Sustainable management and utilization of forage resources

**IN THE PAST, WORLD PRODUCTION OF RUMINANT MEAT AND MILK** has increased considerably, a trend attributed to the increasing demand for livestock products particularly in developing countries. Most of this production increase has been achieved through mixed and landless (intensive) production systems that rely on a combination of concentrates and roughage consisting of such feed resources as forage/fodder crops, crop residues, and other sources of feedstuff.

In Asia, ruminant production provides livelihood to a large number of small-scale livestock farmers. With forage crops being the most vital feed resource in any ruminant production system, practical and appropriate technologies in managing and utilizing forage-based feed resources are the key to sustainable ruminant production, as well as in enabling Asian small-scale farmers to cope and survive given the trend toward intensive production systems.

**Forum on forage-based feed resources**

FFTC, together with the Indonesian Research Institute for Animal Production (IRIAP) and the Livestock Research Institute, Council of Agriculture (LRI, COA) of Taiwan ROC, joined forces to organize the international seminar on Sustainable Management and Utilization of Forage-based Feed Resources for Small-scale Livestock Farmers in Asia. Held in Lembang, Indonesia on 03-07 August 2009, the seminar primarily aimed to collect promising and practical technologies for the sustainable and improved production of ruminants by small-scale livestock farmers in Asia, by addressing major issues related to forage-based feed resources.

In particular, the seminar sought to come up with an integrated technology package covering: sustainable and safe forage crop production, as well as the identification of promising forage grasses indigenously available and/or introduced from other countries; on-site detection of nutrient composition of forage crops and other techniques for efficient nutrient management; and improved and innovative utilization and processing techniques for forage-based feed resources to mitigate the scarcity during the dry season and ensure the availability of forage resources year-round. The seminar was attended by 12 resource and country paper presenters from Indonesia, Japan, Korea, Malaysia, Taiwan ROC, Thailand and Vietnam, and about 60 local participants and observers.

**Sustainable management of forage-based feed resources**

Improved forage crop production is important in ensuring the availability of cost- and nutrition-efficient forage-based feed resources for sustainable ruminant production by small-scale livestock farmers. The most promising forage grasses in the sub-tropics are Napier grass, Pangola grass, and Nile grass. The agricultural traits of these grasses have been considerably improved through years of breeding, leading to the successful development of new improved varieties. While these promising grasses have been mainly developed for ruminant animals in the sub-tropics, they also hold great promise in terms of efficient production of high quality feed in tropical Asia.

Technologies for improving the nutritive values, digestibility and formulation of total mixed rations (TMR) using forage-based resources are also critical in ruminant production. In Taiwan, the Near Infra Red Spectrum (NIRS) method was successfully applied for on-site determination of nutrient compositions of both Pangola grass and Napier grass. This success leads to the easy preparation of the best TMR for ruminant animals. Since the quality of forage is greatly affected by several factors such as grass variety, soil, cultural practices, climate and so on, on-site forage testing is indispensable for the preparation of the best total mixed ration.

Another major concern in ruminant production especially among small-scale Asian farmers is how to mitigate the scarcity of forage crops during the dry season and store the available biomass to meet the feed requirements during lean periods. This can be done by processing the abundant forage resources during the wet
season in the form of leaf meals, pelleted processed rations, or forage-based total mixed rations. Hence, it is important to share and exchange practical processing technologies to produce nutrient efficient forage-based TMRs (processed forage or fodder combined with nutrient concentrates in different forms such as compressed or pelleted); efficient storage of forage resources for the dry season; and composition of forage-based feeds that can supply balanced daily required nutrients and additional micro-nutrients to ruminant animals.

Due to the increasing demand among consumers for safe and sustainable forms of livestock production systems, the issue on the use of agrochemicals in forage crop production has also become a major concern. One approach to address this is the promotion of organic forage production for safe and value-added dairy and meat products under a sustainable soil management system.

**Forage production and utilization in Asia**

Based on the paper presentations, one major barrier in small-scale dairy production is the limitation in both quantity and quality of forage supply for dairy cattle. Forages such as grasses still dominate as feeds in many countries in Asia. Small-scale farmers with low livestock ownership, such as those in Indonesia, make use of native and introduced grasses as their main feed source. Meanwhile, whole crop rice (WCR) silage and whole crop barley silage are used in some developed countries such as Japan and Korea. WCR in Japan has given farmers extra source of income since production is subsidized. However, the cost efficiency of WCR silage must be analyzed without considering the subsidy.

Agricultural wastes such as rice straw and corn stover may have great potential for animal feeds. However, further pre-treatment technology to improve their nutritive value still needs to be developed and should be made suitable for small-scale farm holders. The use of the NIRS method as a tool for quick forage analysis with high accuracy holds great promise for most countries, but the price of the apparatus is very prohibitive.

The impact of livestock production to the buildup of greenhouse gases causing global warming has been identified and more attention should be given for its mitigation. The potential use of forages with cellulose and hemi-cellulose materials as sources of renewable energy was also discussed, but its threat to the total production of grasses for animals was emphasized.

**Prospects and recommendations**

Various kinds of forages are available in such countries as Indonesia, Malaysia and Vietnam which can be used by small-scale dairy cattle farmers. However, an efficient and sustainable production system for these forages must be developed to ensure quality and quantity of forage supply. Proper management of communal land for forage production should also be practiced.

Crop-livestock integration such as integration of oil plantation with ruminant production is a potential system to improve the livestock industry. The use of green grasses and legumes as animal feeds is also recommended.

Training courses and demonstration farms are not sufficient enough in transferring forage technology to small-scale dairy farmers. Government intervention is necessary to overcome some of the limiting factors affecting the adoption of new forage technology in many Asian countries.

Other recommendations drawn during the seminar include: exchange of expertise among participating countries in terms of forage production and management in support of small-scale farm holders; transfer of practical and advanced technologies to farmers for a more efficient management of the farming business; development of a forage-based farming system; and development of a handbook on practical and cost-effective technologies on utilizing forage resources for small-scale farmers.
International Seminar on Sustainable Management and Utilization of Forage-Based Feed Resources for Small-Scale Livestock Farmers in the ASPAC Region

Held in Bandung, Indonesia, 03-07 August 2009
No. of participating countries: 7 (Indonesia, Japan, Korea, Malaysia, Taiwan ROC, Thailand, Vietnam)
No. of papers presented: 12
No. of participants: 12 resource and country paper presenters and about 60 local participants/observers
Co-sponsors: Indonesian Research Institute for Animal Production (IRIAP); Livestock Research Institute (LRI), COA, Taiwan ROC

List of papers
1. Utilization of forage-based feed resources for biofuel production
   - Maurice S. B. Ku, National Chiayi University, Taiwan ROC
2. Production and utilization of whole crop rice silage as cattle feed in Japan
   - Motohiko Ishida, Ishikawa Prefectural University, Japan
3. Production and utilization of whole crop barley and whole crop rice in paddy field
   - Min Woong Jung, National Institute of Animal Science (NIAS), RDA, Korea
4. Nutritive value of mulberry leaves (Morus alba) and effects of partial replacement of cotton seed in rations on the performance of growing Vietnamese cattle
   - C.C. Vu, National Institute of Animal Sciences, Hanoi, Vietnam
5. Forage-based systems for sustainable animal production
   - Sharif bin Haron, Malaysian Agricultural Research and Development Institute
6. Modeling the changes in forage quality and the application of near-infrared spectroscopy on forage analysis
   - Chia-Sheng Chen, Hengchun Branch Station, Livestock Research Institute, Taiwan ROC; and Jih-Tay Hsu, National Taiwan University, Taiwan ROC
7. Availability and utilization of forage resources for small-scale farm in Indonesia
   - Bambang Risdiono, Indonesian Research Institute for Animal Production
8. An approach on pasture-based dairy production for small-scale farmers in Thailand
   - Somkiert Prasanpanich, Kasetsart University, Thailand
9. Utilization of forages, tree fodders, crop residues and agro-industrial by-products for ruminants in Malaysia
   - Wan Zahari Bin Mohamed, Malaysian Agricultural Research and Development Institute (MARDI)
10. Green forage and roughage sources for feeding ruminants in Vietnam: characteristics, prospects and research and development strategy
    - Nguyen Thi Mui and Vu Chi Cuong, Dr. Nguyen Thi Mui, National Institute of Animal Husbandry (NIAH), Vietnam
11. Forage management and utilization in Taiwan
    - Jeng-Bin Lin, Livestock Research Institute, Taiwan ROC; and Jih-Tay Hsu, National Taiwan University, Taiwan ROC
12. The dynamics of native grass resources in dryland area of Indonesia to support beef cattle production: case study of Nusa Tenggara
    - Abdullah Bamualim, Indonesian Center for Animal Research and Development

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