**Dryland Pasture, Forage & Range Network News**

*An informal vehicle for communication*

*ISSUE NO. 15* *JULY 1998*

# *Setting Livestock Research Priorities for Central and West Asia, and North Africa*

***Livestock are crucial to the farming economy of many of the Central and West Asian, and North African countries. National Agricultural Research Systems (NARS) and International Agricultural Research Centers are joining hands (see page 15).***

***Photo: This 2.5-m high statue at Karakul Sheep Research Institute in Samarkand depicts the Karakul sheep, long the mainstay of pastoralists in Central Asia. It represents a proud past–and prosperous future.***

*Dryland Pasture, Forage & Range Network News* is published semi-annually by the International Center for Agricultural Research in the Dry Areas (ICARDA), and co-sponsored by the International Plant Genetic Resources Institute (IPGRI) Central and West Asia and North Africa Regional Office, the Food and Agriculture Organization (FAO) of the United Nations Near East Regional Office, the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), the Centre for Legumes in Mediterranean Agriculture (CLIMA/Australia), the Small Ruminant Collaborative Research Support Program, USAID (SR-CRSP/USA), and the International Development and Research Centre (IDRC/Canada).

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# EDITORIAL

## Livestock Research: A future Challenge

We have entered a significant period for global and regional livestock research. In July 1997 a conference in Holland was the culmination of a multi-donor study aimed at emphasizing the positive roles that livestock can have on the environment. The two centers in the Consultative Group for International Agricultural Research (CGIAR) with livestock research, ILRI and ICARDA, have both expanded their research domains. Since 1995 ILRI has had the global mandate for livestock research, whereas ICARDA's 1998-2000 Medium-Term Plan extends its research on small ruminants to the dry areas, including parts of Central and Southern America, Southern Africa and Central Asia.

Two significant events concerning livestock took place in WANA in 1997. In the first, ICARDA hosted with FAO a regional workshop in Aleppo on the *Initiating Group for the Implementation of Animal Genetic Resources Management for the Near East*. Once the regional mechanism has been established, the next step will be to develop a regional program to document and characterize the livestock breeds of WANA.

The second significant event was the IFAD-sponsored consultation with ILRI on 'Setting Livestock Research Priorities in WANA', held in Aleppo in November 1997. It attracted representatives from 20 countries in WANA, from three countries in Central Asia, and from donors and regional and international organizations. The representatives spent a substantial amount of time identifying and prioritizing livestock research areas for WANA. These are presented later in this issue.

One theme that receives high priority in the ICARDA MTP is research on ways to accelerate the rate of adoption of technologies that enhance the productivity of small ruminants. This has generally been very low to the extent that with the exception of certain high input systems found in the richer countries of WANA, the gap between what farmers are practicing and what scientists' know about livestock continues to widen. Indeed, the opinion is increasingly heard that a disproportionate amount of scarce research funds are being used for basic research that will contribute little to accelerating the adoption of new technologies to improve rural incomes. Even though one may not totally agree with this opinion, we should take account of the point being made.

Animal scientists can now face the enormous challenges of the 20$^{th}$ century feeling that the global community is better informed about the role of livestock in environmental issues and that the CGIAR is fully supportive of research on livestock. But we should not become complacent. Much remains to be accomplished in a short time and solutions found for emerging problems. Higher living standards result in changing human lifestyles and livestock products will be blamed for the diseases associated with a sedentary lifestyle. Exotic breeds are displacing indigenous ones, leading to a gradual erosion of animal biodiversity. As more intensive production systems emerge, environmentally friendly waste disposal systems will have to be installed as the outset. And the heavy dependence of intensive systems on cereal grains will continue to be a point of contention. ICARDA, in collaboration with its sister center ILRI, national programs and advanced research institutes, is now poised to address many of these challenges. It is also ready to take its place in the efforts to promote productive but sustainable small ruminant production systems in dry areas, particularly in WANA and Central Asia, but also in other dry areas as well.

Euan F. Thomson
Principal Livestock Systems Scientist
ICARDA

Editors note: Dr Euan F. Thomson has now left ICARDA to return to Edinburgh after working for over 18 years in the WANA region. He says that this is partial rather than full retirement since he wishes to remain involved in livestock systems research for many years to come.

# CENTRAL AND EASTERN ASIA

## Livestock Trends in Kazakstan and Turkmenistan

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The new Republics of Central Asia, formerly USSR, contain vast steppes and deserts used for centuries by pastoralists migrating over long distances to avoid extreme winter cold and seeking seasonal pastures. The pastoralists were collectivized in the Soviet era and production was intensified with the supply of cultivated fodder and other inputs, while new breeds - mainly wool sheep - were introduced to meet Soviet demands. A major effect of constraining livestock movement was overuse of some rangelands (Kerven et al. 1996).

Current policies on privatization have dismantled collectives and greatly reduced the state's role in production and marketing. Research is being carried out in two Central Asian countries, Kazakstan and Turkmenistan, on the social, economic and biological effects of privatization on livestock and rangeland management.

### *Grazing and fodder management*

In Kazakstan, access to pasture land is now undetermined in practice. The new agricultural entities and private farmers may hold pasture land only in "permanent use", with the state retaining ultimate rights. Although land share certificates have been issued, the physical demarcation of such land has not necessarily been carried out and pastoralists experience few restrictions on where they can graze their animals on the open range (see also Robinson 1997). This open-access situation may be temporary, however, as it is likely that regional administrations will soon divide up pasture land to individual entities.

Grazing in the semi-arid plains of southern Kazakstan (precipitation of 100-250mm/year) has always been based on seasonal mobility, from pre-Soviet times (Khazanov 1984; Olcott 1987). Large-scale agricultural entities still follow a four-season migration system in southeastern Kazakstan. Livestock, mainly fine-wooled sheep, are managed in winter by shepherds in remote quarters located in the sandy dune areas of the northern desert. Here the animals are given supplementary feed in barns and grazed largely on Artemisia in the open whenever weather permits. In spring (March), animals are moved further south to semi-desert steppe, to graze mainly on ephemerals, where lambing and shearing takes place. By June, animals are taken for the summer up to mountain meadows (annual precipitation of 600 mm), where shepherd families will live in yurts (felt-covered tents). In autumn, shepherds take the animals to different areas in the semi-desert steppe, and animals are culled for the market. By the time the first heavy snow falls, animals are taken back to the northern winter pastures. The total length of the migration route is between 200 to 300 km.

Most Kazak pastoralists consider the system of seasonal migration ideal for animal nutrition, but many newly-privatized shepherds cannot migrate because they lack family labor and transport, while their flocks are not big enough to generate an income sufficient to pay for hired shepherds or rented transport. Only those private farmers with fairly large numbers of animals still move their animals seasonally, sometimes hiring shepherds rather than moving themselves. The remainder of private farmers graze their animals year-round within a 2-10 km radius from their permanent home. This sedentary form of livestock management has caused pasture degradation, with a loss of favorable plant species and reduction of plant cover, leading to soil erosion in the vicinity of settlements and waterpoints (Alimaev et al. 1986; Asanov et al. 1992).

Kazak pastoralists in pre-Soviet times were never solely reliant on natural pastures, but cut or grew fodder for the severely cold winter season (Olcott 1987). Under Soviet collectivization, large areas of fodder crops (barley, wheat, lucerne and maize) were grown usually with irrigation, and fed to animals for several months over winter. Cultivated and natural hay was also cut mechanically. Such intensification brought increases in output and livestock numbers (Gilmanov 1995), but can no longer be sustained under present privatized conditions when all fodder must be obtained through the market.

Grazing systems in the Karakum desert of Turkmenistan are also mobile, but due to less extreme seasonal temperature and spatial rainfall variability, do not involve long-distance movements between winter and summer pastures as in Kazakstan. Sheep and camels are grazed from 10 to 20 km. away from settlements by male shepherds on a fortnightly rotation, in winter, spring and summer, moving every 10 or 15 days from one pasture area to another. In autumn, all but the lambs are taken to a northern pasture zone away from settlements and water, where richer desert pastures are available.

Shepherds herding out on the ranges use tents, while some families accompany the menfolk, using yurts in the spring and summer. The cost of providing fodder inputs relative to the market price or subsistence value of livestock is a severe problem for all types of production units at the present time in Kazakstan. As one director of a cooperative complained: "We have no information. Prices fluctuate beyond our control and understanding". There is a very active market for fodder, which is grown by cooperatives and now by some private farmers. Some cooperatives have a fodder deficit and barter with others in the region which have a surplus. Only a few private farmers are able to meet their animals' fodder needs through domestic production and so must buy or barter from entrepreneurs, neighboring cooperatives or urban markets. Livestock production units in Kazakstan, both large and private small-scale, have difficulty balancing

income from livestock sales with outlays needed for planting fodder crops. The main season in which inputs are required for crops is spring, when fuel, spare parts or *cash for renting* tractors is needed. But livestock should ideally be sold in autumn, after the young have grown and fattened over summer. Without seasonal credit to bridge this gap, many production units have to buy fodder at the beginning of winter by selling animals, then lack sufficient funds to purchase crop inputs in spring. Under these conditions, it is very difficult for a production unit to become self-sufficient in fodder. In contrast, livestock associations in Turkmenistan continue to supply all fodder for animals leased by members. The fodder is either grown by irrigation on the association's land, or bought in from other associations. Although shepherds must purchase fodder for their privately-owned animals, they have the opportunity to accumulate offspring from leased animals, which brings a secure income. Thus, the system allows a period of transition from total state support to complete privatization.

***Shifting emphasis on livestock breeds, products and markets***

Formerly in the Soviet period, livestock management on the semi-arid rangelands of Kazakstan was mainly geared to production of fine wool, which was required in the USSR. Various breeds were developed by crossing merino sheep with indigenous breeds, for adaptation to particular ecological zones. Since Independence, the depressed international wool market has coincided with the rapid removal of state support to the livestock industry and loss of the traditional Soviet market (ADB 1997).

As a result, pastoralists in Kazakstan are switching to local fat-tailed breeds of sheep, whose meat fetches a good price in domestic markets. The local breeds are better adapted than merino crosses to forage under snow, as well as producing heavier animals. Horses and downy goats are also more economic to raise under the new economic conditions; they too can forage better in the winter, and there is demand for their meat and down, respectively. Cattle are now very difficult to keep during the winter, as they depend entirely on fodder.

Wool from Kazak producers is now purchased by private buyers from China, Turkey, and Korea, who strike deals with cooperative farms, or buy directly from producers. However, prices are quite low as the wool is often unsorted and unwashed. There is potential for meat exports, but a well-developed meat marketing chain from producers in remote areas to international buyers has not yet emerged.

There has similarly been a shift in emphasis of livestock products in the Karakum production zone of Turkmenistan, since Independence from the USSR. Formerly state farms mainly raised karakul sheep, whose pelts (astrakhan or Persian lamb) were centrally marketed through Russia for making hats and coats. With the central marketing channel broken, and international demand for karakul pelts having declined, production targets are now refocused on meat, to meet national deficits. While state-managed livestock associations still concentrate on raising karakul sheep, however, privately-owned animals are nearly always another local breed, which although more difficult to keep in the desert, is valued for its wool, which is sold and used by women to make carpets as another source of income.

In Kazakstan, the lack of a well-functioning marketing system is the major problem facing small- scale privatized farmers who do not have good access to the main urban markets. They have to barter or sell their wool and animals at poor rates of exchange in the rural areas, to itinerant traders or local cooperatives. Wealthier private farmers regularly transport their own animals to the city, where good prices are received for meat, if not for wool.

A stratification is emerging among Kazak pastoralists between private farmers whose flocks and herds are large enough that marketing is planned on a commercial basis, and the majority of farmers who own insufficient animals to accumulate wealth through marketing.

Among the former group, owning several hundred or more animals, young male sheep are fattened by being fed supplementary rations and kept in barns for up to six months before sale. These commercially-orientated farmers regularly bring animals year-round to sell in the main market in Almaty, and own their own trucks for transporting animals and fodder. Meat prices in the city are higher in winter, when fewer animals are sold. Such farmers also have enough labor, either from grown-up sons or by being able to afford hired shepherds, that their animals can be taken on the seasonal migration. Rotating between seasonal pastures provides better nutrition for livestock than grazing around settlements where both the quantity and quality of vegetation may be depleted through past overuse. By selling males and retaining female breeding stock, such farmers have typically been able to build their flocks and herds over the past years since Independence.

Smaller-scale private livestock farmers must market some animals every year to buy fodder as well as family necessities such as food and clothing. These farmers normally sell a few animals in autumn, when the market is glutted and prices are lowest. They must either hire transport or pay commission to a neighbor to sell on their behalf, which reduces the income from sales. They also sometimes sell underage animals, because they cannot afford to feed animals over several winters until they have reached full weight at maturity. Thus they are unable to obtain the highest market prices for animals which are sold. Having few animals, it is not economic to send them on seasonal migrations, which would require either income to hire labor, or enough animals to support sons. Over the winter, animals may not receive enough feed, as the owner cannot afford to obtain enough fodder. Poor nutrition will affect productivity. Under these conditions, flocks and herds do not flourish, and may decrease. Many

private farmers with few animals are going out of business.

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The research project is being conducted through the Overseas Development Institute, London, and is funded by the Department for International Development - DFID- (formerly ODA), of the UK Government. The title is "Impacts of privatization on range and livestock management in semi-arid Central Asia". Further information and publications of the project may be obtained by contacting C. Kerven at:

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## Present Condition and Improvement of Georgian Arid Pastures

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The arid pastures of Georgia are concentrated in the south-east part of the country and within watersheds of Mtkvari and Alazani rivers. They are represented by various associations, typical for semideserts and dry steppes and are located at altitudes of 90-900 m above sea level. Occupying the area of more than 300 thousand ha in the lowland and pre-mountainous zones and partially in the foothills of eastern Georgia these lands are used as seasonal pastures in winter and in cattle- and sheep breeding in spring and autumn.

The relief of these pastures is characterized by a complex combination of plains developed on the new and the ancient terraces of the Lori and the Alazani rivers (partially of the Mtkvari as well), flat foot-hilly and plateau-like plains, substantially eroded hilly ranges, sheep ravines and sloping gullies. The lowest elevations (90-200m above sea level) can be found in Samoukh depression, while the Gare-Kakhetian table-land has the highest elevation with some of its mountain-tops well-over 900m above sea level.

The climate of arid pastures is basically dry subtropical. The high location of some massifs and different degree of penetration of continental air currents from the Aral-Caspian semi-deserts and deserts has considerable influence on the diversity of the climate. The average annual temperature varies from -12,0 to +14,2 °C. The average monthly temperatures of the coldest months (December, January, February) varies from +0.3 to + 2.5 °C and the average minimal temperature of these months is – 1.8 – 3.8 °C below zero. The average monthly temperature of the hottest months (July, August) reaches 22.8 – 25.7 °C. The average duration of frost-free period varies from 216 to 252 days.

The average annual precipitation varies from 250 (Samoukh semi-desert) to 390-430 mm (Shiraki, Udabno, Kara-Douz massifs). Very erratic distribution of precipitation is a common feature. The largest amount of precipitation comes in spring in the form of heavy showers, with less rain in winter and autumn.

The wind regime is characterized basically by northern and North-east point winds, most strong and frequent in the western and north-west parts of the region.

The topsoil of the arid pastures of Georgia is diversified. In flood lands and riverside terraces we find alluvial and also brown soils. In many massifs considerable areas are occupied by saline soils and salt-marshes. The plains and gentle slopes of table lands are occupied by black earth and partially by dark chestnut soils and in case of steeper slopes - we have brown forest soil. Along with erosive and accumulative processes, the evaporation of moisture in summer that greatly exceeds saturation, and enrichment of top horizons of the soil with salts over considerable areas, has a significant impact on the environment.

The vegetation is not less diversified. In the semi-desert zone various associations of wormwood pastures prevail where *Artemisia meyeriana* is dominant. The considerable areas occupied by grasslands represented by *Salsola ericoides, S. nodulosa, S. dendroides.*

The most important for animal feeding are the following representatives of ephemeral grasses: *Poa bulbosa, Agropyrum pectiniforme, Bromopsis japonicus, Hordeum leporinum, Medicago minima, Veronica polita,* and *Eremopyrum orientale.*

In dry-steppe belts, most of the territory is occupied by groups of *Bathriochloa* (*B. ischemum*) and *Stipa* : *S.*

*lessinglana, S. pulcherima, S. joanis,* and *Festuca rupicola* (*F. Sulcata*).

The semi-desert vegetation has been used as winter pasture for sheep-breeding from time immemorial. This can be explained mainly by the climate and soil conditions and biological peculiarities of the basic plants of these pastures. Dry summers, very little precipitation, saline soils allowing no possibility for agriculture without preliminary land-improvement and existence of fodder grass and plants, determined by the way these lands are used for pastures, the character of precipitation distribution, the fact that sheep eat the main fodder plant *Artemisia meyeriana* only after the first autumn frost– all of these reasons determined the use of pastures only in winter time.

The vegetation of dry steppes is used as winter and transition (in spring and autumn) pasture, and in some more rainy years, for hay making as well.

The productivity of semi-desert pastures varies greatly depending on weather conditions of a year and mainly on the amount of autumn and spring precipitation. The analysis of the data, accumulated through many years of study of crop capacity and dynamics of wormwood and Russian thistle pastures, shows there are two maxima of plant growth capacity - in autumn and spring. It was noticed that the autumn harvest almost always better than the spring one. In the beginning of a winter pasturing season (the end of November) the crop capacity of grass of these pastures averages 0.8-0.9 t/ha of the green edible mass. From the second half of March the plant growth capacity is about 0.5 t/ha and in the first half of April, by the end of the winter pasturing season 1.0-1.2 t/ha.

The harvest of beard grass lands in the middle of November is in average 1.6-2.2 t/ha of the green mass, of which approximately 0.9-1.4 t/ha is edible and can hardly be called "green" as almost 90 % of it consists of dried stems and leaves of beard grass with total water content of 16-20%. During winter the grass harvest of beard grass pasture falls rather more sharply than in semi-desert pastures. The month-by-month dynamics of plant growth capacity from November to April is 1.12; 1.05; 0.87; 0.65; 0.51, and 0.76 t/ha of green edible mass. In May as beardgrass, which is the main grass, starts its vegetative growth rather late, the crop capacity doesn't exceed 1.0-1.3 t/ha of the green mass in average. The nutritional value of the basic fodder plants of the arid pastures of Georgia is rather high.

The present state of semi-desert and dry steppe pastures in Georgia is characterized by development of erosive processes, destruction of plant stands. The grass cover density is decreasing and the pastures are full of stones and weeds. Most widely-distributed weeds in semi-desert areas are: *Carduus acanthoides, C. hamulosus, C. seminudus, C. arabicus, Onopordum ocanthium, 0. hetercathum, Artemisia schowiciana.*

Weeds found in beardgrass pastures are the following: *Daucus carota, Xerathemum squarrosum, Eringium biberstenianum, Centaurea solstitialis, Cirsium arvensis*, etc. As these weeds are unused, ungrazed ballast, they cause great losses of soil fertility and spoil the quality of wool.

One of the peculiarities of the natural fodder base of Georgia is that the area under summer pasture greatly exceed that of winter ones: 1.3 million ha against 320 thousand ha. Taking into consideration the long duration of the winter pasturing season, higher crop capacity and nutrition value it becomes absolutely clear that the main task is to increase significantly productivity of winter pastures and also through converting suitable parts of the summer pastures into hayfields.

The most radical way of improving the situation is to carry out land improvement works on plain and slightly steep slops of arid pastures (irrigation and in some cases of need- desalination) and create cultivated, irrigated fodder fields by planting cereals, leguminous crops and perennial herbs, like alfalfa, orchard grass, meadow fescue, awnless bromegrass.

Calculation shows that these works and creation of sown pastures can be done over the area of 200-220 thousand ha. 25 % of this area is enough ensure completely the total number of sheep with all necessary types of fodder for winter. Execution of such projects is impossible at present without major investment. But some action for superficial improvement seems more realistic. These measures include fighting weeds, elimination of shrubs in places where they have no anti-erosion value. The studies show that elimination of weeds through mechanical or chemical means can give an increase of 15-30 % in useful pasture area and improve the quality of wool. In seasons with normal autumn and spring precipitation it is an advantage to apply organic and mineral fertilizers. The experiments, carried out through several five year periods, show that in average introduction of 30kg N P and 40 kg increased the dry mass yield of ephemeral group of grasses by 1.4 t/ha (131.2 %).

The numerous experiments showed low efficiency of sowing perennial grasses with suffrutices and shrubs. The best results were obtained in sowing of a yellow alfalfa, and intermediate and crested wheat grass in semi-desert zones.

The efficiency of the planned measures for superficial improvement of natural pastures are closely connected with the amount of autumn and spring precipitation. In normal seasons, these measures increase the yields of edible dry grass mass by 25-40 %. The economic efficiency of land-improving works on these lands and sowing of cereals, leguminous plants, vegetables, and other crops will be very high. Some land-improvement works (irrigation through water sprinkling system "Fregate" and desalination) over 4 thousand ha of semi-desert pastures of Georgia made it possible to get 50-70 tons of green mass or harvest 14-18 tons of high quality hay, 6-8 tons of maize, 60-70 tons of silage mass per ha and in case of sowing maize after having harvested winter wheat or barley – 4.15-5.5 t/ha of cereal grain or 6-7 t/ha of corn.

## Enriching Community Pastures: Villages of Kavlas in Rajasthan Take the Lead

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Kavlas is a small village in Asind taluka of Bhilwara district, Rajasthan comprising of a population of 4,935 belonging to 10 different castes and 350 families. These villagers live in great harmony with 4040 ha cultivable land, 500 ha waste land and 180 ha pasture land. Agriculture and livestock husbandry are their traditional means of livelihood. The villagers allow their livestock free grazing in the community pasture spread over 150 ha (750 bighas) near the Dev Narayan temple. As a result, over the past few decades, the pastures have been overgrazed and neglected. The productivity has decreased and 4000 heads of livestock have had to face severe shortage of forage. In addition to these domesticated animals a large herd of Blue Bull (locally known as Neelgai) were also not able to get their share of feed and thereby attacked agricultural crops in the dark of night. As the problems of controlling Neelgai and development of community pastures were beyond the capability of the poor villagers, no serious effort was made to tackle them and they were accepted as a part of their long struggle for survival.

In 1979, with the support of the district Rural Development Authority (DRDA) Bhilwara BAIF established a Cattle Development Center at Asind. As Kavlas is located at a distance of 8 km from the headquarters of this center the Extension Officer started visiting this village to promote livestock development. BAIF provided free breeding services for cows and buffaloes at the door steps of the farmers and advised them to adopt good feeding and health care practice. As feeding of protein rich concentrate was expensive, farmers were encouraged to produce green fodder to nurture their valuable livestock with limited feed supplement. By 1988-89 as the cattle development program progressed a good number of cross-bred cows and improved buffaloes were in milk production generating cash surplus. They were also able to realize the shortage of good quality forage, required to optimize the milk production.

At this stage the Swiss Development Cooperation came forward to support BAIF in initiating the pasture development program through community participation. Biharilal Sharma, the Extension Officer from BAIF established a dialogue with various groups in Kavlas village on the scope of conserving 150 ha. pasture, owned by the community in the name of the village deity Dev Narayan. Fencing of the pasture, control of livestock, soil conservation, cut and carry of grass were all strange ideas. Biharilal discussed with the villagers, but the response was very poor. Nobody took him seriously. Some felt that this new scheme with strange ideas, would never take off. But having enjoyed the reputation of providing excellent livestock breeding services, Biharilal fortunately did not encounter any resistance. Within a few weeks many senior officers from BAIF visited the village and arranged a series of meetings with the members of various village organizations and community leaders on pasture development. The officers had convincing answers to all their questions. Realizing that BAIF was sincere about initiating this programme, and as there were no financial stakes involved, the villagers expressed their willingness to cooperate with BAIF and launch the experiment. However, some sections of the society still resisted as their livestock were totally dependent on the community land for grazing Hence it was decided to develop only a small portion of this pasture, while the traditional grazing system would continue in the remaining area. The villagers suggested taking up this work on the outskirts of the village, adjoining the neighboring village as this part of the pasture was often grazed by livestock from that village.

The new programme of conservation of community pasture was launched with the formation of a village level committee of 21 members which included the village sarpanch as the chairman and BAIF's local officer as a member. Initially the enthusiasm was confined only to a few members and others did not participate seriously. The committee decided to fence 10 ha in the first year by creating a trench mound around the plot on which a live fence was developed by planting Euphoria branches at a close spacing. Water gullies were blocked by erecting check bunds and stone gradonies at closer intervals. The pasture was divided into smaller plots by creating contour bunds. Sowing of forage seeds such as *Cenchrus Setigirus* (Stylo) was carried out before the onset of rain, after stirring the soil with tractor-operated tillers. With the first few showers, tender grasses emerged which attracted the livestock. To prevent stray grazing, the committee which met once a month (on every Amavasya, as it is easily remembered even by the illiterate), decided to recover a fine of Rs. 51 for stray grazing by cattle and buffaloes and Rs. 21 for every goat or sheep. As these decisions affected everybody, many members expressed their desire to participate in the process of decision making. Hence the committee was reconstituted with two members from each caste and a member from BAIF.

Over a period of three years, an expenditure of Rs.10,000/ha was incurred out of which 60% was spent on fencing. the remaining amount was spent on contour bunds, forage seeds and watch and ward. Biofertilisers were introduced to enrich the soil and a small dose of superphosphate was also applied, as the soil was poor in phosphorous. Major cost was met from the BAIF grant and the villagers contributed voluntary labor for developing the pasture. With the ground water table below 50 m and most of the 650 mm rainfall flowing away from the pasture, it was difficult for the grass species to survive. However, the soil and water conservation measures, could check the run-off water and increase the forage production. Enriched soil could also boost the growth of the existing forage trees. Looking to the forage production, the Charagha Samiti

invited the members to cut the grass and the remaining quantity was to be converted into hay and auctioned. After harvesting the grass, the Samiti auctioned Acacia trees for light lopping of forage. to discourage heavy lopping of branches, the bidders were not allowed to carry any woody branches outside the pasture. After browsing the branches, the woody portion was also sold as fuel wood. on an average, a tree could fetch Rs. 10-20 per season, depending on the available forage volume. This way the Samiti was able to earn an income of Rs. 2,100/- in the first year. This was the first cash income generated from the pasture in the history of the village. the villagers look greater interest in the activities. The committee meetings were regularly attended by almost all the members. during the second year, the gross income increased to Rs. 7,370/- and Rs. 48,286/- respectively in the third as shown in table 1.

Apart from grass production, the pasture also generated additional employment by way of seed collection. Villagers having spare time, particularly the landless were encouraged to collect seeds of dhaman grass. The Samiti is paying Rs. 10/kg for seeds are sold outside.

Last year the Samiti has sold seeds worth Rs. 4,680/- and it is expecting to earn Rs. 24,000 from the sale of seeds this year. looking to the success, the Samiti decided to expand the conservation activity and thereby approached the Swiss Development Cooperation for assistance. Approval was received in 1995 and an additional area of 40 ha was fenced for development. The villagers came forward to render voluntary labor for pasture development and the Samiti was able to save Rs. 25,000/- which was donated by the donor agency. Today, nature has regained its green glory on this denuded patch of grassland. The villagers have succeeded in preventing their livestock from entering the fenced pastures and the Neelgais have found a new home amongst this conservation. They have plenty of grass to graze and bushes to hide. the villagers are no longer worried as the beasts do not visit the cropping areas. The project has made a big impact within a period of five years.

An abundance of better quality grass has improved the microclimate, while establishing greenery. The families have learnt about the benefits of stall feeding. The time involved in collecting grass is gradually motivating them to reduce the size of their herd. The milk yield has naturally gone up and above all the harmony among members of different castes is remarkable. The committee which now has a net saving of Rs. 58,000/- is able to provide the salary for a watchman. The savings are expected to reach Rs.1,00,000 during the current year. it is now planning for many development activities in the village. A true Gram Rajya is in action. the success story of Kavlas is inspiring the neighboring villagers to adopt this sustainable model of silvi pasture which is environmentally sound and beneficial to the entire community.

## An introduction to Inner Mongolia Grassland Ecosystem

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Our station was established in 1979, under the leadership of Academia Sinica. The Station is situated at N43°38', El16° 42', within a livestock farm of Balinxile. Xinlinhot city, Inner Mongolia Autonomous Region.

The steppe in Inner Mongolia is one part of the Eurasian continent's temperate steppe with a semi-arid cold climate and quite unique in the world. Temperate grassland in China extends over 3.3 million $km^2$, and have been traditionally used as pastoral land for thousands of years, carrying a significant population of highly diversified nationalities. During last several decades, grassland degradation and desertification were accelerated due to changes in land use patterns following the sedentarization of the nomadic society, and increase of the population and associated livestock numbers.

Facing the extremely serious challenges, our research emphasizes subjects related to optimal grassland management, sustainable agropastoral ecosystem, grassland degradation mechanisms, and restoration techniques, and responses of grassland to human activities.

Since its establishment, our station has accumulated long-term climatic data, background data of vegetation, soil, and animal species. We have published six volumes *Research on Grassland Ecosystem* introducing of our research activities.

Our station is open to all the scientists from every country interested in semiarid grassland research. Several hundred scientists from domestic and foreign countries have done research work in our station. We hope to establish more cooperation with scientists from other countries and share experience with them.

# WEST ASIA AND NORTH AFRICA

## Discrimination Among Populations Forming Ecotypes and Cultivars of Lucerne (Medicago sativa L.) Using Random Amplified Polymorphic DNA (RAPD)

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RAPDs (Randomly Amplified Polymorphic DNA) were used to discriminate among 10 cultivars of

lucerne (*Medicago sativa L.*). A set of 26 primers (10-base oligonucleotide) were tested individually to amplify RAPDs from bulk DNA samples of the cultivars. Ten primers generated polymorphic fragments, four of which generated RAPD profiles by which all of the 10 cultivars, including those with a closely related genetical background, could be discriminated. Replicated PCR reactions were carried out using two primers alone, and in combination with the standard reaction mixture using different batches of enzyme from the same manufacturer. The findings of this study demonstrate that the results obtained by the RAPD can be reproduced. The results also illustrate that the number of distinct RAPD fragments generated by a combination of two primers was fewer than those produced by each individual primer alone.

## Land Degradation and FAO's Contribution to Implementing the Convention to Combat Desertification in the Arab Countries

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*NB: This paper was presented to the Workshop on "Preparation and Financing of National Action Programs to Combat Desertification in the Arab Countries", Cairo, Egypt, 7-9 July 1998.*

FAO and other international organizations have been concerned for many years with the impact of land degradation on renewable resources affecting dryland areas. Drylands are predominant in the Arab countries, covering about 12 million square kilometres (89% of total surface area) and providing essential support to rural communities and to the livestock population and wildlife.

Rapid population growth and urbanization in the Arab countries has greatly increased the demand for cereals and animal products. As a result, rainfed cultivation of cereals has expanded into marginal areas in the absence of well-defined plans and control measures. Newly introduced agricultural practices frequently lead to the destruction of most prime rangelands and increase grazing pressure on the remaining areas. This destructive trend, combined with complex political, social, and economic influences, has contributed to land deterioration and endangered the sustainability of dryland ecosystems in the Arab region. Land resources are deteriorated by a variety of process, including water erosion, wind erosion, and salinization. It is estimated that 70 percent of Arab rangelands, which dominate the drylands, are moderately to severely degraded.

This paper defines desertification and describes its causes and processes. Strategies for combating desertification are outlined, and the principles underlying the strategies are defined. The document also outlines FAO's past and current activities in combating desertification in the Arab region, stressing FAO's comparative advantages, especially its proven commitment to promoting agricultural sustainability and its long experience in the Arab region.

The paper also outlines FAO's role in supporting Arab countries' efforts to protect and develop their drylands. Through its normative and field programmes, FAO strives to promote the conservation of dryland resources and to ensure the long-term sustainability of agricultural development in these areas. FAO's long experience in the development of arid land resources and the fight against land degradation in the Arab countries complements its ability to assist countries in preparing National Action Plans to implement the Convention to Combat Desertification. Its multidisciplinary and holistic approaches, supported by the development of information systems, databases, and decision-support tools, encourage the participation of local communities directly affected by degradation of resources. A commitment to such activities as the ARTEMIS, AFRICOVER, Forest Resources Assessment, and Global Information and Early Warning System programmes indicates FAO's ability to assist in the development of strategies to combat desertification in the context of World Food Summit and food security goals.

By assisting in the generation, formulation, and implementation of relevant projects, as well as collaborating with other international institutions in the Arab countries, FAO is ready to participate in and support the development of national and regional action plans against desertification. The establishment of partnerships and collaborative networks of institutions and organizations also allows FAO to develop sustainable, rational drylands management within appropriate sociological contexts. A commitment to the long-term objectives of improving the quality of life and alleviating the degree of rural poverty complements the need to properly manage the region's natural resources. On national, regional, and local levels, FAO supports the notion that combating desertification in the Arab countries is closely linked to ensuring food supply and self-reliance, and developing the human resources necessary for sustainable agricultural development.

## Seeking Sustainability in Rural Egypt: Linking Scientific and Indigenous Knowledge

*Kirsteen MacLeod, a Toronto-based writer and editor*

*The following is excerpted from: Biodiversity, Equity and the Environment. A Review of Research for Development. IDRC 1997-1998, IDRC Canada.*

*On Egypt's dry north-west coast, everything depends on rain. For 300,000 indigenous Bedouin, whose ancestors have lived in the area since the 17th century, rainfall levels dictate how much barely to plant and where the sheep and goats will graze and even the*

*timing of weddings, which occur more often in good rainfall years. The area's water resources are not only scarce, but are also extremely variable.*

In response, the Bedouin have developed an intricate web of strategies for managing their water resources. For example, they have traditionally moved around for water, pastures, and crop land, based on local precipitation patterns. But with increasing pressure on natural resources as a result of the adoption of more sedentary lifestyles, population growth, climate change, and geopolitical and other forces, there is a growing need for sustainable rural development policies for the area. The main question, which also applies to other semi-arid areas in North Africa and the Middle East, is how to improve agricultural production and the well-being of local inhabitants without degrading the fragile environment?

***Dynamics of Bedouin resource management***

To provide answers, a project funded by the IDRC in Wadi Naghamish, located 270 kilometres west of Alexandria, studied a representative wadi system (a wadi is an ephemeral river created when torrential rains occur) to understand better the current dynamics of Bedouin resource management. The project involved a multidisciplinary team with expertise in soil science, hydrology, socioeconomics, and remote sensing. The result? A comprehensive computerized, information database that provides the basis for a much-needed evaluation of resource management options and the environmental consequences of those options.

"What we all tried to get across was the need to look holistically to understand the dynamics of the [wadi] system, because any effective planning is going to be based on an understanding of that system," says John FitzSimons of the University of Guelph's School of Rural Planning and Development. Dr FitzSimons and scientists from the University of British Columbia and the University of Alexandria in Egypt began by examining how the system works as a whole. They collected data from 1993 to 1996, synthesizing biophysical information on rainfall, water collection, soil types, degradation, and natural vegetation, for example, with socioeconomic data focusing on people's use of natural resources. The team wove Western scientific data with the Bedouins' indigenous knowledge, such as how they view the environment and how they make decisions about cereal planting or the movement of livestock.

The Bedouin also provided information for detailed maps. With the help of GIS (geographic information systems) and other modeling tools, the research team constructed a computer-based system that integrates maps with biophysical and socioeconomic models. The resulting database of the Wadi Naghamish is capable of producing detailed maps, predicting whether agricultural practices are sustainable, suggesting ways to improve production, and even evaluating the effect that certain changes, such as planting alternative crops, may have on the system as a whole.

***Foundation for future research***

In addition to its unique methodology, the project is a milestone by providing a foundation for future research. "Now we understand how the system works, so we can ask, 'Can we manage it more effectively?'" says Dr FitzSimons. "And that raises issues and questions about the implications for sustainable development."

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## Economics of Crop/Livestock Systems in the Abdul Aziz Mountain Area of Hassakeh Province, Northeast Syria

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This study provides the first quantitative economic base-line information on the bedouin agro-pastoral systems of the Abdul Aziz Mountain area in the low-rainfall, 200-300 mm, zones of Hassakeh Province in the north-east corner of the Syrian Arab Republic. Interviews of 60 sampled households in 21 villages were completed in 1993/94 with reference to activities and economic outcomes of the 1992/93 season. Household data clustering with criteria of flock size, areas of barley and wheat cultivation, and agricultural off-farm income, resulted in placement of each household into one of five main groups. Two households were exceptions, fitting none of the five groups. Results are reported by group and for the total 60 households.

The main enterprise is sheep production, accounting for 80% of household income, based on local rangeland grazing and barley cultivation, and on grazing of cereal and cotton crop residues in the higher-rainfall and irrigated zones outside the Abdul Aziz Mountain area. Group average family sizes ranged from 8.5 to 10.5 persons while average flock sizes ranged from 56 to 123 breeding sheep and goats. All sample households cultivated barley for their livestock, averaging 16.5 hectares; two thirds of the sample also grew plots of wheat, averaging 1.8

hectares, for their own consumption. Off-farm employment, often on others farms in the higher potential areas, averaged 10% of household incomes.

Groundwater, high in magnesium, is unfit for human consumption; drinking water is trucked in to most bedouin villages and camps from Hassakeh. While schools are generally not accessible to children; this was not mentioned as a problem by adults, most of whom are illiterate.

Veterinary assistance, through an annual state vaccination campaign is sometimes supplemented through private vets from Hassakeh. The nearest human health services were available in Hassakeh. While diesel fuel is used for heating, firewood for cooking and heating is collected by up-rooting range shrubs; with overgrazing and expanding cultivation, this has resulted in heavily degraded rangelands. Large amounts of winter feed supplements (mainly barley grain and cereal straws) are used; summer and autumn migrations for crop residue grazing in the higher potential zones outside the Abdul Aziz area are typical.

Government forest and range reserves have concentrated the grazing of private flocks on remaining areas of rangeland, already reduced by expanding dryland barley cultivation. Both human and animal populations are large relative to the resource base in the Abdul Aziz Mountain area and are maintained only through heavy use of feed and water brought from the outside in winter and spring; and through seasonal migrations to outside sources of cheaper feed and water in summer and autumn. Access to local range grazing is informally controlled by each village and is limited or forbidden in the government reserves.

Formalizing and strengthening local controls, with enhanced and far-sighted management of the natural resources of the Abdul Aziz Mountain area will be essential in arresting and reversing the process of range degradation. Substitution of subsidized buta-gas for firewood could be promoted as in other countries with large gas reserves. Other public investments in human resource development (schools, public health), and infrastructure (roads, electricity, radio and TV) could provide an escape for young people in the community. Such investments, while not self-funding on the basis of short-run economic efficiency, could be justified at the national level on the basis of equity (poverty alleviation) and environmental sustainability.

## The Valorization of Plant Materials in Morocco

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The International Development Research Centre has been funding for several years a network of projects working in several countries in Africa on the valorization of various underexploited or unexploited starting materials of plant origin with the intention of finding new sources of jobs and revenues for the poorest populations of the continent. The investigations have looked into various products from native and introduced exotic plants, such as essential oils, dyes, adhesives, algae, vegetable oils and fats, pharmaceuticals, etc., and various issues have been tackled including chemical analysis, pilot plant extraction, cultivation, quality and market issues, biological properties, sustainable use of the resource, transfer of the technology to the local communities and entrepreneurs, etc. Three of the projects involved in the network are based in Morocco.

Because of its geographic situation, Morocco has a rich and diversified flora with a large number of aromatic plants, from which essential oils have been produced for centuries.The production of essential oils from endemic aromatic plants is still done using traditional distillation techniques. Building on this tradition, the Plantes aromatiques (Maroc) project has brought improvements to the traditional distillation techniques for the production of essential oils from plants such as *Lippia citriodora, Artemisia herba-alba* and *Thymus satureoides*, which are quite common in the arid and semi-arid valleys of the Southern Atlas Mountains. The project has also worked on improving the quality of the essential oils of *L. Citriodora* and *A. Herba-alba*, on developing methods for the production of optically pure high value-added products, such as l-camphor and d-borneol, on improving the cultivation of selected aromatic plants and on the transformation of other essential oils. Work was also done on developing markets for the Moroccan essential oils and the products derived from them. In its final phase, the project has extended its reach to other plants from other regions of the country to the East and to the North, such as *Rosmarinus officinalis*, *Tanacetum annuun* and *Ammi visnaga*. The project was headed by Dr. Bachir Benjilali from the Institut agronomique et vétérinaire Hassan II of Rabat and Dr. André Bélanger from the Centre de recherche et de développement en horticulture, a research centre of Agriculture and Agri-Food Canada, based in Saint-Jean-sur-Richelieu, near Montreal.

The Biotransformations (Maroc) project, whose project leaders are Dr. Mustapha Ismaïli-Alaoui of the Institut agronomique et vétérinaire Hassan II of Rabat and Dr. André Morin of the Food Research and Development Centre, a research centre of Agriculture and Agri-Food Canada, based at Saint-Hyacinthe (Quebec), aims at finding a solution to the pollution problem caused by the 180.000 tons of olive oil cake produced each year in Morocco by the 5.500 maâsra and other producers of olive oil and mostly discarded as waste in the environment. The project hopes to develop a technology using microorganisms, that would enable the rural producers of olive oil to transform the by-products from their unit into a protein-rich feed for their animals through a solid state fermentation of the olive oil cake with sugar cane bagasse. Alternatively, the olive oil cake could be tranformed by solid state fermetation with thermophilic filamentous fungi into enzymes and aromas for the agri-food industry, the textile industry and the pharmaceutical industry.

The Valorisation de l'arganier (Maroc) project, whose project leaders are Dr. Zoubida Charrouf of the Faculté des sciences of the Université Mohammed V of Rabat and Dr Faical Benchekroun of the Institut agronomique et vétérinaire Hassan II of Rabat, is interested in the conservation and valorisation of the argan tree (*Argania spinosa* (L.) Skeels). The tree, which is endemic to Morocco, is the second most important tree species in the forests of the country and it is very common in the arid and semi-arid zones of South-West Morocco, where the livelihood of about 3.000.000 people depends on the argan tree. All parts of the tree are used: the leaves and fruits are very much appreciated by camels and goats, the wood is used for heating and the oil from the nuts is used for food and in traditional medicine. In spite of this, the argan tree forests are disappearing. The projects hopes to come up with a technological package which would allow the women's cooperatives to use the trees in a more sustainable and more profitable way through better management of the argan tree forests, the selection of more productive specimens for planting and the improvement of technology for the production and the transformation of the oil. The project, which has just started, has already generated a lot of interest and various donors are involved. The project will be collaborating with a similar project in Burkina Faso, called Huiles végétales non-alimentaires (Faso), which has been involved in the improvment of the small-scale technologies used by women groups for the production of certain vegetable oils in the arid northern zones of the country.

The results from these projects were recently presented at a meeting of the network held in Ottawa from May 26 to 29, 1998.

# AUSTRALIA

## New Pasture Species Can Mean New Disease Problems

***(From CLIMA Newsletter Number 10, March 1998)***

CLIMA's successful research programs involving selection of pasture species new to Australia have led to new cultivar releases, are more are in the pipeline.

But new species coming into an environment different to that in which they evolved are likely to be attacked by the diseases of their new environment. Identifying and combating these diseases involves an intense effort by CLIMA and Agriculture Western Australia pasture pathologists Simon McKirdy, Roger Jones and Martin Barbetti. Simon and Roger are investigating virus diseases and Martin is concentrating on fungal diseases.

One of the most serious diseases has proved to be bean yellow mosaic virus (BYMV) which has been endemic in Western Australian pastures for many years. It causes mottled and distorted leaves, plant dwarfing and apical necrosis, with the combination of symptoms found depending on the species concerned.

In 1996 BYMV infection was rife in two of Simon's experiments at different sites, in which clover infector plants served as a uniform source for spread. These experiments allowed detailed records of susceptibility and severity of symptoms to be made for each species present. As well, there were severe outbreaks of BYMV in two pasture trial sites in which plots of a wide selection of cultivars and lines of different new annual pasture species were being propagated. The more susceptible species suffered up to 100 per cent BYMV infection.

From work at these and other sites Simon and Roger found that species to which BYMV poses a serious threat include biserrula (*Biserrula pelecinus*), crimson clover (*Trifolium incarnatum*), arrowleaf clover (*Trifolium vesiculosum*), lathyrus (Lathyrus cicera, *Lathyrus ochrus*) and Trigonella (*Trigonella balansae*). Several other species, such as gland clover (*Trifolium glanduliferum*) showed moderate levels of infection, sufficient to be of concern. However, BYMV infection of pink serradella (*Ornithopus sativus*) and yellow serradella (*Ornithopus compressus*) were of little concern, as they were not very susceptible even though they were severely damaged by infection when it did take place.

BYMV survives in dormant seed of naturalised clovers between growing seasons so new species will often encounter the virus when old pastures are resown with them. Studies are under way to see if the virus is carried through the seed of any of the new species, as infected seedling plants are likely to act as a potent source of spread by aphid vectors, resulting in severe outbreaks.

Two of Simmon's field experiments evaluated the sensitivity of the same range of species to cucumber mosaic virus (CMV). High levels of susceptibility were found in *Trifolium isthmocarpus*, balansa (*Trifolium balansae*), crimson and arrowleaf clovers.

Moderate levels of susceptibility were found in hedysarum (*Hedysarum coronarium*), gland, helmet (*Trifolium clypeatum*) and persian (*Trifolium resupinatum*) clovers and in biserrula. No infection was detected in pink serradella.

Biserrula was also infected with seed-borne mosaic virus (PSbMV) and alfalfa mosaic virus (AMV) at different sites, in addition to BYMV. This species is highly susceptible not only to several diseases but also to aphid vectors. Symptoms caused by PSbMV are stunting and mottle. Symptoms of BYMV in biserrula are severe leaf paleness, leaf distortion and twisting, and plant stunting. Studies are under way to investigate seed transmissibility of the different viruses in biserrula.

Some examples of the fungus diseases found by Martin Barbetti are:

- Several cases of a severe crown/upper root rot condition in serradella, in both commercial and experimental stands. A similar condition has been observed in experimental plots of biserrula. *Rhizoctonia* is the most likely cause

but it is possible that one or more *Fusarium* species are also involved.

- Severe rust (*Uromyces trifolii*) has been observed in commercial stands of persian clover.
- A severe lateral root rot condition has been observed in *Lathyrus ochrus*.
- A severe leaf spotting condition in *Lotus purshianus*, associated with *Stemphyllium* sp.
- Severe clover scorch disease (*Kabatiella*) in helmet clover.

# AFRICA

## Improvement of Sahelian Pastures in Senegal

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Senegal is an economically important and ecologically senesitive country in West Africa. Located between the Sahara desert in the north and semiarid region of Guinea and Guinea Bissau in the South, the economy is heavily dependent on livestock and agriculture. A significant part of the land area is located in the Sahelian zone, which stretches through a wide band from the Atlantic coast running 6,000 km across Africa. The total geographic area of Senegal is 19.253 million ha, of which 5.226 million ha is under agriculture, 5.700 million ha under permanent pastures, 5.942 million ha under forest and woodlands and the rest under other uses. In 1989, the Gross National Product (GNP) of Senegal was US $ 4,716 million with a per capita of GNP distribution of US $ 650. Inspite of 62.6% of the 8.42 million population living in rural areas, contribution to GNP from agriculture was only 22% while the industries and the services contributed 31.1% and 46.4% respectively.

The mean temperature in Senegal varies from a maximum of 37°C in May to a minimum of 19°C in January. The Sahelian region, which receives rainfall in the range of less than 200 mm to 600 mm can be divided into the following three zones: Sahara-Sahelian north transition with rainfall below 200 mm; Central Sahel with 200-400 mm rainfall and Sudano-Sahelian south zone with 400-600 mm rainfall.

Livestock is the main stay of pastoral families. The livestock population of Senegal in 1988-90 was 8.225 million, with 2.674 milion cattle, 5.049 million sheep and goats, 0.487 million pigs and 0.015 million camels. Livestock are considered a bank for conserving wealth. Any surplus cash generated, is invested in livestock. The average herd size in the Sahelian region comprises of 40-50 cattle, 60 sheep and 60 goats. Some of these animals are sold to generate cash income during times of difficulty. However, this livestock bank is prone to threat from natural calamities.

With the decline in forage production, pastoralists have been adding more sheep and goats to their herd. This has resulted in 60% rise in the population of sheep and goats during the last two decades. Nevertheless, the common ownership of land verses individual ownership of livestock, resists the rational use of pasture resources on a sustainable basis. Therefore, striking an ecological balance between the pastures and livestock in this region is of global significance in order to slow down the process of global warming, while providing sustainable livelihood to the local population.

The pastures are comprised of a large number of herbaceous and tree species. In the central part of the Sahel, *Schoenefeldia gracilis* represented 86% of the grasses followed by *Ipomea vagans*, *Corchorus tridens*, *Merremia pinnata*, *I. coptica* and *I. pestigridis*. The main woody species in the pasture are *Acacia senegal*, *Acacia raddiana*, *Faidherbia albida*, *Balanites aegytiaca, Boscia senegalensis, Combretum aculeatum, Calotropis procera* and *Grawia bicolor* (Nolan, et al, 1994). Some of the other prominent tree species found in the Sahelian region are *Acacia laeta, A. Seyal, Boscia angustifolia, Diaspyros mespliformis, Adensonia digitata* and *Zizyphus mauritiana*. With continuous grazing pressure, frequent droughts and excessive collection of timber and fuelwood, the tree population has reduced significantly in this region. The decline in tree cover during the last few decades has reduced the moisture retention capacity and fertility status of the pastures, which in turn has suppressed the yield and quality of forage.

In such a condition of natural degeneration where heavy investment on external inputs is not feasible, soil and water conservation and establishment of multipurpose tree species (MPTS) which draw nutrients from deeper profiles and fix atmospheric nitrogen, can help in ecological restoration at the micro-level.

With this background, a study was undertaken to improve the productivity of pastures in the Institut Sénégalais de Recherches Agricoles (ISRA) at Dahra in Louga province in the Sahelian region of Senegal, through the introduction of different MPTS. Considering their adaptability in the native region and elsewhere, the species selected for this trial were *Acacia nilotica, Acacia raddiana, Acacia senegal, Acacia seyal, Bauhinia rufescens, Combretum aculeata, Leucaena Leucocephala, Parkinsonia aculeata, Prosopis cineraria* and *Zizyphus mauritiana*. Seeds of *Acacia nilotica, Leucaena leucocephala, Parkinsonia aculeata* and *Prosopis cineraria* were introduced from India.

Fourteen months after planting, the highest survival was recorded by *A. senegal* followed by *Comretum aculeata* and *A. seyal*, while the lowest were *Leucaena leucocephala, Parkinsonia aculeata* and *Zizyphus mauritiana*. After a year of establishment, *Prosopis cineraria* had attained the greatest height and colar girth. This was followed by *Parkinsonia aculeata* and *Bauhinia rufescens* for height and *A. nilotica, A.*

*raddiana and Parkinsonia aculeata* for collar girth. Grazing had a significant effect on the growth of *Leucaena leucocephala, C. aculeata* and *Z. mauritiana.* The adverse impact was most prominent in the plots grazed by goats followed by sheep and cattle.

It is observed that MPTS seedlings are able to withstand the grazing pressure and compete with the local herbaceous species in the Sahelian pastures. A part from native species such as *Acacia senegal, A. Seyal, A. nilotica* and *C. aculeata,* newly introduced Prosopis cineraria is performing well. The growth of *Parkinsonia aculeata* is also impressive, although the rate of survival is low. *Leuceana leucocephala* was adversely affected by drought and browsing. *Bauhinia rufescens, C. aculeata* and *Z. mauritiana* have good regeneration capacity inspite of heavy browsing. The observations will continue for 2-3 years to assess their impact on forage productivity.

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# EUROPE

## Persistence of White Clover in Permanent Grassland

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Despite its nutritional benefits and its ability to fix $N_2$, white clover is hardly used in The Netherlands. However, as the amount of N fertilizer applied to grassland is decreasing, there is renewed interest in white clover. The lack of persistence of white clover in permanent pastures is a major problem. Clover content and persistence are affected by various factors. The objectives of this project are 1. to investigate the effect of clover cultivar, companion grass cultivar, management (cutting or grazing) and soil type on clover persistence, and 2. to study the effect of white clover on nitrate leaching. Mixtures of perennial ryegrass cultivars with contrasting growth habits, cvs. Condesa, Wendy and Barlet, and white clover cultivars with different leaf sizes, cvs. Alice, Gwenda and Retor are being evaluated under cutting (clay soil) and under grazing (sand and clay soils) . No fertilizer N is applied. Nitrate leaching was studied with ceramic cups.

Grazing trials are conducted on mixed swards of the three perennial ryegrass cultivars with white clover cv. Gwenda. The plots were continuously stocked with cattle, aiming at an average sward height of 7-8 cm. There was no effect of grass cultivar on liveweight gain or net production. Mixtures with the prostrate grass cv. consistently had less clover than mixtures with the more erect grass cvs. Despite 'clover crashes, cv. Gwenda had persisted in all plots for more than five years after sowing.

Measurements on seedling survival and stolon characteristics were conducted as part of a joint program on overwintering of white clover.

# MEETINGS

## Setting Livestock Research Priorities for Central and West Asia and North Africa

The International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Livestock Research Institute (ILRI), with generous support from the International Fund for Agriculture Development (IFAD), organized a regional meeting on future livestock research needs in Central and West Asia and North Africa (WANA). This event took place at ICARDA in Aleppo, Syria on November 12-16, 1997. The main purpose of the consultation was to identify research priorities and define an agenda for livestock research for development in the WANA region.

The consultation brought together forty representatives from national programmes in 17 West Asian and North African countries, Algeria, Cyprus, Egypt, Iran, Iraq, Jordan, Lebanon, Libya, Morocco, Pakistan, Saudi Arabia, Sudan, Syria, Tunisia, Turkey, United Arab Emirates and Yemen, and three Central Asian countries, Kazakstan, Uzbekistan, Turkmenistan. It was also attended by representatives from two regional agencies, ACSAD and AOAD and four donor agencies, CIRAD, DFID, GTZ and Italian Co-operation. The FAO and the US Global Livestock Collaborative Research Support Programme (GL-CRSP) were also represented. Altogether, the delegates represented 24 countries interested in livestock research and development in WANA.

The main recommendations for research priorities to be addressed by the National Agricultural Research Systems (NARS) were:

- feed resources: assessment in different production systems, strategic supplementation
- animal health: development of integrated flock and herd health management strategies, validation of diagnostic kits
- animal breeding: development of production and reproduction recording systems, development of selection indices for livestock improvement based on farmers objectives, development of strategies for the establishment of nucleus herds
- herd management: determine interactions between nutrition and reproduction efficiency

- policies: delivery of veterinary and extension services, marketing policy for both inputs and outputs
- marketing: impact on production systems of marketing strategies and terms of trade
- natural resource management: water conservation and utilization
- extension: assessment of extension services and proposals for improvements, establishment of mechanisms to coordinate research, extension, credit and policy formulation.

In addition, the main recommendations for issues that need to be addressed internationally through collaboration between the National Agricultural Research Systems and the International Agricultural Research Centres were as follows:

- feed resources: improved forage and fodder quality, nutritional evaluation of feeds (phytochemistry, methods, and rumen ecology)
- animal breeding: estimation of genetic parameters for economic traits, development of appropriate genetic evaluation methods, breeding for disease resistance, breed characterisation, including DNA mapping
- animal diseases: economic impact and epidemiology of diseases of regional importance
- policy: assessment of land management and land tenure systems, options for improvement
- extension: assessment of extension methods
- natural resource management: development of indicators for land degradation, water use efficiency
- farmer participation: development of effective methods to ensure the participation of farmers in the overall research and development process.

Specific project proposals would be developed for research on the priorities that had been identified in the consultation. This would be done in a participatory manner, involving the major stakeholders and following the agreed principles for partnerships.

## Regional Meeting to Promote Implementation of the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture in Central & West Asia and North Africa

*Yawooz Adham, WANANET Coordinator*

The regional meeting to promote implementation of the *Global Plan of Action* for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture in Central and West Asia and North Africa was held in Aleppo, Syrian Arab Republic, from 22nd to 25th June, 1998. The meeting was convened by FAO and the CGIAR's System wide Genetic Resources Programme (SGRP), hosted by ICARDA, and organized with the assistance of the CWANA regional office of IPGRI.

Representatives and observers from each of the following countries attended the meeting: Afghanistan, Algeria, Armenia, Azerbaijan, Cyprus, Egypt, Iraq, Islamic Republic of Iran, Jordan, Kazakhstan, Kyrgyz Republic, Lebanon, Malta, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Syrian Arab Republic, Tajikstan, Tunisia, Turkey, Uzbekistan and Yemen. In addition a number of representatives of regional and international organizations attended the meeting.

Opening remarks were made by Dr. Mahmud Duwayri on behalf of FAO, Dr. Geoffrey Hawtin on behalf of IPGRI and the CGIAR/SGRP, and Prof. Dr. Adel El-Beltalgy on behalf of ICARDA.

His Excellency, Mr. Asaad Mustapha, Minister of Agriculture and Agrarian Reform, delivered the opening address. He welcomed participants to the Syrian Arab Republic and he stressed the importance of plant genetic resources for food security and wished the meeting success in its critical task of promoting implementation of the GPA

The meeting reviewed the progress in implementing the GPA in the region and analyzed it at three levels (a) Strengthening National Programmes, Strategies and Policies, (b) Strengthening Community PGRFA management and (c) Strengthening Regional and International Collaboration, and made the following recommendations:

**(a) Strengthening National Programmes, Strategies and Policies**

1. It was agreed that each country should formulate a national strategy and/or plan on PGRFA, particularly for the implementation of the GPA according to national needs, and that this plan should be part of or in harmony with national biodiversity strategy and action plans. FAO, in collaboration with IPGRI and other organizations, is requested to encourage and assist countries to develop GPA/PGRFA plans and strategies.

2. It was noted that according to the new operational criteria of GEF for enabling activities, countries could add consideration of *agro-biodiversity* issues, including PGRFA, to their new or ongoing biodiversity strategies and action plans, and seek additional funding for this component from GEF.

3. National PGRFA plans and strategies should also be integrated in national development and agricultural sector plans.

4. All countries to establishing or strengthening national programmes on PGRFA should give high priority. These should encompass all PGRFA activities including plant breeding and other forms of utilization, and not be limited to genebank operations.

5. The following additional points were noted concerning national programmes:

- Coordination is very important, with a strong link with all concerned stakeholders, and mechanisms for coordination with national and international organizations.

- All countries should have National PGR Committees, or similar coordinating mechanisms, involving all concerned parties, and with high level participation including key decision makers. The committee should have clear terms of reference and regular meetings.

- PGR units or facilities should be improved where required meeting national needs. They should be located so that they can serve the whole country. They should have clear responsibilities and programmes, and be coordinated with other parts of the national programmes.

- appropriate legislation on PGR should be developed.

- Emphasis should be given to improving public awareness and awareness of policy makers;

- Human resources development should be strengthened, to improve the availability of qualified staff, through training programmes, use of experts from the region etc. Attention should be given to improving staff motivation to avoid attrition.

- National programmes require secure and sustainable finance, drawing upon local and international sources. There is also a need for an international funding mechanism.

**(b) Strengthening Community PGRFA management**

1. The importance of PGRFA management by farmers and communities as a contribution to national efforts to implement the GPA was noted. This would contribute both to conservation and increased productivity by increasing the range of genetic diversity available to farmers, by facilitating the exchange of landraces, and through decentralized and participatory plant breeding. The importance of strengthening and developing markets for the products of landraces and underutilized species was stressed. The need to strengthen the scientific basis of *in situ* (including on farm) conservation was underlined. The complementarity of *in situ* and *ex situ* conservation efforts was emphasized.

2. Countries are encouraged to promote activities aimed at strengthening the management of PGRFA at the community level.

3. A concept note of a project for the promotion of sustainable conservation and use of landraces through community based systems has been developed by the conference participants.

4. Immediate actions to boost work in this area include the following:

- A survey the current status of community based PGRFA conservation activities and preparation of a list of NGOs involved in PGRFA work and farmer associations present in the CWANA region. National Programs in each country should be requested to carry out this survey.

- on the basis of the survey's result, development a framework for the implementation of the work in this domain that reflects the institutional, economic and scientific diversity across the region. Existing Networks (e.g. WANANET and CAN/PGR) should be asked to carry out this task

**(c) Strengthening Regional and International Collaboration**

1. In the CWANA region several regional and international organizations/centers have activities. These include FAO and other intergovernmental organizations, IPGRI, ICARDA and other IARCs, the regional research network AARINENA, regional organizations and research centers such as AOAD and ACSAD.

2. There is a need for coordination of the activities of organizations active in the region on PGR. It is proposed these organizations convene a meeting, in which representatives from selected national programs will be invited to participate, in order to focus the activities of organizations on selected priorities and avoid duplication of efforts. The result would lead to the identification of regional projects.

3. CAN/PGR and WANANET should play a major role in developing projects in cooperation with other organizations, and other networks including crop-specific networks, and networks of other regions. In particular, it was proposed that links between the crop working groups of CAN/PGR and WANANET and the crop-specific networks be strengthened. The activities of these networks, and of IPGRI-CWANA should be supported. The above mentioned organizations are encouraged to participate more fully in WANANET and CAN/PGR including by providing technical or financial assistance as appropriate.

4. The major partners in the regional work in PGR are the national programmes. National plans should be active cooperators, efficiently implementing their programs on PGRFA and contributing information and material, through WANANET, to the other countries.

5. National programmes should make greater use of CAN/PGR and WANANET in the formulation of common projects in line with national priorities in order to facilitate implementation of the GPA and overcome the difficulties (funding, training, technology transfer) faced by national programmes.

6. There is potential for collaboration between countries in the region concerning the sharing of the burden of *ex situ* conservation, characterizations and evaluation. The Islamic Republic of Iran offered to assist other countries in the region through the characterizations and evaluation, in Iran, of samples of other countries in the Region. The meeting welcomed this offer and invited WANANET and CAN/PGR to follow up this proposal.

7. The meeting highlighted the importance of access to information on material available in collections, through SINGER, WIEWS and national PGR information systems. National and regional databases should be developed in the context of WIEWS and SINGER, with the assistance of FAO and SGRP.

8. Considerable effort has been made during the last decades on the collection and conservation of PGR. There is a need to formulate regional projects on the utilization of landraces and PGR. This effort will be implemented after carrying out a survey, in the CWANA region, on the utilization of PGR (e.g. as varieties or parents in the breeding programme or for direct introduction). The publication of a report or proceedings of a workshop on the subject will facilitate the undertaking of further work, the formulation of project for future common work and also could encourage the attraction of funds by potential donors.

9. It was suggested that the ongoing external review of the SGRP should take into account the recommendations of this meeting. Participants were encourage to make further inputs to this review process, and specifically to how the SGRP can support the implementation of the GPA, via the FAO secretariat.

10. The steering committees of WANANET and CAN/PGR are invited to follow up the relevant recommendations of this meeting.

# NETWORKS NEWS

## ICARDA Coordinates a Shrub Project

ICARDA in collaboration with ICRISAT has initiated a shrub project in response to their parent organization CGIAR's system wide livestock initiative. The project is "Production and Utilization of multi-purpose fodder shrubs in West Asia, North Africa and West Africa". Thiry four scientists from countries where desertification is considered of serious concern met at ICARDA headquarters in Syria last February to draw up a plan of action. Participation will be from Burkina Faso, Mali, Niger, Senegal, Syria, Morocco, Jordan and Tunisia. ICARDA has been working on shrubs in Syria in a national program on a rangeland reserves project where severely degraded rangeland is enclosed and planted to saltbush shrubs. After about five years, when the reserves are well established, they are opened to patoralists at critical times of the year when no other sources of feed are available.

## First Survey of Scientists with Interest and Expertise in Soil Conservation and Dry Land Management

In its research work ICARDA places special emphasis on natural resource management. Interdisciplinary soil conservation and land management research programs are being developed in close collaboration with national institutions in the West Asia - North Africa (WANA) region. A major aim is to strengthen multidisciplinary and participatory approaches to land management research and technology development. This is a long-term task which requires intensive preparation, finances, and teams of qualified, experienced, and motivated researchers.

ICARDA is compiling a roster of scientists in the region who have a strong interest in soil conservation and land management and who could be potential collaborators for future research programs. ICARDA plays an important role in the professional linking of these scientists and their institutions. An immediate aim is to launch an informal Dryland Management Research Exchange and Discussion Forum within the WANA region, bringing together people of various professional backgrounds and with expertise and experience in different aspects of soil conservation and land management.

Therefore we kindly request you to help us gather the initial information on scientists in your institution and in your country. I am enclosing a short questionnaire which I would like you to distribute to interested colleagues within and outside of your institution. The information obtained this way will provide us with an initial basis for better professional exchange in the future.

Michael A. Zoebisch, ICARDA

## *First* Survey of Scientists with Interest and Expertise in Soil Conservation and Dry Land Management in the West Asia - North Africa (WANA) Region

Please return this form to: Dr. Michael A. Zoebisch, ICARDA, P.O.Box 5466, Aleppo, Syria
Fax +963-21-225 105, 213 490; E-Mail M.Zoebisch@cgnet.com

*This concise survey form will be used as a first basis for the development of an expert data base for the WANA region. If you are interested to be updated on ICARDA's work in soil conservation and land management and if you are interested in possible future research collaboration and professional exchange then please fill this form and return it to the address above. All information given on this form will be treated as confidential.*

**Make copies of this form freely and distribute to your colleagues.**

Name of scientist .....
Position .....
Name of institution .....
Department/Section .....
Mailing address .....
P.O. Box .....
City & Postcode .....
Country .....
Telephone **office** .....
**private** .....
Fax **office** .....
**private** .....
Telex .....
E-Mail .....

**Professional training and degrees obtained**

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**Main fields of expertise and years of experience**

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**Duties and responsibilities within the institution**

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**Main areas of *research interest* (Tick a maximum of five boxes)**

| Agroforestry | | Integrated crop management | | Rural sociology | |
|---|---|---|---|---|---|
| Biodiversity | ☐ | Irrigation | ☐ | Soil and water conservation | ☐ |
| Climatology (agrometeorology) | ☐ | Land degradation | ☐ | Soil erosion (general) | ☐ |
| Conservation tillage | ☐ | Land tenure/property | ☐ | Soil management | ☐ |
| Deforestation | ☐ | Land evaluation | ☐ | Soil salinization | ☐ |
| Desertification | ☐ | Land resource analysis | ☐ | Soil survey | ☐ |
| Environmental impact assessment | ☐ | Land use planning | ☐ | Sustainable agriculture | ☐ |
| Environmental protection | ☐ | Legislative framework | ☐ | Water erosion | ☐ |
| Erosion and sediment control | ☐ | Livestock management | ☐ | Water harvesting | ☐ |
| Farmer/land user participation | ☐ | Modeling | ☐ | Watershed management | ☐ |
| Forestry | ☐ | Overgrazing | ☐ | Wind erosion | ☐ |
| Economics of resource management | ☐ | Policy framework | ☐ | Others (specify) | ☐ |
| Gender & resource management | ☐ | Poverty & resource management | ☐ | ..... | ☐ |
| Geographic information systems | ☐ | Range management | ☐ | ..... | ☐ |
| Geomorphology | ☐ | Remote sensing | ☐ | ..... | ☐ |
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**Research projects (completed or in progress)**

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**Publications (please enclose copies if available)**

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***If the space on this form is not sufficient, please continue on a separate blank sheet***

**Date** ..... **Signature** .....

***Thank you for filling and returning this form***

## For the Set-up of a Working Group on Prediction of the Nutritive Value of Feedstuffs for Ruminants in West Asia and North Africa

*Michel Chenost, ICARDA, P.O. Bx 5466, Aleppo, Syria*

The recent knowledge in ruminant nutrition provides tools which enable a better approach and better accuracy in matching the animal feeding systems to the available feed resources. However this knowledge, particularly in WANA countries, is still neither well spread nor accessible to NARS. A consensus and a better understanding of the scientific principles must be reached.

Different units are used to express both the nutritive value (Energy, Nitrogen value, Ingestibility / Intake) of a feed and the requirements of the animals. Just taking the N (Nitrogen) value of a feed as an example, should we still talk in terms of Digestible Crude Protein - DCP -(this is what a lot of people still unfortunately do) whereas the modern N system based on N degradability in the rumen allows, for instance, mastering with an extreme accuracy the use of non protein nitrogen (NPN *e.g.* urea) in a ration, which was impossible with the DCP system;

Different methods and techniques are available to predict those values. They range from the classical chemical analysis to the more recent and sophisticated, but nutritionally more accurate, biological tests *e.g. in situ* techniques. The question is, then, "which technique to chose to solve a given problem at the optimum precision/cost ratio" Still referring to the above N value example : are people going to use fistulated animals to assess the N degradability of straw whereas, in that case, a simple Total N (Kjeldahl) is sufficient.

The above examples may be provocative but they stress the fact that, in front of a panel of techniques, one should first think of one's problem before embarking in sophisticated, costly and, often, nutritionally irrelevant techniques. All these problems deserve to be critically discussed between specialists. This is why ICARDA, in consultation with NARS and with the Mashreq and Maghreb Project (M&M), has considered launching training activities and writing a manual on the methodology for evaluating the nutritive value of local feed resources for ruminants.

The training component would be managed at two levels : a workshop for senior people and a training course for more junior ones.

The workshop (ICARDA, Tel Hadya, Syria, 5 days, early 1999) would consist of midseniority specialists of WANA and some key external specialists in addition to one or two ICARDA scientists. It will focus on the standardization of methods for predicting the nutritional value of feedstuffs for ruminants in WANA. Its objectives will be (a) to review the scientific principles of feed evaluation (nutritional approach/concepts) and the available methods and techniques and (b) to critically discuss the relevance of the latter to WANA constraints through case studies. Its main output is to come to a consensus about appropriate methods for feed evaluation in ruminants. It will also help to contribute to a better preparation of both the training course and the manual on methodology of feed evaluation. The long term output is to enable people involved in animal production to perform better adequation between feed resources and animal requirements.

The training course (ICARDA, Tel Hadya, Syria, 10 days in late 1999) will deal with "*appropriate techniques for predicting the nutritional value of feedstuffs for ruminants in WANA*". It is planned for junior teachers, researchers and extensionists in animal production/nutrition of WANA. Its main objectives will be to update the trainees' knowledge in ruminant nutrition and to train them on the available and relevant techniques for the evaluation of the nutritive value of WANA feedstuffs. Its main output will be a better understanding of appropriate methods for feed evaluation/utilization in ruminants with a final long term output : better efficiency in running laboratory and field work in ruminant nutrition. Its content will include (a) lectures on the recent advances in ruminant nutrition (Energy, Protein and Intake systems) and on methods for measuring and predicting (chemical, physical, biological, ...) the nutritive value of feedstuffs, (b) case studies, (c) laboratory practical work on specific techniques.

The Manual/Book on feed evaluation in WANA countries aims (a) to review the scientific principles of feed evaluation and the available methods and techniques for predicting the nutritive value of feeds, (b) to provide researchers, teachers and extentionists of the WANA region with tools which would enable them (i) to answer questions such as "which technique to chose to solve a given problem of feed evaluation at the optimum precision/cost ratio?" and, finally, (ii) to perform better adequation between feed resources and animal requirements. Its content will be : (a) description and classification of local feed resources of WANA by main nutritional categories, (b) the recent advances in ruminant nutrition : energy, protein and intake systems; (c) methods for measuring the nutritive value of feedstuffs and (d) the description of the various methods available for predicting the nutritive value of feedstuffs and the discussion of their relevance to WANA constraints through case studies.

## WANANET: Steering Committee Meeting

*Yawooz Adham, WANANET Coordinator*

The Steering Committee of WANANET met during the period 27-28 June 1998, after the Regional Meeting on Implementation of the Global Plan of Action for the Conservation and Sustainable Use of Plant Genetic Resources for Food and Agriculture in Central & West Asia and North Africa, which took place at ICARDA.

Following the specific recommendations of the GPA implementation meeting on WANANET and

CAN/PGR, which states that ***"The Steering Committee of WANANET and CAN/PGR are invited to follow up the relevant recommendations of the meeting"***. The Steering Committee met to discuss implementation of activities and possible changes in its governing bodies, in order to increase its efficiency.

Dr. Yawooz Adham, WANANET Secretariat, emphasized the significant role that WANANET is expected to play in implementing the GPA. He presented ideas on the modus operandi and structure of WANANET aiming at strengthening this cooperative Network to better catch the opportunities offered by the GPA.

In particular his proposals aimed at improving the involvement of National Programmes in plant genetic resources work, the setting of priorities, formulation of projects, the implementation of its decisions and more efficient coordination of the activities of its governing bodies.

The Steering Committee agreed to make the WANA-PGRC more effective in order to enhance the efficiency and productivity of the network, and therefore agreed on the following points outlined in his proposal:

1. *The West Asia & North Africa Plant Genetic Resources Committee (WANA-PGRC) consists of three representatives from each National Programme in the region. The appropriate national authorities will nominate the representatives at the higher level on the basis of their scientific background, which must be related to plant genetic resources work.*
2. WANA-PGRC members will meet once every three years.
3. WANA-PGRC will elects the nine members of the Steering Committee. The Steering Committee is composed of scientists committed to WANANET and of high scientific standards in plant genetic resources. It should include members, who represent all the sub-regions of WANA. The representation will be as follow: West Asia (4 members), Arabian Peninsula (2 members), North Africa (3 members).
4. The WANA-PGRC will examine and eventually endorse the reports of the Steering Committee.
5. The Steering Committee meets once every year, or at closer intervals if the need arises.
6. The WANA-PGRC decides on the composition of the workshops (working sessions) during its regular meeting following the existing six working groups (Cereal Crops; Horticultural Crops; Pasture, Forage and Rangeland Crops; In situ/Biodiversity; Food Legumes and Industrial, Aromatic and Medicinal Crops) of WANANET.

The steering committee felt that the WANANET's objectives drawn out in 1992 upon the establishment of the Network, need updating, and agreed on the following changes:

(1) Identify common problems and constraints hampering effective conservation and utilization of plant genetic resources in individual countries and in the region and indicate ways and means to overcome these constraints;

(2) Assist national programmes in developing national genetic resources programmes and establishing national committees on plant genetic resources;

(3) Strengthen the relationship with other networks, including crop genetic resources networks;

(4) Develop and follow up on plans of action at the regional level as identified by the network;

(5) Promote scientific exchange and cooperation, and to promote coordination, planning, and priority setting at the regional level, as a means to avoid duplication, to strengthen and make more efficient existing work in plant genetic resources.

(6) Provide a common forum for information exchange, and documentation of plant genetic resources, public awareness among policy makers and agricultural researchers.

(7) To facilitate the implementation of the GPA by acting as a platform at the regional level.

The implementation of WANANET activities to a great extent relies on the commitment of Governments and interest of scientific at national level. In order to improve the effectiveness of national programmes and commitment by member countries the following are proposed:

1. Functional National Committees for PGR (NPGRC) must be established in all member countries. Some countries already have establish NPGRC whose effectiveness varies among countries, but other countries have not establish yet (this must be a precondition for membership)
2. Commitment by national programmes, that WANANET recommendation will be implemented in the country.
3. A symbolic contribution as a membership fee will be introduced, this fee will strengthen the sense of ownership of the national programmes have for the WANANET, while this contributing to implementing some most urgent activities of the network. This amount will be paid as cash or in kind in the form of services costs of hosting meeting etc.

The Steering Committee agrees on the need to develop a regional project proposal on computerization and standardization data, development of national genetic resources databases in CWANA countries, and on linking the National Programme databases in a regional genetic resources information system.

# UP COMING EVENTS

### VI International Rangeland Congress

Townsville, Australia - July 19-23, 1999

***Program Congress***

**Opening Plenary Session and Speakers**

In the opening plenary "People and Rangelands", delegates will be challenged to consider the broad rangeland issues involving people, financial and natural resource systems and their interrelationships. It will set the scene for the Congress with three speakers and a Panel Discussion. The speakers will focus on issues of People and Rangelands from the perspectives of past impacts, the current struggle, and building the future. Each will participate in the subsequent discussion along with additional Panel Members who will provide a variety of perspectives from around the world. Congress delegates will have opportunity to contribute to the discussion.

The Closing Plenary session, "Building the Future", will include presentations summarising the outcomes of sub-theme, a final plenary speaker, discussion, and concluding commentary. Analyses of session outcomes, plenary, invited and selected contributed papers, and Congress conclusions concerning how rangeland people may build a better future will be published after the Congress separately from the Congress Proceedings.

There will be 18 scientific sessions:

***Call for Papers***

Any individual is invited to submit one paper relevant to any of the themes outlined in the Congress Program. All volunteered papers will be presented as posters that will be displayed for at least two days of the Congress. All accepted volunteered and invited papers will be published in the Conference Proceedings that will be available at the Congress. Abstracts will be available on the internet (http://irc.web.unsw.edu.au). All papers must be written in English and peer reviewed (see Instructions to Authors later).

Abstracts of volunteered and invited papers are due by: 30 August *1998*.

Abstracts should be submitted to:

Editors
International Rangeland Congress
PO Box 764, Aitkenvale
Townsville, QLD 4814
Australia

or emailed to: editors-irc@unsw.edu.au

Papers, volunteered and invited, are due by 30 November 1998.

### International Herbage Seed Conference – 1999

The Fourth International Herbage Seed Conference is to be held in Perugia (Italy). It will run from Sunday 23 May to Friday 28 May 1999.

The main objective of the Conference is to provide a forum for the exchange of information on activities related to forage seed production, particularly in Mediterranean environments.

Further information can be obtained from Prof. Mario Falcinelli, Instituto di Miglioramento Genetico Vegetale, Facolta di Agraria, Universita degli Studi di Perugia, Borgo XX Giugno 74, 06100 Perugia, Italy. Phone: +39 75 585 9205. Fax: +39 75 585 6224. E-Mail: imgv@egeo.unipg.it.

### International Symposium on *Arid Region* Soils

Izmir,Turkey, 21–25 September 1998

Organized by Çukurova University, Soil Science Society of Turkey, General Directorate of Rural Services, and held under the aegis of the International Society of Soil Science.

All correspondences should be addressed to: Prof. Dr. Suat Senol. YISARS Secretary, Çukurova University, Dept. of Soil Science. 01330 Adana, Turkey. Fax: +90 322 338 6643.

### International Symposium on Livestock Production and Climatic Uncertainty in the Mediterranean

Agadir, Morocco, 22–24 October 1998

The first objective of the international symposium on 'Livestock production and climatic uncertainty in the Mediterranean' is to analyze in detail how the concept of risk still affects Mediterranean livestock systems. The second objective is to identify ways of developing livestock production under these conditions. Two complementary strategies might be put in action: a strategy against uncertainty to eliminate climatic constraints through intensification (irrigation, purchase of inputs, etc.) and a strategy of adoption to alleviate the impact of drought on sustainability of the existing production systems and to ensure sufficient supply of animal products.

The third objective is to assess the relative importance of each of these two strategies and to examine how they are presently implemented in the Mediterranean countries.

The symposium is organized by the Moroccan National Association of Animal Production (ANPA) in collaboration with EAAP, ICAMAS-IAMZ and FAO.

# NEW RELEASES

### *ICARDA Caravan* No. 6 Spring/Summer 1997

Bangladesh has been updating its lentil technology in a big way—and the results have been satisfying. ICARDA has been helping breed the varieties of the future (Page 8).

Bread wheat—the most important staple of all? How wheat research has helped to feed millions (Page 10).

The deserts of Egypt are springing into life. An enlightned approach has ensured that women take a full part *in this* process (Page 14).

ICARDA has been bringing farmers from the region to Syria again. Recently they've been looking at range management and water harvesting (Page 16).

Vanishing hillsides...Overgrazing renders slopes vulnerable to water erosion. But high-tech tools can help us to understand what's happening—and start looking for an answer (Page 18).

Seeds—you can't grow much without them. Ethiopia has found a way of getting them to farmers (Page 22).

Making sense of a mass of data; how ICARDA developed software to make crop trials more useful (Page 26).

Plus...A birthday party. ICARDA is 20 years old this year, and it's been celebrating (Page 4).

### *ICARDA Caravan* No. 7 Autumn/Winter 1998

Poverty—it is also rural, and it is connected with agriculture. *And it is perhaps* the biggest single threat to the environment in the dry areas (Page 8).

Central Asian agriculture is changing. ICARDA is now the focal point for international efforts in research collaboration (Page 4).

China is looking to the future and has just held a meeting with international research institutions (Page 7).

The pattern of agricultural labor is changing. And women are affected most of all (Page 10).

More sheep, more meat, more dairy products—thanks to ICARDA's work with farmers in Syria (Page 14).

Medics are a good tool for rehabilitating poor grazing land. But where do you get the seeds? ICARDA has been developing answers (Page 16).

ICARDA's national partners are bringing farmers into the research process (Page 20).

Disney is an ally in the drive to educate the public about agriculture (Page 24).

Agriculture began in West Asia—but how? The past could provide clues to the future (Page 26).

Biotechnology has helped ICARDA to protect the lentil harvest (Page 30).

Caravan is published four times a year, by ICARDA.

Executive editor: Dr Surendra Varma.
Editor: Mike Robbins

### THE ARID LANDS NEWSLETTER #42

Editor's note:

The newly recognized importance of urban agriculture----by Katherine Waser.

Agriculture in Middle Eastern cities: Commonalities and contrasts-----by Joe Nasr and Paul Kaldjian.

Istanbul: Opportunities in urban agriculture-----by Paul Kaldjian.

Drought mitigation policy and food provision for urban Africa: Potential use of treated wastewater and solar energy -----by Hendrik Bruins.

Are urban gardens an efficient use of resources? -----by David Cleveland.

Urban trees in arid landscapes: Multipurpose urban forestry for local needs in developing countries -----by Guido Kuchelmeister.

For further information:Resources on urban agriculture-----compiled and annotated by Katherine Waser.

Briefly noted: Selected resources of interest----- Annotated by Carla Casler

Selected news of interest-----Annotated by Heather Severson.

### *THE ARID LANDS NEWSLETTER #43*

Editor's note:

Of ecotourism and linkages-----by Katherine Waser.

Ecotourism and the desert whale: An interview with Dr. Emily Young.

The potential for ecotourism in Uzbekistan-----by Eric Sievers.

The role of NGOs in promoting drylands ecotourism: An Ongoing project in southern Tunisia-----by Mohamed Ouessar and Habib Belhedi.

International cooperation and sustainable tourism in the Gulf of Aqaba-----by Robin Twite

SPECIAL REPORT: The Convention to Combat Desertification after COP-1-----by Guenter Riethmacher and Hassan Hassan.

For further information: Internet resources on ecotourism-----compiled and annotated by Katherine Waser.

Briefly noted: Selected resources of interest----- annotated by Heather Severson and Elaine Cubbins.

Selected news of interest-----annotated by Heather Severson.

The Arid Lands Newsletter is published semi-annually for an international readership with the purpose of exploring events and issues of interest to arid-lands researchers, resource managers and policy-makers, by the Office of Arid Lands Studies, College of Agriculture, University of Arizona. E-mail: kwaser@ag.arizona.edu

### *Biodiversity, Equity and the Environment*

*A Review of Research for Development.*
*IDRC 1997-1998, IDRC Canada.*

***Opinion***

***Integrating the issues----------Page 3***

If sustainable and equitable development is to become a reality, environmental, social, and economic policies must work together. Authors David Brooks, Jamie Schnurr, and Neale

### Internet Connections

Society for Range Management http://srm.org
The Society for Range Management's site with information publications, meetings, as well as the *Journal for Range Management* and *Rangelands* on-line. It's a good place to find what the people of the Society are doing.

## NEW SUBSCRIBERS

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Current research focuses on rangeland ecology and management. I'm testing various management strategies (fire, spelling, grazing pressure) and their effects on the sustainability of tropical rangeland.

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**Egypt**
**Dr Said Ahmed Omar**
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Tel: (202) 5724893; Fax: : (202) 5723146

I'm a plant pathologist working on legume and forage disease section, Plant Pathology Research Institute, Agricultural Research Center, Giza, Egypt.
My current interest is to search for natural plant products having antimicrobial substances to be used in controlling plant pathogenic microorganisms. These natural plant materials are safe to the environment and active as pesticides and fungicides in controlling plant diseases. These anti-microbial substances exist in many forage, pasture and range plants: alfalfa, *Atriplex*, *Stipa*, etc. Our results showed that alfalfa and/or *Atriplex* extract inhibited growth of some soil born fungi.

**Mohamed El-Nahrawy**
Forage Crops Research Department
ARC, Giza

My current research and interests are developing high yielding varieties of Egyptian clover, alfalfa, sorghum and millet resistant and/or tolerant to biotic and abiotic stresses. The activities are mainly carried out through collecting, maintaining, evaluating, selecting and enhancing the local and exotic germplasm of the above species. I'm also evaluating introductions of forage crops such as fodder beets, Bermudagrass, Italian ryegrass in the view to select the most suitable species and varieties within species for newly reclaimed land. In addition, I'm involved in activities related to natural resources management of rangelands in Marsa Matrouh, Egypt.

**Eritrea**
**Simon Abai Bisrat**
University of Asmara
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I'm working in the University of Asmara, Department of Animal Science as a graduate assistant. Previously I have been working in the Ethiopian Research Institute as a Research Assistant particularly in the area of forage and pasture research. I'm planning to pursue my study for my M.Sc. degree on range science.

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Collection, evaluation and utilization of oats, sorghum, amaranth and Guinea grass germplasm; Development of varieties of oats, guinea grass and hybrid of sorghum-sudan-grass (using cms); Production of basic and breeder seed of forage varieties and monitoring of the above seed plots; officer in charge of all India coordinated Research Projects on Forage Crops, testing of forage crop varieties, data collection, compilation and preparation of annual reports; Teaching of plant breeding and seed technology courses and guide P-G students' dissertations; Provide training for farmers, government officials and foreign trainees.

**Iraq**
**Dr. I.K. Ibrahim**
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Director for the food and forage legumes in Iraq since 1993. The program is concerned with the development and production of food and forage legumes through direct contact with farmers and sheep owners.

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Currently I am working on modification, expansion and implementation of the people's participatory approach for range rehabilitation and rangeland management plans. I am also making efforts to promote the ley farming system in Iran through convincing decision-makers.

**Jordan**
**Professor Muhammed Harb**
Department of Animal Science, Faculty of Agriculture
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I have worked and still working in sheep nutrition from 1979 till now. My work is related to sheep nutrition in the range and under mixed pasture. I'm working also with by-products, such as Citrus pulp, olive pulp, tomato pomace, banana leaves and many others.

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Morocco

I'm working at an agricultural experimental station, particularly in the pasture and forage program. This program is responsible for introducing and testing new sources of pasture and forages. The evaluation fort the pasture and forage includes establishment, yield and animal performance. I would appreciate to any one could provide any small samples (seed, vegetative material) to include in my research program.

**Nigeria**
**Dr. John Adisa Ayoade**
Department of Animal Production
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Evaluation of new and unusual products as feeds for animals and rabbits; management of grazing animals; agronomical practices and nutritive value of crop residues/forages; small ruminant production systems.

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I teach courses on grassland and forage science, dealing with both temperate and tropical regions, therefore I'm interested in your Network News. My research is at present concerned with legumes in temperate grassland.

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I work on two projects : 1. Revegetation of marginal regions; 2. Utilization norms of pastures in dry regions.

**Sudan**
**Dr. Mohamed Elamin Elimam**
PO Box 188, Medani
I'm a Veterinarian with MSc and PhD in Ruminant nutrition and production. I'm interested in browsing in ruminants, especially goats. I determined the rumen degradation of different browses in Nubian Goats. I'm introducing new browses (eg *Leucaena leucecephala*) into the Sudan. I'm surveying the pastures around the Rahad area to identify the browses and to determine their nutritive value. I'm interested in antinutrional factors in browses and other feeds especially tannins, polyphenol, alkaloids, flavour, etc...I'm interested in compensatory growth in ruminants. I'm interested in camel nutrition.

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**Syria**
**Elias Fayad**
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Lecture at the Faculty of Agriculture on pasture and forage crops

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Our faculty is conducting research to lay the ground for a sustainable agricultural development in the Agricultural Research and Development Project Package (GAP) Region in Southern Anatolia. This project is aiming at irrigating 1.7 million hectares and it is essential to know in advance which crop types can be adapted to the newly irrigated and to the surrounding rainfed areas. In the forage, pasture and rangeland area, we are studying the following:

- effect of row space and fertilizer application (P) on alfalfa seed yields alfalfa cultivars
- Mixture of grasses with *Trifolium alexandrinum* and field pea as winter crops
- Establishing of suitable range for turkeys and their effects on turkey performance
- effect of different range improvement methods on yield of natural range and lamb grazing
- feeding experiment on the different ranges.

**Prof. Dr. Hayrettin Ekiz**
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At the Forage and Rangeland Section of the department, we are interested in increasing animal feed production in Turkish agriculture. The perennial legume sainfoin (*Onobrychis viciifolia*) has a great importance in dryland agriculture systems of Turkey because of its high quality hay. In the inner parts of the country, the crop has an insect damage problem that has decreased its acreage in the last 15 years. We have been conducting a project with ICARDA to develop some lines tolerant to the insects since 1992. Some good progress has been made and a number of lines have been tested.

We are also working on rangeland inventory to understand degree of degradation, biodiversity, actual and potential yield, species distribution, and vegetation composition.

In addition to research studies we are giving classes on grasses, forage legumes, range management and improvement to over 2000 students in the university and technicians from Ministry of Agriculture and Rural Affairs.

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# LAST SEMESTER SHARE

### Use of GIS/RS technologies for rangeland inventory, survey and mapping

Dear readers,

We received several contributions related to the subject. We also included some useful references.

## GIS/RS at ICARDA

*Tom Nordblom* et al. and Nicholas Thomas

ICARDA has begun integrated use of remote sensing, GIS, GPS and biological and socio-economic surveys. ICARDA works in collaboration with NARS of the North Africa and West and Central Asia regions and, other institutions in these countries as well as centers of excellence from outside. Brief notes on on-going projects are given below:

### Geo-Referenced Grazing Areas and Grazing Transhumance of 56 Households in The Jebal Abdul Aziz Area of Hassakeh Province, Syria.

In this study on the economics of agro-pastoral systems in the barley/sheep zone in northeastern Syria, 56 households were interviewed. Questions included a description of each household's local grazing domain, *locations for* transhumant grazing of crop residues outside the Jebal Abdul Aziz area and details of sheep diet calendars.

Each household location was recorded with a GPS reading to provide the geo-reference for recording "range and bearing" descriptions of local grazing area limits. These were transferred to a topographic map of the area on the spot for confirmation by the interviewee. Individual household grazing area maps were collected with GIS (ILWIS) for display on a single page with a one-km grid.

Locations of summer grazing of wheat stubbles and autumn grazing of cotton residues, both outside the main study area, were recorded in the same interviews, again in the form of "range and bearing" questions confirmed with an area map on the spot.

Questions were asked on the percentage composition of sheep diets from various feeds and grazing sources, month-by-month. This allowed summarizing a calendar of change with the seasons, providing a picture of the economic life of the local agro-pastoralists. The overlap of local grazing territories of households from the same village, and non-overlap with other villages, was a glimpse of what would be found in later studies.

### Geo-referenced transhumance and sheep diet calendars of 30 bedouin households leasing parcels in four government grazing reserves planted to shrubs in Syria.

This field study focused on understanding the context of bedouin use of government grazing reserves which were established in the mid to late 1980s on the traditional grazing lands of the Hadidiyin of NW Syria. In collaboration with the Steppe Directorate of the Syrian Ministry of Agriculture and Agrarian Reform, the locations of the perimeters of four grazing reserves were determined by GPS readings and plotted with GIS.

The bedouin households with grazing contracts in the spring of 1996 were met and interviewed individually. Transhumance patterns of the summer and autumn months, with information on year-round diet calendars were elicited.

Most of the 30 households using the grazing reserves were of the clans which had used the same land in earlier times and were continuing their use both for the grazing it provided and to maintain their use rights. These economic and institutional contexts for natural resource management could now be seen in perspective. Plans for improving the rangelands could benefit from the direct participation, and protection, of the traditional land users.

### Geo-Referenced Clan and Tribal Boundaries in the South-East of Aleppo Province and the Northern Part of Hama Province, Syria.

Questions remained over the definition of traditional use rights on rangeland. The locations of clan boundaries and the existence of informal institutions governing them (in conjunction with the official position that all this is state land), were the subject of an in-depth study.

A painstaking process of locating, one at a time, the head households of clans, the identities of neighboring clans on all sides, and the positions of clan boundaries, was done through interview visits to the boundaries and the recording of GPS fixes. Locations of clan boundaries were cross-checked with neighboring clans. While sometimes marked by plow lines, the physical presence of these boundaries was often missing, being described as an imaginary line between two hills or piles of stones. These were boundaries nevertheless, existing as local institutions due to the mutual respect accorded them by neighboring clans.

We created a boundary map for the rangeland areas using the GPS fixes with a GIS program (ARCINFO). This map has no legal basis or administrative use except for the higher rainfall cultivated zones where there are government maps of village boundaries, and lines defining official rainfall zones. The latter define units used for government planning and administration of policies.

The clan boundaries in the rangeland areas do not exist legally. But, because they are respected by the land users, we come back to the prospect of locally supported development efforts for identifiable groups of land users. This was a breakthrough also in allowing economic appraisals of different investment options.

### Resource Management Mapping in the Farm and Rangelands of Aleppo Province, N35°-36° and E37°-38°, Syria.

This is a collaborative project linking ICARDA with the Maison de l'Orient Méditerranéen (Université Lyon 2, Lyon), the Graduate Institute of Development Studies (I.U.E.D.), Geneva, and IGARUN at the

University of Nantes (France) in a research and capacity-building program.

This study will result in detailed maps of the natural resource base in the same areas and beyond. Landsat images and intense ground-truthing on vegetation and soils are being combined with topographic maps to provide detailed resource characterizations at scales appropriate for practical range management decisions. Because the Twaimat area is included in this study's coverage, the intention is to make use of the detailed natural resource information in the "community modeling" which is planned.

The natural resource mapping project includes a historical perspective with archeological experts doing the field work needed to map and understand the many ancient ruins in the area. These include defunct pre- and post-Roman irrigation works, gardens, fortresses and towns in areas which today appear more like a lunar landscape. The Syrian Ministry of Antiquities is a partner in this work.

### GIS/Spatial Modeling of Primary Range Plant Productivity and Carbon Balance in Central Asia

These activities are key parts of a USAID Small Ruminant Collaborative Research Project (SR-CRSP) of the University of California - Davis, ICARDA. Collaborating are NARS of the three republics (Kazakstan, Uzbekistan and Turkmenistan) that account for most of Central Asia's steppe ecologies; some 260 million ha of treeless plains with 100-400mm annual precipitation.

In this project, the basic resources for livestock production will be described and quantified in a GIS. A GIS model of forage production in the major ecological regions of Kazakstan, Uzbekistan and Turkmenistan (with $10km^2$ resolution) will be based on continuous measurement of $CO_2$ fluxes. This model will be used to construct scenarios of seasonal range production in the different zones, and will provide an assessment of the role of rangelands in the global C budget and climate changes.

### Rangeland Resource Management Mapping in the Rangelands of the Karnap Station of The Karakul Sheep Breeding Research Institute, Samarkand Region, Uzbekistan.

This project is aimed at modeling in physiological detail the sheep / range / cropping systems at sites in Central Asia. Large scale GIS mapping of range resources at the individual management-unit level (1:25,000) is intended in this project.

### GIS/Spatial Crop-Growth Modeling in the Central Dryland Cereal Belt South of Casablanca, Morocco

This is the longest-established GIS activity at ICARDA, funded from the mid-1980s by IDRC and done in collaboration with INRA-Morocco and the Moroccan Meteorology Office. Weather records were assembled from numerous sites in the study area to provide the empirical basis for a "spatial weather generator" model.

The spatial interpolation made possible by the model allowed generation of a stochastic series of daily rainfall, temperature and solar radiation for each point in a grid-work covering the study area. Combined with soil data for these points, this provided the input needed to run a crop-growth simulation model depicting multi-year sequences of wheat yields.

The results were shown in maps of probability gradients for given yield levels, maps of average yields, yield variations over time, etc. Morocco, like many countries of the North Africa, West and Central Asia region is subject to wide year-to-year fluctuations in growing conditions for dryland farming). This work provided scientists and policy makers a clear picture of the "moving" target of potentials they have to deal with in this vast region.

The crop-growth simulation model "SIMTAG" used in this pioneering work was derived from the earliest versions of the CERES-Wheat model. Driven by daily weather, and given a soil description, the model would calculate wheat yields calibrated for given cultivars where N and P are not limiting... the best under the soil and weather circumstances.

But farmers routinely encounter problems with pests, winds, frosts and hail events, and sub-optimal fertilization, not simulated in the model. This raised the idea of comparing reported yields of farmers with simulated yields. The hypothesis was that the cumulative distribution over time of the former should be lower than that of the latter, and that the difference between these is a quantifiable "yield gap" that might be closed with targeted agronomic research.

This lead to the idea of mapping yield-gap contours, showing in a spatial frame the differences between simulated and reported yields. With such a tool, researchers could geographically target areas of greatest potential improvement. Errors arising from the simulation process and from farmer interviews on their yield experiences provide a rich basis for methodological debate and further study. The combination of "hard" and "soft" science here has been provocative.

## Lebanon

### Prospects for GIS Use in the Lebanese Agricultural Research Institute-----by El Takach Tamim

Lebanon is a small but environmentally diverse country. Agro-Ecological Characterization (AEC) was identified as a key component and a valuable tool to target agricultural research.

In this context, spatial distribution of agricultural information is important. This can be achieved by using GIS (Geographical Information System). This tool will help gathering and relating information for optimal agricultural development purposes.

It is very important to advise farmers and help optimizing supplemental irrigation scheduling and

other farmer operation, methods for yield forecasting, methods for monitoring land degradation.

The M&M project should have a pilot function, introducing new methods and demonstrating their potential in the project area. Successful approaches would then be taken up by the concerned units of LARI and replicated in the other regions of the country. What is still needed is some guidance and training from ICARDA.

As possible collaborative activities baseline climatic and soil-landscape inventories, mapping the potential productivity of crops and identification of environmental constraints and risks to crop production were identified.

The GIS tool of selecting and gathering information for agricultural development purposes, will be helpful to realize the project objectives.

There was no previous experience at LARI regarding GIS, two scientists attended the AEC training course organized by ICARDA in Amman last October, and one of them is attending another course on GIS and RS use in agriculture.

Since Agro-Ecological Characterization (AEC) was identified as a key component for Lebanon, the M & M working team will emphasize this approach. In fact, the project phase II workplan included AEC as a major activity.

## Morocco

### Use of GIS in INRA-Settat, Morocco---- by Dr Mohammed Amrani

**CRRA P.O. Box 589**
**Settat- Morocco**

GIS has been involved in many fields of agriculture and is a very powerful tool. In the INRA-Settat Center in Morocco, the GIS was used to generate soil productivity maps. The objective is to put together all information regarding soil type, fertility, climate, and crops. The output will make it easy for farmers to manage these soils effeciently. These maps will be generated for specific zones and will be the base of vecisian making of every developping project. In the future our objective in the Aridoculture Center in Settat is to use GIS to develop "Precision Farming". In fact, fields are heterogeneous, therefore, inputs have to be distributed depending upon the productivity of a specific part of field. This way of managing fields will minimize production cost as well as negative environmental effects of fertilizers especially N and P, and pesticides.

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# *SHARE OF THE SEMESTER*

## Common Vetch (*Vicia sativa* subsp. *sativa*)

Forage legumes have enormous potential for raising cereal yields and quality and better sheep-feeding. The use of legumes in rotations will also ensures long-term sustainability of the land. And several countries are promoting use of forage legumes in rainfed farming systems.

Our readers are kindly requested to exchange their experience on Common Vetch research, promotion and use with colleagues of the region. The editors will compile the information and publish it in a coming issue of the *News*.

# DRLYLAND PASTURE, FORAGE & RANGE NETWORK

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