pest control*. In: CERES 20 (1987), No. 115, p. 12, FAO, Rome, Italy.

- Mathen, K., 1984, *Convention on Cattle and cattle breeds*. D-1, Aurobindo Society, Mridul Citadel 1, Near Vastrapur Talavdi, Ahmedabad 38015, India.

- Ministry of Foreign Affairs/DGIS, 1987, *Ervaringen van Ontwikkelingssamenwerking op het gebied van Rundveehoudery opgedaan in de periode 1978-1984*, Samenlevend rapport. P.O. Box 20061, 2500 EB Den Haag, The Netherlands.

- Munzinger P., 1982, *Animal Traction in Africa* (ISBN 3-88085-133-6, GTZ, Dag-Hammarskjold-Weg 1, D-62136 Eschborn, West Germany).

- PPST-Bulletin, 1984, *Proceedings of the Organic Farming Convention*, March 1984, Sevagram, Wardha, India. c/o R. Vijayalakshmi, 17 South Mada, St. Triplicana, Madras, 600 005, India.

- Rockefeller Foundation, 1980, *Working Papers Conference on Integrated Crop and Animal Production*, New York, Rockefeller Foundation.

- Simpson, J.R. and P. Evangelou (eds.), 1984, *Livestock Development in Sub-Saharan Africa: Constraints, Prospects, Policy*. Boulder, Colorado: Westview Press, USA.

- Smith, J.R., 1950, *Tree Crops, a more permanent agriculture*. Devin Adair Publishers, USA.

- Spaulding, C.E., 1976, *A Veterinary Guide for Animal Owners*, 420 pp., ISBN 0-87857-118-3, Rodale Press Inc., Emmaus, PA 18049, U.S.A.

- Spore, 1987, *A Taste for the Wild*, Spore No. 10: 1-3, CTA, P.O. Box 380, 6700 AJ Wageningen, The Netherlands.

- Torres, F., 1983, *Role of Woody Perennials in Animal Agroforestry*. ICRAF, P.O. Box 30677, Nairobi, Kenya. Agroforestry Systems Vol 1, No 2: 131-163. Martinus Nyhoff Publishers. P.O. Box 163, 3300 AD Dordrecht, The Netherlands.

- Wiersum, K.F., 1985, *Trees in agriculture and livestock development*, Netherlands Journal of Agricultural Science 33: 105-114.

- Winrock International, 1983, *Sheep and Goats in Developing Countries, Their Present and Potential Role*, 116 p., World Bank Publications, P.O. Box 37525, Washington, D.C 20013, USA.