Dryland Pasture, Forage & Range Network News

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Fodder shrubs could play a role in the rehabilitation of rangelands in semi-arid and arid zones

Farmer Abdullah Gazi from Marsa Matrouh, Egypt inspects an *Acacia saligna* seedling for adverse root coiling (see page 6).

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EDITORIAL

Forage, pasture and range genetic resources: Building for the future

The Central and West Asia and North Africa (CWANA) region is the center of origin and primary diversity for many range, pasture and forage species. These species have developed adaptive strategies to cope with prevailing soil, climate and management systems across the region. The special characteristics found in indigenous plant material are important to preserve and utilize, and their loss will reduce the potential for forage, pasture and range production in the region.

There is a clear need to save at least part of these resources for future generations as concern is growing that an accelerated genetic erosion is occurring for many important species. Much effort is also needed to use these resources for increased productivity by increasing the range of genetic diversity available to the farmers.

Combining of forces and sharing of experience is essential to meet these challenges. Coordination is essential to contribute both to conservation and increased productivity. Links should be strengthened between all concerned stakeholders, and mechanisms for coordination with national and international organizations established.

The International Plant Genetic Resources Institute (IPGRI) is a partner in global efforts to strengthen the conservation and use of plant genetic resources. In line with its strategic plan 'Diversity For Development', IPGRI has been working in the CWANA region with several regional and international organizations/centers. These include FAO and other intergovernmental organizations, ICARDA and other IARCs, the regional research network AARINENA, regional organizations and research centers such as AOAD and ACSAD. This collaboration will be further strengthened.

Aware of the importance of networking, ICARDA, IPGRI and FAO organized in 1992 a workshop with representatives from 13 WANA countries. During this meeting, WANANET was created to serve as a regional network to strengthen common activities and to build regional collaboration in conservation and use of plant genetic resources. WANANET made substantial contribution to the enhancement of range, pasture and forage genetic resources in the region. A major achievement of WANANET is the establishment of a regional network for rangeland seed information. It has two subregional nodes, one in Jordan to serve the Mashreq countries, and one in Morocco to serve the Magreb countries. The Network's objectives are: 1) to document information on rangeland seed in the region; 2) promote the exchange of information, genetic materials and experience on distribution, availability and ecotypes of pasture plants; and 3) strengthen national research programs and seed production. Training courses on information handling and computer use, with practical applications for rangeland plants, have been organized.

Another potential area for collaboration between countries in the region is the sharing of the burden of *ex situ* conservation, characterizations and evaluation. Much forage, pasture and range germplasm has been collected in this region. For example, the workload of characterisation could be reduced if each plant group is assigned to a single country.

There is a need to formulate regional projects on the subject as recommended by the meetings of the Range, Pasture and Forage Working Group of WANANET. Due to the shortages of international funding, it has become imperative to get together to raise funds from international and other donors.

I strongly believe that networking is a step forward in the field of agricultural development. Joining forces can lead to the safeguard of the range, pasture and forage genetic resources and to their exploitation for developing new and performing cultivars. Through collective action, we can conserve the available genetic diversity and put it to work in the service of development.

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Ecology and biotechnology of pasture plants in Kazakhstan

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Kazakhstan covers a territory of 2,7 million square. kilometers, out of which 64% can be used as pastures. The 182 million ha of pastures cover five natural zones: forest-steppe, steppe, semi-desert, desert, and mountain, with 4.0, 36.4, 32.4, 90.2, and 19.0 million ha, respectively.

The basic pasture territory of Kazakhstan is characterized by a dry continental climate with an annual rainfall of 200-250 mm. The soils are grey and brown with an organic matter content of 0,7-1,2%.

The relationship between pasture plants and environment plays an important role in productivity of pastures. Plant response depends on many factors such as soil, climate, geology, topography, and human activities.

Light. Productivity of pastures is connected with the photosynthetic activity of plants. In forest-steppe and steppe zones occupying about 22% of total pasture land, the photosynthetically-active radiation (PAR) is 1.0-1.5%. In arid zones, occupying about 67 of total pasture land, PAR decreases to 0,2 %. A task of the future is to select or develop plant species with improved PAR.

Temperature. Pasture plants can be divided into different groups according to their ability to withstand the long winter period: highly cold-resistant (*Agroppyron, Festuca, Bromopsis*); cold-resistant (*Poa, Lotus*); average cold-resistant (*Medicago, Trifolium*); and low cold-resistant (*Arrhenathum*).

Drought. Kazakhstan is frequently affected by drought. In desert and half desert zones, there is a competition between pasture plants for moisture. This results in pruning of vegetation, changing the type of structure and decreasing plant productivity. The most drought-tolerant pasture include perennial grasses, wormwood and shrubs. In forest-steppe and steppe zones, water supply is more or less optimum.

Influence of animals. There is a close relation between plants and animals. Overgrazing , due to non-rational use of pastures between 1965 and 1994 when the number of animals has substantially increased has caused desertification in huge territory (63 million ha). The consequences of this ecological accident still have negative effect on feed supply industry in Kazakhstan.

Anthropologic factors. Human activities (mining, military camps, drainage, building of roads, etc.) have influenced the geographical distribution of pasture plants, their structure, their quality and their efficiency.

There is a clear need for the maintenance of an ecological balance in pasture ecosystems. In particular, there is a need for the selection of new cultivars for special zones with good balance between plant and animal development.

During the last 10-15 years breeders have succeeded to develop new varieties of arid pastures: Takums hybrid, Progress 85, Tolagai; Almaty-1; Tereskena KLX-2; Aidarlinsk; *Psathyrostachys juncea* and Start. The first cultivars from wormwood were also developed. There is a group of new varieties successfully cultivated under irrigation as well as under rainfed conditions. These include alfalfa varieties: Semirechenskaya, Zalinckaya, and Karkara 90.

All these cultivars were created by traditional methods of breeding by mass, group, or individual selection. Now, new methods and especially biotechnology can accelerate the development of more reliable and productive cultivars of fodder species.

In Kazakhstan such research started with 3 species from *Agropyron* and *Psathyrostachys juncea*. Tissue and embryo cultures were used. A number of researchers noticed dependence of proliferation on ploidy of plants. As a result of the research, it was shown that varieties of *Agropyron* had the highest callus proliferation. On optimal medium callusogenesis reached 80%. Lower callus-forming ability (27%) was found in tetraploid varieties of *Agropyron*. *A. desertorum*, the most adapted and drought-tolerant species, had the highest regeneration potential (90%). The ability for regeneration in *Psathyrostachys juncea* reached 97%.

The breeding work with these species was directed towards the development of stable lines with increased set of chromozomes. We obtained regenerated plants with double ploidy and improved economic characteristics. Their ability for polyploidization and regeneration in tissue and embryo culture is due to many factors, including biological features of initial plants and ecological factors.

Thus, for the improvement of pasture plants, a complex approach involving consideration of biological and ecological aspects should be taken.

CGIAR reaches out to Central Asia and the Caucasus

Several of the world's most popular foods, including wheat and onions, have their genetic origins in the newly independent states of Central Asia and the Caucasus. Today, ironically much of the genetic heritage of this economically struggling region is in jeopardy due to the widespread collapse of state institutions.

The nations are Kazakhstan, Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan in Central Asia, and Armenia, Azerbaijan, and Georgia in the Caucasus. Together they make up a new region called CAC. Each of the countries faces serious problems with supplies of seed, and no systems have been put in place to ensure the diffusion and adoption of new varieties. Without these innovations, crop yields are stagnating or declining. Agricultural production as a whole, which has driven the region's economy and fed its people for centuries, is now seriously imperiled.

A new CGIAR program launched in 1998 is now backing a region-wide effort to help restore agricultural growth, while preserving and protecting genetic resources. Nine CGIAR centers will be contributing, including CIMMYT, CIP, ICARDA, ICRISAT, IFPRI, ILRI, IPGRI, IWMI, and ISNAR. ICARDA has taken the lead by establishing a coordination office in Tashkent, Uzbekistan, and the first meeting of the steering committee, composed of representatives from CAC countries, CGIAR Centers and donors, was held there in September 1998. During its mid-term meeting in Brasilia last spring, the CGIAR endorsed an initial work program and allocated US$2 million in start-up assistance. The total budget for the program is expected to reach US$16 million over five years.

The effort to restore farm production and conserve genetic resources faces numerous challenges due to wide variations in the Region's physical and agricultural environments, which include lowland rainfed and irrigated croplands, lowland semi-arid rangeland, and mountains.

The CGIAR-supported effort will focus on numerous tasks: agroecological characterization of new farming systems and identification of production constraints; germplasm enhancement; improving seed supply systems; management and diversification of cropping systems; enhancing livestock production systems; improving irrigation and on-farm soil and water management; rehabilitation and management of rangelands; conservation of genetic resources; policy research promoting small farm development; training to upgrade technical and language skills; and information technology to assist exchange of ideas.

The program carries with it a sense of urgency. Any further delay in getting outside support and expertise to the region, especially to its national research institutions, could damage the potential for collaboration among the CAC's fragile agricultural institutions. The CGIAR's new commitment to assist the Region's farming sector couldn't be more timely.

Forage and pasture legumes enhance agricultural sustainability

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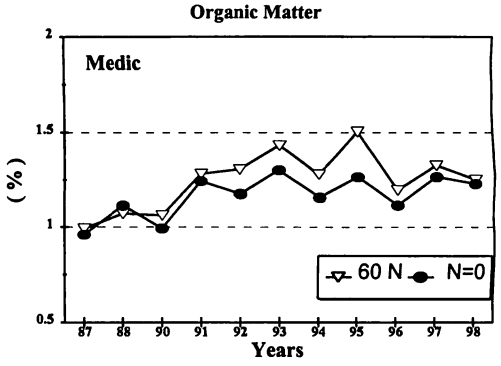
The sustainability of productivity and of the agricultural resource base is becoming a major issue in West Asia and North Africa (WANA). Macro- and micro-economic considerations (e.g., insecure tenure, support for cereals) have often resulted in decisions to use more erosive crop rotations. Fallow as a means of combating the limited soil moisture is being replaced by continuous wheat or barley. Monocropping is having negative consequences associated with declining soil fertility, cereal yield depression, and diseases.

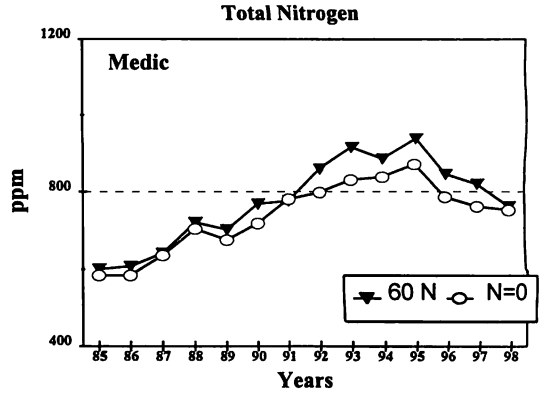
To monitor long-term trends in cropping systems in WANA, ICARDA is undertaking both on-station and on-farm research. Within this context, a trial was established in 1985/86 at Tel Hadya, northwest Syria. The trial compared the productivity of cereals, with and without nitrogen, in rotation with grazed *Medicago*, vetch, lentil, clean fallow, and watermelon. Soil analyses for total mineral nitrogen (N) and organic carbon (C) were performed annually, with a final measurement of labile and biomass N and C forms.

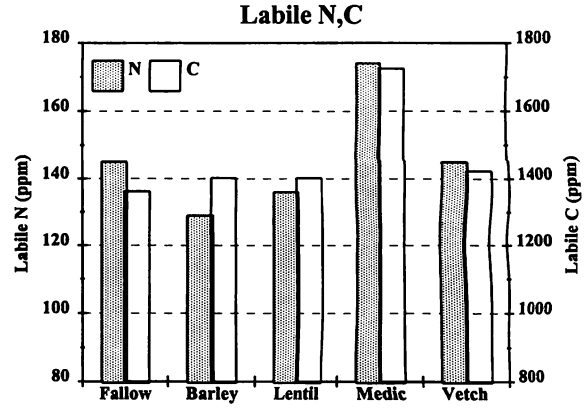
The introduction of legumes into rotation increased cereal yield. During the last 5 years (93-98), barley yields were lowest after continuous barley (1.39 t / ha), intermediate after lentil (2.11 t / ha), and similar with fallow (2.51 t), medic (2.63 t), and vetch (2.69 t).

Organic matter and total mineral nitrogen were highest with vetch and medic, and lowest with continuous cereal. Organic matter (Fig. 1) and total N (Fig. 2) show gradual increase with *Medicago* over the years. Labile C and N were higher with *Medicago* (Fig. 3).

Legumes such as *Medicago* and vetch can increase soil







organic matter and total soil N, thus enhancing soil quality. The C and N buildup can reduce N needs for the alternating cereal crop and improve soil structure.

Recommendations for a rangeland strategy in the northwest coast of Egypt

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A meeting of experts took place 17-19 October 1998 to outline a strategy for integrated rangeland/livestock development for the northwest coast of Egypt. The Matrouh Resource Management Project (MRMP), QRDP/GTZ, the World Bank, ICARDA, and the World Food Programme (WFP) were all represented among the 50 participants. The agenda included short reviews of relevant subject matter and discussions on a variety of topics.

Introduction

The natural resources of the northwest coast are already over-exploited. The land provides only half of the necessary feed units for ruminants at the current time. It is likely that the biggest improvement to the feed unit deficit will come from improved cereal culture in Zones 1 and 2 closest to the Mediterranean Sea. Nevertheless, a technically feasible fodder shrub demonstration on the scale planned by MRMP/WFP may lead to independent farmer adoption once fodder shrub germplasm is readily available at low cost. These fodder shrub investigations are important because 80% of the rangelands are in the third zone from the coast where cereals are unlikely to provide much feed. An obvious guideline will be to target interventions at land with the best soils and water capture to increase chances of success for any plantings. All projects present in the expert meeting were committed to the idea that development activities should be socially, economically and environmentally sustainable.

Land Use Plan

A land use plan utilizing Geographic Information Systems (GIS) is needed to make recommendations for rehabilitation of rangeland. A general classification of landforms should be developed into a database to contain physiography, external and internal soil characteristics, rainfall probability, the potential for water collection and retention and existing vegetation. Details will be debated and completed by November 1998.

Rangeland Development

Rangeland of low potential

The vast majority of the area (80%) in the northwest coast is rangeland of low potential. As depressions and pockets of deep soil add variation to this landscape, an assessment of the relative differences within this area would be useful to guide development efforts.

Fodder shrub plantations

Continued support for fodder shrubs plantations in local communities on areas with potential for improvement is recommended for rangeland where ownership of land is clear. Windbreaks and tree belts are also considered useful in areas that are subject to wind erosion.

Selected range management areas (SRMAs)

The SRMA is considered a valuable contribution to rangeland development; however, an urgent need for the SRMA is to assess the effort to date: to evaluate the technical and social feasibility and to construct a database of inputs, outputs and indicators to assess the cost and social benefits of the SRMAs by the end of the project's first phase. Having agreed that an economic analysis will be conducted, it is essential that the SRMAs are established and managed using the most efficient methods. As fencing is the most expensive input to the SRMAs, means to lower the cost will be evaluated, including control without fencing where possible. Evaluations should be based upon the point of view of the farmer, taking into account the different farming zones and farming system intensity. Supports should be standardized among projects in the northwest coast of Egypt and should not surpass a value equal to the expected annual return from a given piece of land.

As not all species will be understood well enough to be extended to farmers via the selected sites and SRMAs, a sub-set of species will be subject to evaluation within the adaptive research activities of the project. A list of proposed species is shown in Annex 1 with adaptability guidelines for soil type and agricultural zone.

Barley/shrub intercropping

Interplanting fodder shrubs in barley fields is a promising part of barley/forage/livestock integration. Expansion of barley/shrub intercropping in appropriate areas of the northwest coast is considered an important complement to the development of rangeland.

Wadi tips

These areas at the heads of the wadis, termed "wadi tips", are recognized as un-exploited and potentially valuable sites for fodder shrubs owing to their private ownership status and favorable conditions for plant growth. Soils in wadi tips are adequate for shrubs but generally not suitable for horticultural use and barley. The initiative will work directly with QRDP/GTZ, in close collaboration with MRMP, to implement the pilot activity so that a judgement can be made by all projects about its suitability for larger-scale development efforts in the years to come.

Reseeding

In potential areas and in watersheds where surfaces are prone to erosion, reseeding of land is accomplished with well-adapted native species, particularly where they also are valued as fodder plants for animals, but might also include unpalatable species with desirable environmental benefits.

Water harvesting

Micro-catchment water-harvesting techniques, where appropriate, should be integrated in the system to

improve moisture supply to plants and to conserve natural resources.

Seed production

MRMP and the ARC Qasr station are full partners owing to the fact that both are part of the Ministry of Agriculture and both are producing seed and seedlings. A division of responsibility is needed to sort out the genetic resources that are easy to propagate and those that need a preliminary evaluation.

A botanical garden is recommended as a convenient place to conserve plants under threat or as a site to collect seed and monitor plant growth.

Given the very large demand from fodder shrub plantations and SRMAs for seed of native annual and perennial plants, MRMP will contract with local community members to collect the quantities of seed needed. It is recommended to continue this process of contracts with the local people in an attempt to stimulate a private sector expertise, and specialization, as is being done with the seedling nurseries.

It is recommended to produce guidelines for cultural practices and fertilization that will enhance seed production from areas where an adequate density of target species exists, and thereby promote fodder production and seed collection efforts.

The ICARDA Seed Unit will provide assistance for the elaboration of seed production guidelines concerned with cleanliness, purity, viability, labeling and pricing. Guidelines on storage and inventory are also urgently needed.

The establishment of a Seed Production Center is an immediate need. MRMP could begin planting materials at the site of the wastewater treatment plant so as to make some headway with development of their nursery in the current year.

Seed importation

Seed importation is an acceptable means of enhancing the genetic diversity available to the project; however, the multiplication of seed for use on a large scale should be done locally. In many cases the seed that is needed is available in neighboring countries. MRMP will interact with plant inspection and health organizations to make sure phyto-sanitary regulations are respected.

Seedling production

Up to the present time, the delivery of plants for range rehabilitation in the northwest coast has been based on plants grown in farmer-owned nurseries. A greater diversity of well-adapted plant species available in the nurseries is needed and effort should be made to improve nursery techniques to deliver high quality seedlings at a minimum of cost. To contribute to the control of deleterious environmental hazard, projects have agreed to phase out the old plastic bags and begin using the newer biodegradable plastic products as soon as possible.

Evaluation and selection of promising species

Overall, natural vegetation and rangelands are extremely degraded and many of the best grazing species are on the verge of extinction, being now restricted to cliffs and rocky areas of difficult access to grazing animals. As a consequence of this situation, highly browsed individuals still remaining in some populations ought to be selected, multiplied by vegetative propagation and established in seed orchards.

Biodiversity

The importance of safeguarding the genetic resources is often not given the attention it deserves, particularly within the context of development projects where such studies are classified as 'research'; however, MRMP has recognized this need and proposals for nine *in-situ* sites have already been put forward. As a strategy, it is an appropriate juncture to develop partnerships with ARC, DRC, ICARDA and IPGRI, to seek special projects that would develop a foundation for genetic resource studies in the northwest coast of Egypt. Such support would provide the technical inputs needed to establish proper databases, herbaria, botanical gardens, *ex situ* and *in situ* seed banks and training to maintain the effort beyond the time-frame of the project.

***Ex situ* germplasm conservation and documentation**

Since farmers are now being enlisted to collect and sell seed to the project, the project should do its best to geo-reference the sources of these genetic resources. In addition, with a minimum of training, farmers can contribute to the accumulation of herbarium sheets available to the project. Base collections of genetic resources now being gathered should be kept on hand but plant populations from the areas collected should be properly sampled and conserved in the genebank at ARC's Bahteem Station or DRC's Sheik Zouwayed station accompanied by complete passport data.

Adaptive Research Program

Several meaningful targets for the Adaptive Research Program included the objective of producing seed in sufficient quantities so that a strategic shift could be made from a range rehabilitation program that is based mainly on the transplantation of seedlings to one that has more, and cheaper, direct seeding options at its disposal. This will require a prioritization of effort to select the species most amenable to such a program. In the first step, community members could collect seed. A second step might be to generate larger-scale seed production methods pioneered by the Adaptive Research Program or the Seed Production Center. Commercial seed producers could then take over and free the Adaptive Research Program to address new seed development priorities. The size of the rehabilitation need, coupled with the desire to generate employment in the northwest coast, makes it imperative to reflect upon this strategy.

Up to this juncture, there have been few opportunities to combine the range and livestock work in an integrated way, due to the immature size and yield of

shrubs grown in the project. As the shrubs now reach an exploitable age in the fodder shrub plots and SRMAs, the livestock group is expected to investigate the nutritive value of shrubs in various standard diets.

Many studies have already been conducted in semi-arid and arid countries on range-livestock interactions, some from neighboring countries with similar breeds of livestock. The project should take advantage of applied results with direct relevance to the northwest coast and sort these experiences from the literature and to conduct relevant research to fill identified gaps.

Human resource development

It is agreed that human resources are the cornerstone for the success of rangeland development efforts; therefore, it is important to continue upgrading the capacity of the personnel.

Annex 1. Plants proposed for use in the northwest coast of Egypt

Species	Use [1]	Soil [2]	Zone [3]
Periploca angustifolia (*P. laevigata*), found locally.	G	sil/sha	I-III
Atriplex nummularia, cultivar 'Von Holdt', from South Africa.	CC/G	sil/sal	I-II
Atriplex lentiformis, held at ARC, El Qasr Station.	CC/G	sil/sal	I-II
Atriplex halimus subsp. *halimus,* cultivar 'INRF 70 100', Tunisia, from Spain.	CC/G	sil/sal	I-II
Atriplex halimus subsp. *Schweinfurthii,* from local sources of improved highly palatable individuals.	G	sil/sal	I-III
Colutea istria, from Sinai, Jordan and Syria.	CC/G	sil	I-II
Opuntia ficus-indica f. inermis, from Wadis Abu Lahou and Bahariya.	CC	san	I (II)
Atriplex canescens cultivar 'Marana' from the USA.	G	sil/sal	I-II
Cassia sturtii, found on ARC, El Qasr Station from Australia.	CC	sil/san	I-II
Atriplex canescens linearis	G	san/sal	I-III
Acacia salicina	CC	sil/sha	I-III
Acacia cyanophylla	CC	san	I-II
Moricandia nitens (reseeding), locally found in Wadi Saloufa (km 50 from Marsa Matrouh on the Alexandria road)	G	sil/sal	I-III
Atriplex glauca, locally found in Wadi Medouar (reseeding)	G	sil/sal	I-III
Atriplex leucoclada (reseeding)	G	sil/sal/sha	I-III
Salsola vermiculata, from Syria (reseeding)	G	sil/sal/sha	I-III
Artemisia herba alba, locally found at 12 km east of Sidi Barrani, (or km 111 west of Marsa Matrouh), north side of the highway in front of Sidi Othman El Fitouri's tomb, Lat. 31° 02' 25" N., Long. 26° 47'32"E, Alt. 20 m; area ca. 50 feddans (reseeding).		sil/sha	I-III
Subject to experimental confirmation:			
•*Rhamnus oleoides* 'Salouf'; Locally available in major wadis and on cliffs, *e.g.*, Wadi Saloufa at km 50 on the Marsa Matrouh - Alexandria road. Excellent browse, extremely drought-tolerant in the whole of North Africa to the very edge of the desert, similar to *Periploca angustifolia* ('Hallaba').	G	sil/sha	I-III
•*Chamaecytisus mollis* (Morocco)	CC	sil/sha/san	I
•*Myoporum serratum* Local (New Zealand)	CC	sil/san/sal	I-II
•*Agave americana* (Mexico)	CC	sil/sha/san	I-II
•*Portulacaria afra* (South Africa)	G	sil/sal	I

(1) Use: Grazing (G); Cut and Carry (CC).

(2) Soils: Saline (sal); Silty (sil); Sandy (san); Shallow (sha).

(3) Zone: Coastal plain (I); S. coastal plain, cliffs and plateau depressions (II); depressions in the S. plateau (III).

Land imprinter and pitting machine for rangeland reseeding

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What to do when the range is quite degraded and vegetation cover is low in the 150-250 mm winter rainfall zones? The classic approach in many countries of the region is first to protect the site and establish a range reserve, with a large ditch around or a proper fence to stop trespassing flocks. The next stage is to re-establish a proper vegetation cover by different techniques. The most common is to transplant 3-6 month-old nursery-raised shrub seedlings. Shrubs used include saltbushes at 400-1200 shrubs/ha (*Atriplex halimus* native from the old Mediterranean world, *A. nummularia* from Australia, *A. canescens* from the North American continent), acacias at 200-400 shrubs/ha (mostly *Acacia cyanophylla* from South West Australia), and to a lesser extent *Salsola vermiculata, Cassia* sp., and *Parkinsonia* sp.

Seedlings are raised in plastic bags in open-air nurseries and transplanted during winter after opening the soil with a deep 80-cm ripper. Transplanted seedlings then have to be watered 2-3 times with 10 liters each during the first two summers and in any case protected from grazing for two seasons at least. Rreplacement of dead seedlings or missing shrubs is expensive and time-consuming. This forestry approach is labor-intensive and a costly exercise that well suits some of the countries of the region to absorb abundant and cheap rural labor force.

Direct seeding is used for range rehabilitation in some countries such as the USA, Australia, and South Africa. In Central Asia, range managers in Samarkand (Uzbekistan) and Chimkent (Kazakhstan) practiced, for many years, successful direct seeding straight in the snow of white and black saxaoul *(Haloxylon* sp.*)*, *Eurotia* sp. and *Salsola* sp. The range improvement done is quite remarkable. And the plants that survived the early stage of establishment in the Central Asian steppe survive extremely dry summer and cold winter. But the climatic conditions are different from the one encountered in the Syrian steppe where soils are mostly loamy and the rain is scarce. On degraded Syrian range, continuous grazing, wood collection for fuel, successive barley and inopportune cultivation exhaust the soil seed stock; the soil surface is inert, crusted if not sealed and compacted preventing rain infiltration.

To remedy this degradation, the Syrian Steppe Directorate is carrying out a massive range rehabilitation program that covers now some 100.000 ha of reserves and fodder shrubs plantations. Most of the shrubs are produced in a conventional nursery and transplanted on new reserves by a large labor force during each winter. Direct seeding was encouraged to reduce costs and cover larger area each winter. It was tested using conventional seeder. It simply proved to be disastrous, destroying the remaining native vegetation without in fact allowing proper establishment of the sown range species. Facing the tremendous task of restoring several hundred of thousand of hectares of rangeland, the Aleppo Steppe Directorate agreed to join effort with ICARDA to explore direct seeding techniques and the use of native species. To this end, the ICARDA range project tested the pitting machine (Photo 1, from Kimseed Ltd®, Australian patent) and the Land Imprinter (Photo 2) built in the ICARDA workshop. Both machines are old ideas based on the simple principle of water harvesting in micro-depressions, favoring the collection of water, organic matter, seeds, soil particles in shallow pits or grooves. The grooves and pits reduce water run off, increase water accumulation and infiltration, and offer a shelter from blasting cold wind to emerging seedlings.

One should notice the difference between the two machines. The pitting machine scoops a pit in the soil, therefore removing the top horizon of the soil, and the surviving native vegetation in place. The use of the pitting machine is appropriate on medium depth (10-30 cm) loamy soils with a homogenous soil profile. In the Syrian steppe, the soils are frequently gypsiferous. In this type of soil, the bottom of the pit may be quite sterile and inhospitable to the emerging seedling. Water collected into the pit may be enough, but the fertility of pure gypsum is not ideal. However this gypsiferous soils are covered with a shallow (maximum of 2 cm) top organic horizon biologically quite active and covered with the nutritive *Poa bulbosa*, a geophytic short grass particularly appreciated by the sheep in spring. We want to improve the productivity of this grass and get *Artemisia* and *Salsola* established on this grass mat.

This is the purpose of using the land imprinter that does imprint shallow grooves in the soil without destroying the *Poa bulbosa* carpet, and at the same time re-introduce mother plants of white *Artemisia* and *Salsola vermiculata* on the range. Also the reseeding needs not to be implemented on 100% of the range area. We are simply trying to re-establish a starter-vegetation with self-reseeding plants, and covering only 10-20% of the range area may be sufficient. The choice of the species is also important, as it must be accepted by the pastoral community. From experience, the Syrian Steppe Directorate and the Bedouin's communities favor *Salsola vermiculata,* locally called "the Queen of the Steppe," and *Artemisia herba-alba.* Seed are mass-produced without problems on range reserves, easy to collect and to clean. During the range reseeding operation, seeds are mechanically dispersed in the pit or in the grooves mixed with finely ground sheep manure. Establishment of *Salsola vermiculata* and *Artemisia herba alba* proved to be successful in the pits.

We are now testing the Land imprinter. It is clear that any direct seeding may prove to be useless if not supported by appropriate range management measures carried out by the agro-pastoral communities. A careful spring grazing would allow collecting the biomass from the annuals and not touch the perennials. This is the next stage of our work.

Photo 1. The Kimseed pitting machine

Photo 2. Land imprinter built at the ICARDA Station Operation Workshop with the support of Dr. J. Diekman. A new machine from an old story for rangeland rehabilitation

Carob *(Ceratonia siliqua* L.), truly a multi-purpose tree for the CWANA region!

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Carob is a relatively small tree belonging to the *Leguminosae* family (sub-family *Caesalpinoideae*, tribe *Cassiae*), whose center of diversity is speculated to be Asia Minor and possibly Syria though no general agreement among scientists is reached on this. The only other member of the *Ceratonia* genus is C. *oreothauma* Hillcoat, taxon described in 1980. The carob tree has successfully spread over time throughout the Mediterranean region due to its early cultivation practices. The name Ceratonia derives from the Greek word 'keraton', allusive to the shape of the plant's dried pods resembling that of a horn. The common name carob derives from the Arabic word 'karrub'. Its seeds are used in some African countries for weighing spices. The unit carat, employed to measure precious stones, derives from the Arabic 'quirat' meaning seed of carob, as these seeds were, in fact, widely used in the Middle East in the past for assessing the value of precious stones. Such a practice is still in place today in some parts of India for weighing diamonds and gold.

PLANT DESCRIPTION

The tree is an evergreen slow growth plant, usually not taller than 10-15 m; the massive trunk is characterized by a green-brownish cork and branches forming a dense and globose canopy. Leaves are compound. The species is dioecious, with female and male flowers borne on different trees on catkjn-like racemes stemming from old branches or even directly from the trunk as 'caulifloria'. Bisexual flowers also occur occasionally. Fruits are leatherly pod, which can reach 10-30 cm in length. The external part of the pod is hard, but the inner part, mesocarp, is soft and edible.

HABITAT

The tree is a typical component of the Mediterranean maquis and it is usually associated with lentisk, terebinth, myrtle, strawberry tree and olea species. Its presence is recorded from sea level to 500 meters above sea level, in mostly calcareous soils and rocky places.

CULTIVATION AND CONSERVATION

Outside of the Mediterranean area, carob trees are being cultivated today in USA, California, Chile, South Africa and Australia. There are some 400 carob germplasm accessions maintained around the world (Spain 302, Portugal 13, Tunisia 10, USA 5 and Australia 10 accessions). In spite of its value to the community, carob trees are being cut down indiscriminately, yet their slow regeneration rate does not help populations in recovering from loss of stands. Thus, the threat of genetic erosion exists.

USES

Food— carob pods are hard but become soft by chewing them. Their pulp is used to prepare sugar and molasses, alcohol and microbial proteins. Pods are also used to prepare a refreshing drink known as 'kaftan' and fermented beverages. Seeds are used as surrogate of coffee and cocoa.

Feed— pods are used for feeding horses and ruminants and seeds are employed in pet food preparations.

Soil improver— the combination of a thick canopy and a good root apparatus contribute in controlling effectively soil erosion.

Fertility restorer— being a typical leguminous species, carob trees are characterized by nodulated roots, which provide a beneficial effect on soil fertility.

Medicinal and other uses— tannins extracted from the pods are used as anti-diarrhoea, and pod powder is used in dietary and pharmaceutical applications. Seed endosperm is used in cosmetics and the seed coat in the extraction of tannin for leather tanning process; timber is used to make furniture as well as source of fuel. Because of its handsome appearance and its ability to withstand poor soil conditions and drought, the tree is an ideal candidate for landscaping particularly in dry areas. The dense canopy offers a good shade to animals and humans.

Ecosystem conservation— the species plays an important ecological role in the forests due to its slow rate of burning; it is therefore extremely valuable in those vegetation types like the Mediterranean maquis, where fires are very common.

SUGGESTED LITERATURE

Battle, I and J. Tous. 1997. Carob tree. *Ceratonia siliqua* L. Promoting the conservation and use of underutilized and neglected crops. 17. Institute of Plant Genetics and Crop Plant Research, Gatersleben, Germany/International Plant Genetic Resources Institute, Rome, Italy.

Gene mapping could speed the release of new lupins

A new technique of gene mapping being developed in a joint project between Agriculture Western Australia (Wallace Cowling and Bevan Buirchell) and the State Cultural Biotechnology Centre at Murdoch University (Sarah Brien, Rob Potter, Phil O'Brien and Mike Jones) has the potential to cut five years off the lead time for release of new lupin varieties.

The research is part of the CLIMA C3 sub Program 3. It is supported by the Grains Research and Development Corporation, and uses a technique called Amplified Fragment Length Polymorphisms (AFLP), first patented by a Dutch company in 1993. In the technique, DNA fragments are labelled with a fluorescent, which can be detected and sized as genetic markers, using a DNA sequencer and the latest Genescan software. It is being used to create DNA fingerprints of lupin plants to analyse their genetic characteristics.

Linking genetic markers to agronomic characteristics will allow breeders to identify improved plants early in their life cycles, to significantly earlier selection,

development and release of improved varieties at reduced cost.

A marker for early flowering has been identified, with markers low alkaloid tent, reduced pod shattering and resistance to phomopsis being studied.

The research has led to the construction of the first partial molecular map of the lupin genome, with 180 molecular marker located on 21 linkage groups.

Transgenic yellow lupin coming soon

CLIMA will soon have access to transgenic yellow lupins which have resistance to the bean yellow mosaic virus disease (BYMV) and the herbicide "Basta".

Working in CLIMA's C3 Sub-Program on diseases of grain legumes, Professor Mike Jones and his team at Murdoch University have produced the world's first transgenic *yellow lupin (Lupinus luteus).*

Transgenic yellow lupins have the potential to be grown profitably on some 100,000 hectares of acid soils in Western Australia's eastern wheatbelt. Their seeds have 8 to 10% higher protein than the commonly grown narrow-leafed lupins, and should command a premium on the market.

BYMV is one of the main limitations to the success of yellow lupins; resistance to the disease should help increase yields. "Basta" resistance, already available in narrow-leafed lupins, will improve weed control.

The Murdoch scientists used a technique involving *Agrobacterium* to introduce the resistance genes and tissue culture to establish resistant plants in the genetic project. Further work is under way to to select the best performing transgenic plants for BYMV and Basta resistance in preparation for release.

The research is supported by CLIMA, GRDC, the Grains Research Committee of Western Australia and Murdoch University. Murdoch research workers include Li Hua, Visanu Somsap, Kirilly Ryan, Katrin Hoffmann and Steve Wylie.

Legumes and water management for sustainable agriculture

(From CLIMA Newsletter Number 8, March 1997)

In this article, CLIMA S2 Sub-Program leader Ian Fillery discusses some dramatic results of studies on leaching of nitrogen in sandy soils in the West Midland region of Western Australia.

His team has recorded some 'horrific' drainage rates of rainfall through these soils, accompanied by high leaching of nitrogen. Both move beyond the root zone of annual crop ands pasture plants to join the ground water. This raises, yet again, doubts about the sustainability of current farming systems in this environment.

The high leaching rates indicate that to much nitrogen and water are lost. as well, the unused moisture helps to raise the level of saline ground water, adding to salinity problems when the water-table approaches the soil surface.

The loss of nitrate through leaching wastes much of the nitrogen contributed by legumes crops and pastures. It also raises concerns about increasing soil acidity at depth in the soil profile and possible problems of high nitrate levels in the groundwater.

The failure of our crop and pasture plants to use all the rain that falls on our farming land has long been recognized as a major cause of salinity, but in spite of a growing body of knowledge we have had little success in overcoming it.

CLIMA sees the problem as basic to much of its research because the legumes it produces and the way in which that are managed must help to reduce the loss of moisture and nutrients to the groundwater, stop the water-table rising and thus stop the spread of salinity.

CLIMA Director John Hamblin says the Centre's philosophy is to understand the system so we can get a logical approach to use of this Mediterranean environment in a sustainable way.

"If we can stop water and nutrients going down the profile we can stop salt coming up. We can stop acidity developing deep in the profile and we can ensure that water and nitrogen that are now lost can be available in the root zone of our crops and pastures," he says.

Many of the Centre's sub-programs are co-operating in projects related to the goal of reduced leaching.

Deep-rooted annual plants, perennials such as Lucerne, fodder shrubs such as tagastate, and special plants for water-table recharge areas, are among the approaches by CLIMA sub-programs.

We need to determine how we can fit perennials into farming systems, and what sort of perennials we can use. To what extent can we employ plants that 'mimic' the native vegetation to improve the use of water? Should we try to use the natural vegetation system as a tool for water control?

The genus *Lathyrus*

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In response to an ever-increasing global demand for food and feed resources and the need to diversify modern cropping systems, the legume genus *Lathyrus* is receiving increased attention by agricultural scientists.

Kupicha (1976) lists 152 species in the genus which is distributed from the sub-arctic to the sub-tropics. It includes a range of grain, forage, pasture and ornamental crops. The best known species include the ornamental sweet pea (*Lathyrus odoratus*) and the food legume grasspea (*Lathyrus sativus*).

Genetic resources

The currently *ex situ* conserved genetic resources of the genus are mainly restricted to 86 species (FAO, 1993

data). A thorough assessment of the conservation status (*ex situ, in situ*) for the genus and the range of diveristy conserved for individual species is currently being undertaken by IPGRI. In this bibliography, particular attention has been given to the inclusion of information about the flora of regions where *Lathyrus* spp. occur, since flora can contain information about collection sites, habitat, and economic botany. Although the major utilitarian focus is on Mediterranean *Lathyrus* species, the genus is by no means restricted to this region; other regions such as North and South America and Central Asia also offer considerable biodiversity.

Toxicity

The presence of toxic non-protein amino acids (NPAAs) in the seeds of *Lathyrus* species has restricted their agricultural development in several countries, e.g., India and Australia.

Chemo-taxonomic studies in the early 1960s established the presence of several toxic amino acids in the seeds of different taxonomic groups. This work provided a useful frame of reference to delineate groups of species with different seed toxins.

Three NPAAs of concern are the neurotoxins Beta-oxalyl-diamino-propionic acid (Beta-ODAP) (*L. sativus*), Diamino-butyric acid (DABA) (*L. sylvestris*) and the nitrile-containing Beta-amino-propionitrile (BAPN) (*L. odoratus*).

The bone-deforming (osteolathyrogenic) properties of *L. odoratus* are due to the presence of beta-aminopropionitrile (BAPN). This compound affects the cross-linking of collagen during bone and connective tissue formation. The resultant abnormality is known as osteolathyrism. Recent studies in Bangladesh suggest that a metabolic precursor for this compound, 2-cyanoethyl-isoxazolin-5-one, is present in the vegetative parts and immature seeds of *L. sativus*. It appears responsible for the osteolathyrogenic symptoms observed in some neurolathyrism patients who had consumed vegetative parts of *L. sativus*.

The neurotoxicity of *L. sylvestris* and related species is caused by the toxic NPAA 2,4-diamino-butyric acid (DABA).

With the identification of the amino acid, beta-ODAP, as a toxin, it has become possible to select low ODAP genotypes of *L. sativus*. Such cultivars are now available from Canadian and, to a limited extent, from Indian research programs. Their existence has renewed interest in the further development of this species as a pulse crop.

Lathyrism

There are two different types of lathyrism, neurolathyrism and osteolathyrism, affecting the nervous system and bone formation, respectively. The term "Human Lathryism Syndrome" (HLS or HULAS) was coined to describe the rather diverse clinical and biochemical symptoms (including osteolathyrism) caused by *L. sativus* (Cohn, 1995).

Cohn and Streifler (1981, 1983) have described, in addition to neurological damage, osteolathyrogenic symptoms in lathyrism patients who, 35 years earlier, had consumed food prepared from *L. sativus* seed in a German forced-labour camp. This finding suggests that extreme care is needed with the toxicity assessment of low-ODAP strains of *L. sativus* because other toxins may be present in the seeds under certain conditions, e.g., seed immaturity.

Medical scientists are interested in the causes of neurolathyrism as a model for neurodegenerative diseases striking the more affluent sections of the human population. The scourge of neurolathyrism, known since ancient times, today mainly affects the poorer rural classes, especially in India, Bangladesh, Ethiopia, Nepal and Pakistan during drought-caused famines. Historic outbreaks of this neurological crippling disease have also been documented for Spain, Algeria, Ukraine, Russia, Germany, Italy, France, Syria, and most recently from 1972-74 in China. The cause of neurolathyrism is the continued consumption of *L. sativus* seed as a staple food. Other *Lathyrus* species have also occasionally been linked with neurolathyrism, e.g., *L. cicera*, *L. ochrus* and *L. clymenum*. These species all contain beta-ODAP in their seeds.

Lathyrism and poverty

The occurrence of neurolathyrism is intricately linked to drought caused famine, poverty and malnutrition. The hardy *L. sativus* may provide most of the food for survival in areas where neurolathyrism is prevalent.

Whether the new low toxin strains will survive under the extreme conditions of drought remains to be seen. Detoxification techniques for strains with high beta-ODAP provide some measure to reduce the impact of neurolathyrism. However, as was pointed out by Kearnick and Smartt (1995), the costs in fuel and water may prevent such a practice where it is most needed. Recent advances in solar-cooking technology through the provision of cheap, easily built solar ovens may reduce the future need for solid and fossil fuels in some regions. Governments need to pay attention to the potential threat of neurolathyrism and provide contigency plans to deal with high risk areas during times of famine. Reduction of poverty and malnutrition in lathyrism-prone areas is likely to provide the best solution to this problem.

The development of *L. sativus* as a safe food crop, not only for Bangladesh, India, Nepal and Ethiopia but also for the peoples of countries with suitable climates to grow this crop (Afghanistan, Australia, Canada, Chile, Middle East, North Africa, Spain, etc.) necessitates a good understanding of the conditions and predisposing factors which lead to the onset of neurolathyrism.

Models for neurolathyrism and human safety

Experimental monogastric animal models for ODAP toxicity are needed. In the absence of suitable protocols to provoke neurolathyrism through oral administration of toxic diets in experimental animals, no safety margin for below-threshold ODAP toxicity can be set. Existing toxicological protocols do not provide for the determination of safe *L. sativus* consumption levels.

Consumption of *L. sativus* by humans appears to be much safer than previously thought. Large populations in India, Bangladesh and Ethiopia consume this crop on a regular basis. Dr. Kothari in India argues that *L. sativus* is a safe food and has sparked considerable controversy. Others consider such publicity irresponsible and would rather like to see efforts directed towards better understanding the causes of neurolathyrism. Dr. Kothari ignores that malnutrition is an important and constant factor of neurolathyrism epidemiology.

A monogastric malnutrition model for neurolathyrism, coupled with detailed research into variation in human ODAP metabolism is likely to provide the best approach to define toxicity levels of this glutamate analogue. In addition, the possibility of other toxins and predisposing factors leading to HLS need to be understood. Without a thorough understanding of the real cause (s) of neurolathyrism and the variability in susceptibility of individuals to it, the bright future of grain crops like *L. sativus* is handicapped by the stigma of their toxicity. With a thorough knowledge of *Lathyrus* toxicity and sufficient genetic resources several other species of this diverse genus may well be developed as food crops.

Animal fodder

Lathyrus fodder crops have been utilised for millennia. It appears that high intake of *Lathyrus* fodder from BAPN- and DABA-biosynthesizing species has frequently led to ruminant intoxication. Adaptation by ruminants to such forages has also been reported, whereas horses and pigs can be poisoned by any *Lathyrus* forage. Lathyrism in horses has been an important military problem in the past.

Biomass production by native and introduced legumes has been an incentive for cultivation since the inception of agriculture. Familiarity with naturalised crops and their toxicity has generally resulted in the avoidance of toxic plants and selection of palatable plants for food and feed. Selection amongst existing landraces for adaptation to specific environments and transfer of traditional knowledge about their utilisation provides the basis for new crop options for global agriculture.

The importance of microbes to ruminants

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In West Asia and North Africa and, more generally, in semi-arid regions, good quality forages are very scarce. Thanks to the microbes—bacteria, protozoa and fungi— they host in their rumen, ruminants can convert roughages (high lignified cell walls and low N contents) such as degraded rangeland straw, and cotton leaves, available in large quantities in the region, into useful nutrients. To enable this conversion, it is, however, important to **"feed and manage"** these microbes via "catalytic" supplementation. Following is the nutritional basis for a better understanding of such supplementation.

The microbes provide energy to the host animal

Once ingested, feeds are fermented by the microbes in the rumen. The chewing process of the rumination facilitates this fermentation by reducing the feeds into small particules on which the microbes attach. The microbial fermentation is very important, as between 60 and 90 % of the carbohydrates of the ration, including those from the cell walls, are fermented there. These cell walls, which are the essential components of low quality forages, are partially degraded by the microbes, thanks to the cellulolytic enzyme (cellulase) which they secrete but which is not possessed by the host animal (cow, ewe, goat, camel). The fermentation of the carbohydrates leads to energy production in the form of adenosine triphosphate (ATP) which is used by the microbes for their own maintenance requirements and for self-multiplication. The end products of this fermentation are,

- volatile fatty acids (**VFA**); mainly acetic, propionic and butyric acids, the proportion of each depending upon the nature of the food carbohydrates.
- carbonic dioxide and methane.

The VFA produced during the fermentation process in the rumen are absorbed into the blood stream through the walls of the rumen. They constitute the main energy source for the host animal as they supply between 70 and 80% of the total energy absorbed by the ruminant. In contrast, it should be appreciated that a monogastric draws its energy mainly from glucose and food lipids absorbed by the small intestine.

The microbes provide proteins to the host animal

Nitrogen compounds ingested by the animal (both proteic and non-proteic) are subjected to the proteolytic action of the rumen microbes (bacteria, protozoa and fungi). They are partially degraded into ammonia, in variable proportions depending upon numerous factors, in particular their solubility. Non-protein nitrogen compounds (NPN) such as urea, which might be added to the ration, are completely dissolved and also hydrolysed as ammonia.

Ammonia is a precursory ingredient, essential for the microbial growth of most of the bacteria species in the rumen; these take it up and use it for the synthesis of their own constituent amino acids. It is even considered as the main source of nitrogen for many bacteria, in particular those involved in the digestion of cellulose and starch. Most of the rumen bacteria (82%) can self-develop using only ammonia.

The utilisation of ammonia for the microbial synthesis is closely linked to the amount of energy (in the form of ATP) which is produced by fermentation of the carbohydrates. The collection of research results in this domain allow one to conclude that, on average, 145 g of crude proteins are synthesised in the rumen for each kg of fermented organic matter (FOM)

The microbial synthesis also depends on the presence of certain minerals, in particular, sulphur and phosphorous.

The microbes are then carried along with the "digesta" into the abomasum and the small intestine where they are subjected to the classic digestive process. Their

composition consists of 80 % proteins, well balanced in essential amino acids and of these, between 80 and 85 % are digested. They supply what are known as **protein gigestible in the intestine of microbial origin (PDIM)**. These PDIM play a very important role in covering the nitrogen requirements of ruminants, above all when these are fed basic rations from low quality forages.

Apart from these proteins, there are those of dietary origin but which have escaped (or bypassed) the microbial degradation process in the rumen into ammonia (NH3). The extent of this degradation (known as **Degradability**) is very variable and depends upon the nature of the protein sources. These latter proteins are digested according to a coefficient called the Coefficient of **True Digestibility,** which varies between 50 and 75. They supply what are known as **the PDIA (protein digestible in the intestine of dietary origin,** in French) or as **UDP (Undegradable Dietary Protein** in the rumen, or "by-pass proteins", in the other modern international systems).

The sum of the PDIA and the PDIM constitutes the Protein Truly Digestible in the Intestine (PDI).

The PDI system (French), together with other modern international systems, allows evaluation of the respective roles played by the feed and the microbes concerning the supply of nitrogenous matter to the intestine of the host animal. The true nitrogenous value of a feed may be calculated on the basis of two factors as follows:

firstly, $PDIN = PDIA + PDIMN$

where PDIMN is the amount of PDIM that could be synthesised in the rumen from the degraded dietary N (it is thus very important to know the N degradability of a feed), when energy and other nutrients is not limiting,

and secondly, $PDIE = PDIA + PDIME$

where PDIE is the amount of PDIM that could be synthesised from the energy available in the rumen, when the amount of degraded N and other nutrients is not limiting.

These two values are not additive. It is the smallest value which must be taken into consideration for a given feed supply. This implies that, in order to balance a ration, one must ensure that PDIN = PDIE through suitable associations of feed supplies, some rich in PDIN and others rich in PDIE.

Ruminants are thus less dependant upon the quality of nitrogen source than monogastrics because they are able to transform simple nitrogen compounds - or NPN - such as urea, into microbial proteins of high biological value. It is therefore unnecessary, at least to satisfy the ruminant's normal maintenance needs and those for modest production rates, to feed them high quality proteins, as most of these will be degraded into ammonia which could, alternatively, have originated from simpler forms of nitrogen. This possibility has considerable economic significance in developing countries, given the scarcity and/or the high cost of vegetal proteins such as oil cakes.

The so called "catalytic" supplementation of poor quality roughages consists in supplying the rumen microbes with the missing amounts of NPN and of key minerals to ensure a proper fermentation process and a proper microbial synthesis.

Further reading

Chenost M. and Kayouli C., 1997. Ed., "Roughage Utilization in Warm Climates", FAO Animal Production and Health Paper, n°135, 226 pp.

MEETINGS

International symposium on nopal (*Opuntia* spp.): its Use and application to combat desertification

Experts and Researchers on Nopal (*Opuntia* spp.) from different countries and institutions met in Arequipa, Peru, on May 26-28, 1998, at the International Symposium on "Cactus Pear (*Opuntia* spp.): Its Use and Application to Combat Desertification", organized by the Universidad Catolica Santa Maria, La Joya Verde company, and in coordination with the National Focus Point to Combat Desertification (INRENA). At the end of various presentations the following conclusions were reached:

1- The species of the *Opuntia* spp. sub-genus have developed phenological, physiological and structural adaptations favourable to their development in arid environments, in which water is the main factor limiting the development of most plant species. Among these adaptations stand out its asynchronous reproduction, and its CAM metabolism, which, combined with structural adaptations such as succulence, allow this plant to continue the assimilation of carbon dioxide during long periods of drought and, in this way, reach acceptable productivity levels even in years of severe drought. Besides:

- Biomass generation per unit of water is on average about three times higher than for C4 plants and five times higher than for C3 plants.
- Under optimal conditions, the various types of plants can produce similar amounts of dry matter per surface area, but under arid and semi-arid conditions CAM plants are superior to C3 and C4 plants.
- *Opuntia* spp. can develop in severely degraded soils which are inadequate for other crops. They have a great capacity for adaptation and are ideal for responding to global environmental changes. Their root characteristics avoid wind and rain erosion, encouraging their growth in degraded areas.
- *Opuntia* spp. have an asynchronous development of various plant organs, so that even

under worst conditions some part of the plant is not affected.

- The establishment of sustainable systems of production based on Opuntia spp. May contribute to the food security of populations in agriculturally marginalized areas and to the improvement to the soil.
- *Opuntia* spp. are some of the best plants for the reforestation of arid and semi-arid areas because they can resist scarce and erratic rainfall and high temperatures.

2- *Opuntia* spp. present various alternatives to its exploitation:

forage: Since they grow in severely degraded land, their use is important because of their abundance (900,000 ha) in areas where few crops can grow. High palatability, digestibility, and reduce the need for supplying water to animals; however, they must be combined with other foods to complete the daily diet, because they are poor in proteins, although rich in carbohydrates and calcium.

Vegetable: They are consumed fresh, mainly in Mexico and by Mexicans living in the United States of America. However, Mexican exports to Europe and Asia are increasing, which shows an expanded demand in non-traditional markets, which should be adequately examined.

Fruit: A cultivation policy must be defined aiming to achieving high yields and high quality; therefore a sustainable horticultural system is required. The potential market for this product is extensive but little exploited, so better marketing strategies and post-harvest technology are required. Due to their management requirements, *Opuntia* spp. require extensive labour, which is an important variable in developing countries.

Cochineal: Carminic acid is obtained, which is a natural red dye accepted by health authorities worldwide, with variable yields according to the production system used. Cochineal constitutes a significant alternative because of its profitability and intensive use of labor, but the market for this product has big price fluctuations, which makes investment decisions difficult.

Industrialization: it is feasible to industrialize cladodes, fruit, and nopalitos. This potential market deals mainly with concentrated foods, juices, liquors, semi-processed and processed vegetables, food supplements and the cosmetic industry; it is feasible, but it requires work and investment to develop the market.

Medicinal: There is some experimental research with promising results on the use of nopalito for gastritis; for diabetes due to the reduction of glucose in blood and insulin; for hypercholesterolemia by reducing total cholesterol, LDL cholesterol and triglycerids serum levels; and for obesity.

Economic profiles have been developed from the main exploitation alternatives, indicating they are viable with adequate investment returns; these projects bring additional benefits, such as the generation of employment, environmental improvement, etc., which do not represent income for *investors but they do* contribute to humanity.

3- International Support: The problem of desertification has the attention of humanity, which is why 125 countries have signed the United Nations Convention to Combat Desertification. Various national and international agencies have programs dedicated to elaborate strategies and plans for this purpose, and to support specific projects.

Recommendations

Taking into account the aspects considered in the conclusions, the attendees to the International Symposium "Nopal (*Opuntia* spp.) : Its Use and Application to Combat Desertification" recommend:

1. Spread the knowledge of the current and potential uses of *Opuntia* spp., stressing their function as a biological barrier to reduce the impact of desertification and their positive responses to the expected global increase of CO_2, through programs of integrated development, extension and technical assistance, as a noteworthy alternative to combat desertification.
2. Increase more extensive studies, research and activities on the use and applications of *Opuntia* spp. which will contribute to the improvement of living conditions, especially in developing countries.
3. Include *Opuntia* spp. in the agricultural statistics of national governments as well as of the international agencies.
4. Encourage scientific knowledge exchanges.
5. Protect and assess genetic resources.
6. Foster adequate protection policies, and look for actions aimed at genetic and sanitary certification of the propagation material.
7. Submit the conclusions and recommendations to the Peruvian Focal Point to Combat Desertification. This report could be communicated by way of the Ministry of Foreign Relations to international agencies, so that they may include *Opuntia* spp. in the programs to combat desertification.

These conclusions and recommendations should be distributed to all countries affected by the desertification processes.

The Mashreq/Maghreb Project: Planning for Phase II

Technical Coordination and Planning Meeting

The first Regional Technical Coordination and Planning Meeting of Phase II of the Mashreq/Maghreb (M&M) Project was held 5-7 October in Hammamet, Tunisia. ICARDA Tunis and Amman Offices jointly organized this event.

The ICARDA delegation to this meeting included 13 senior staff members and was headed by Dr. J. Dodds, *ADG (Research)* and Dr. M.B. Solh, Director of International Cooperation. The eight NARS involved in the project (Algeria, Iraq, Jordan, Lebanon, Libya, Morocco, Syria, and Tunisia) were represented each by three project members.

Prof. A. Mougou, President of the Institution de la Recherche et de l'Enseignement Supérieur Agricoles (IRESA), Tunisia, opened the meeting on behalf of H.E. Mr. Sadok Rabeh, Minister of Agriculture. He welcomed all participants and expressed satisfaction with the achievements of the M&M Project in its first phase. He pointed out that M&M is a challenging project as it addresses constraints encountered by mostly resource-poor farmers and sheep owners in the dry areas. Prof. Mougou said that, for higher efficiency, IRESA will ensure that the M&M activities are fully integrated into the strategic research agenda of Tunisia projects. He wished all participants a successful meeting, and reiterated IRESA's full support to the second phase of the M&M Project.

In his statement, Dr. Dodds conveyed the best wishes of Prof. Dr. Adel El-Beltagy, ICARDA Director General, to the participants. "Thanks to such projects as M&M, scientists have crossed physical boundaries among countries to work together," he said. He said that the Project had brought together various disciplines (biology, socioeconomics, property rights, gender issues, extension, etc.) and various institutions within and among NARS. Dr. Dodds stressed that phase II of the project was critical. It should be viewed as a phase of consolidation and integration of the research work undertaken in Phase I. The other challenging feature of Phase II is its community focus whereby interaction and integration become paramount. He suggested that given the current financial difficulties, NARS should develop mechanisms that will ensure project sustainability.

The first session was devoted to an overview of research activities undertaken during the transitional year (1997/98) between phases I and II, and a presentation of two case studies representing major achievements of Phase I : technology impact (barley in Iraq) and alternative feed sources (Tunisia). The last session of the day was devoted to presentations by ICARDA scientists of areas considered to be important in the implementation of Phase II, notably, community approach (Dr. T. Ngaido); gender studies (Mrs. M. Martini); and animal production and nutrition (Dr. M. Chenost).

The 1998/99 work plans were presented and discussed during the second day when. NARS readjusted their research activities. They opted for a four-year project to ensure overall impact of the project.

The third day of the meeting started with a presentation by Dr. de Pauw on agro-ecological characterization, an important activity of Phase II. This was followed by a discussion of regional activities to be undertaken in 1998/99 in the areas of training, workshops, seminars, and consultation.

The meeting was closed by Dr. Dodds, who thanked all participants for their hard work and the Tunisian Government for its hospitality and support. Dr. Dodds said he was remarkably impressed by the richness of the discussions and the synergy among the participants.

Steering Committee Meeting

The Steering Committee Meeting was held 10-11 October 1998 at the same venue. In addition to the eight National Coordinators, it was attended by donor representatives: Dr. A. Sidahmed (IFAD) and Dr. I. El-Zabri (AFESD). IFPRI was represented by Dr. P. Hazell. Drs. M.B. Solh, E. Bailey, T. Ngaido, H. Halila, and A. Belaid represented ICARDA. Dr. Walid El-Tawil, Director of DASR, Syria attended the meeting as a resource person.

In his opening statement, Dr. A. Sidahmed set the tone for phase II. During this phase, he said, ICARDA and IFPRI would play a facilitating role, whereas the National Coordinators would play a leading role in the design and implementation of research activities. He also pointed out the need for innovation in the implementation process of the second phase. IFAD expects the project to closely integrate the PPR (Policy and Property Rights) results and use them in developing the technology transfer and research activities to be undertaken in selected communities. Project reporting will have to be re-adapted to the spirit of Phase II, with increased focus on methodologies, impact and adoption of technologies within the community, he said.

Dr. Peter Hazell stated that IFPRI is committed to the project and will continue its professional support to strengthen and further integrate PPR activities. IFPRI, he said, is quite interested in the innovative community approach which will be used in phase II. Dr. Hazell mentioned that IFPRI is finalizing with DSE the proceedings of Amman's conference held in September 1997, and is looking forward to the PPR workshop to be held in Hammamet in November 1998 to discuss and summarize all PPR activities and achievements executed during Phase I.

Dr. I. El-Zabri emphasized that one of the major features of the project is the integrated approach, which has allowed to merge the Mashreq and Maghreb as one program; it has been a gratifying one. The project is trying to cross boundaries and disciplines and Phase II is an important and critical one. He also indicated that the partnership between IFAD/IFPRI/AFESD is highly viewed and appreciated and gave credit to ICARDA for promoting this partnership within this project. Dr. El-Zabri thanked all National Programs, National Coordinators and ICARDA regional coordinators for all their efforts to get the second phase on track.

On behalf of ICARDA, Dr. Mahmoud Solh thanked the donors and IFPRI for their support. He said that ICARDA views this project as unique as it integrates the technology component with the policy and property rights component. This will lead to a better

understanding of the adoption of technologies and a possible quantification of the impact of the adoption. He also stressed the importance of making the senior management of NARS of the countries involved in the project more aware of the benefit of the M&M project activities at the national and regional levels. Dr. Solh expressed ICARDA's appreciation of the support given by IFAD and AFESD to its research activities and to the M&M project. He commended the input of Drs. Slama, Sidahmed, El-Zabri and Jarrad and thanked them for their interest and their instrumental role in insuring the Phase II of the project.

ICW98 tackles scientific, environmental and organizational issues

More than 500 scientists, government officials and organizational representatives converged on the World Bank's headquarters in Washington, D.C. to participate in CGIAR's International Centers Week 1998 (ICW98) held 26-30 October 1998.

The World Bank President, James Wolfensohn, opened the meeting by praising the CGIAR's "extraordinary achievements" and recalling that one of his first lessons in development economics was at the hands of CGIAR colleagues in Mexico, where he trudged through the fields talking with farmers.

The report of the System Review Panel has "Extraordinary importance to economic development and to the work of the Work Bank," Mr. Wolfensohn said. Agriculture and rural development are central to the Work Bank in alleviating poverty, he explained that the Work Bank supports the CGIAR's work 100 percent.

CGIAR chairman Ismail Serageldin said that the System Review Panel gave the CGIAR a ringing endorsement, and that the Group particularly encouraged by the Panel's judgement that "there can be no long-term agenda for eradicating povert, ending hunger, and ensuring sustainable food security without the CGIAR."

The Group initially discussed the System Review Panel report in opening plenary sessions; then it broke into three Working Groups to focus on key themes. Special open sessions on science, partnerships, and governance and finance were convened, allowing anyone attending ICW98 to participate. The working groups presented their comments on key issues and recommendations to the Group in plenary, where there was further debate.

Following discussion of the System Review Panel's recommendations, the Group as a whole:

- Endorsed a new CGIAR mission statement emphasizing food security and poverty eradication: To contribute to food security and poverty eradication in developing countries through research, partnership, capacity building, and policy support, promoting sustainable agricultural development based on the environmentally sound management of natural resources;
- Endorsed the thrust of the Panel's recommendations on the CGIAR's scientific agenda and directions concerning integrated gene and natural resource management;
- Endorsed the goals and principles embodied in the System Review's recommendations on broadening the CGIAR's partnerships;
- Endorsed the strategic thrust of the Panel's recommendations on the CGIAR's governance and finance.

The recommendation for establishment of a central board, however, was judged to require more detailed study.

Additional deliberations are necessary on act on the recommendations to establish the CGIAR as a legal entity, to eliminate the co-sponsor status of UN agencies, to appoint a full-time Chairman and Chief Executive Officer, and to expand the CGIAR Secretariat's services relating to Center staff recruitment.

To follow-up on many issues raised by the System Review report, the Group asked the Chairman to organize a Consultative Council to monitor the implementation of decisions made at ICW98, to arrange for or conduct follow-up studies, and draft action-proposals for consideration at the CGIAR's mid-term meeting (MTM99). The Consultative Council will be broadly representative of the System including members from North and South, from co-sponsors and multilateral donors, and from Centers and Standing Committees. The Council will consult with the System Review Panel, as appropriate.

The first Council meeting is January 27-28, 1999 in Brussels, Belgium hosted by the European Commission. The Council should have its recommendations available to the CGIAR 4-6 weeks before MTM99, which is scheduled for May 24-28 in Beijing, China.

Use of remote sensing for natural resources management and environmental assessment in southwest Asia

Eddy de Pau
ICARDA, P.O. Box 5466, Aleppo, Syria

ICARDA's Agroecological Characterization Project and the Center for Earth Observations of Yale University, USA jointly organized a 3-day technical workshop 'Use of Remote Sensing for Natural Resource Management and Environmental Assessment in Southwest Asia' at ICARDA Headquarters in November 1998. Financial assistance was provided by the USAID Linkage Fund.

The case for a subregional expert consultation on remote sensing applications was based on the perception that remote sensing is still largely underutilized by the national agricultural research systems of the region as a research tool to analyze environmental and land use trends and fluctuations over large areas. This is unexpected, given the

availability of cheap satellite remote sensing products, and the affordability, power and flexibility of PC-based image-analysis software. The reason for this situation is apparently a communication and information gap. Remote sensing is currently the realm of specialized remote sensing institutes, who are implementing agents for ad-hoc contracts, whereas the agricultural research community is generally unfamiliar with the technology and its costs, and is unable to express its needs and assess the added value of a remote sensing activity.

In order to bridge this communication gap, the workshop brought together a group of agricultural researchers and remote sensing specialists from the region (Syria, Turkey, Jordan and Lebanon) and from Yale University and ICARDA, to present a wide range of remote sensing applications, and to discuss the future options for remote sensing in the region.

Remote sensing applications were presented in the areas of soil survey and land evaluation, natural vegetation mapping, rangeland condition assessment, land degradation and rehabilitation, identification of potential water harvesting sites, plant diversity research, agroecological characterization, land cover/land use mapping, precision farming, regional assessment of climate, hydrology and vegetation, and impact assessment of land use policy. Also new techniques of image analysis were presented, focusing on new classification methods, use of hyper-spectral sensors and indices for crop differentiation, and on methods for the quantitative comparison of low resolution satellite products and climate data.

The workshop papers will be made available in the course of 1999 in the form of workshop proceedings.

NETWORKS NEWS

WANANET: New objectives and structure

The Steering Committee of WANANET met from 27-28 June 1998 to discuss ways to enhance the implementation of its activities and discuss possible changes in its governing bodies. It was felt that the objectives agreed upon in 1992, when WANANET was established, needed updating.

Not only the objectives but also the structure of WANANET was extensively discussed. The outcome was a new structure for the WANANET organization and a changed definition of the roles and responsibilities of the governing bodies. The WANANET Plant Genetic Resources Committee (WANA-PGRC) will now be composed of three representatives of each national program. The Steering Committee will represent all sub-regions of WANA. It is composed of four scientists from West Asia, two from the Arabian Peninsula and three from North Africa. The existing working groups will be replaced by work sessions on specific subject and fields like horticultural crops, pasture forage and rangeland, *In Situ* conservation and biodiversity. Every three years such a working session will take place to identify priorities, develop sound action plans and project concept notes and subsequently seek funds or identify potential donors.

The Steering Committee (SC) is the liaison between member countries and will identify the needs of the national programs with the help of the Secretariat. The SC will assess its priorities according to the proposals from the Working Sessions and the Secretariat. Regional projects can be developed in cooperation with the Secretariat and submitted to possible donors. Finally they will provide relevant information to the Secretariat and prepare regular meetings.

The Secretariat located at the CWANA office will formulate regional projects for several countries having common interests with the assistance of the SC and identify funding agencies to support this or assist individual national programs. It will organize regular WANANET meetings, publish the proceedings, and facilitate information exchange within the network.

Membership fees

The SC decided to raise a fee for members of WANANET. An equivalent amount to $US 500 in local currencies or in-kind contributions to WANANET has been agreed upon. The implementation of WANANET activities primarily relies on the commitment of Governments and interest of national scientific staff. Therefore the SC decided that, functional National Committee for Plant genetic Resources (NCPGR) must be established in all member countries. There should be a commitment by National Programmes of the countries in which, WANANET activities will be implemented.

For more information and also guidelines for Country Reports to WANANET contact: Dr. Yawooz Adham, WANANET Secretariat, IPGRI-CWANA.
c/o ICARDA, PO box 5466, Aleppo, Syria Tel: +963-21-2231412(direct) Fax:+963-21-2213490/225105
Email:ipgri-cwana@cgiar.org

TRAINING OPPORTUNITIES

Advanced Course: "Molecular Techniques in Animal Breeding"

15 - 26 March 1999, León, Spain

Organized by the Mediterranean Agronomic Institute of Zaragoza (CIHEAM-IAMZ) with the collaboration of the Universidad de León.

The deadline for the submission of applications is 15 January 1999. For further information:

Instituto Agronómico de Zaragoza
Appartado 202, 50080 Zaragoza (Spain)
Tel: (34) 976 57 60 13. Fax: Tel: (34) 976 57 63 77.
E-mail: iamz@.ciheam.org

Advanced Course: "Applications of NIRS technology for the evaluation of agricultural products"

12 - 16 April 1999, IAMZ, Zaragoza, Spain

Organized by the Mediterranean Agronomic Institute of Zaragoza (CIHEAM-IAMZ) with the collaboration of Universidad de Córdoba Servicio Centralizado NIRS-Banco de Muestras.

The deadline for the submission of applications is 15 February 1999. For further information:

Instituto Agronómico Mediterráneo de Zaragoza
Appartado 202, 50080 Zaragoza (Spain)
Tel: (34) 976 57 60 13. Fax: Tel: (34) 976 57 63 77.
E-mail: iamz@.ciheam.org

International Postgraduate Training Course: "Risk Management in Agriculture - Principles and Applications"

21 - 26 June 1999, Wageningen, The Netherlands

Jointly organized by The International Training Centre (PHLO), Wageningen University and Research Centre in cooperation with the University's Department of Economics and Management.

Objectives

After attending the course participants will:

- understand the nature of agriculture decision making under uncertainty and be able to use this understanding in conceptualizing decision problems under risk.
- have a firm grasp of the concept of rational choice in a risky world and its foundations in the theory of probability and risk preference.
- understand and be able to apply methods for analysis of risky decisions that can be used in agriculture.
- be able to formulate and evaluate plans and strategies for risk management in agriculture

Target group

The course is primarily aimed at :

- people involved in advising farmers, such as extension workers, financial advisers and veterinarians.
- educators and research workers in agricultural economics, farm management, animal science, crop science and related fields
- policy-makers, for policy development itself and also to understand how farmers react to risk.

All lessons, instructions and documents will be provided in English.

For further information, contact:

The International Training Centre (PHLO)
P.O. Box 8130, 6700 EW Wageningen
The Netherlands
Tel: +31-317-184092. Fax: +31-317-426547

International Course "Livestock and Environment Interactions"

11-25 April 1999, Wageningen, The Netherlands

Organized by: International Agricultural Centre, Wageningen Agricultural University, Animal Production Systems, Development Economics

Objectives

The objective of the International Course on "Livestock and Environment Interactions" is to operationalize the information of the multi-donor study on livestock and the environment and to provide course participants with an enhanced insight in:

- the understanding of the principles and the dynamics of livestock-environment interactions in the various production systems;
- the recognition of positive and negative livestock-environment interactions together with their biophysical and socio-economic implications; and
- the process of analysis, formulation and implementation of environmental policies in relation policy goals in environmental protection and livestock production.

Target group

The course is designed for professionals engaged in policy formulation, in program design and implementation in the livestock or environmental sector at governments departments, in non-government organizations, donor agencies, in private sector entreprises, or in education and training. Participants are expected to have relevant working experience in the field of livestock production or environment. Competence in the English language is required.
For further information, contact:

The Director of the International Agricultural Centre
P.O. Box 88, 6700 AB Wageningen
The Netherlands
Tel: +31-317-490111. Fax: +31-317-418552
E-mail: IAC@IAC.AGRO.NL

Courses in Applied Statistics and Computing. Statistical Services Centre. The University of Reading, UK

Statistics in Agricultural Climatology
20 July to 14 September 1999

Computing and Statistics: Basics
7-23 July 1999

Data Management and Scientific Support
26 July to 14 September 1999

Research Methods for Experimenters
26 July to 14 September 1999

Survey Design and Analysis
26 July to 14 September 1999

For further information, contact:

MASD Administrator
Statistical Services Centre
The University of Reading. Harry Pitt Building
Whiteknights Road. P.O. Box 240
Reading RG6 6FN. United Kingdom
Tel.: +44 118 9318025. Fax: +44 118 9753169
E-mail: masd@reading.ac.uk

Formation continue en télédetection spatiale et systèmes d'information géographique

Le Centre Royal de Télédetection Spatiale, Rabat, Maroc offre cinq modules de formation en 1999 :

MODULE 1 : Systèmes d'Information Géographique pour la Gestion des Ressources Naturelles et l'Environnement

Durée : 2 semaines. 25 janvier – 5 février 1999
Langue de travail : français

Public concerné

- Ingénieurs, cadres techniques, gestionnaires de projets, universitaires
- Secteurs public, semi public et privé désirant intégrer les SIG comme outil de travail quotidien

MODULE 2 : Cartographie et Télédétection Spatiale

Durée : 1 semaine. 15-19 mars 1999
Langue de travail : français

Public concerné

- Ingénieurs, cadres techniques, gestionnaires de projets, universitaires
- Secteurs public, semi public et privé producteur ou utilisateur de cartes

MODULE 3 : Gestion des Ressources Naturelles à Partir des Images Basse Résolution

Durée : 1 semaine. 3-7 mars 1999
Langue de travail : français

Public concerné

- Ingénieurs, cadres techniques, gestionnaires de projets, universitaires
- Secteurs public, semi public chargé de la gestion des ressources naturelles

MODULE 4 : Systèmes d'Information Géographique pour l'aide à la Gestion Régionale

Durée : 1 semaine. 14-18 juin 1999
Langue de travail : français

Public concerné

- Ingénieurs, cadres techniques, gestionnaires de projets, universitaires
- Responsables des collectivités locales impliqués dans les projets de développement et les processus de décision

MODULE 5 : Systèmes d'Information Géographique pour la Planification et la Gestion et des Réseaux

Durée . 1 semaine. 12-16 juillet 1999.
Langue de travail : français

Public concerné

- Ingénieurs, cadres techniques, gestionnaires de projects, universitaires
- Secteurs public, semi public et privé désirant utiliser les SIG pour l'aide à la gestion et la planification des réseaux

Pour plus d'information :

Centre Royal de Télédétection Spatiale
Service de Formation
16 bis, avenue de France, Rabat, Maroc
Tél. : 212 7 77 63 05/06. Fax : 212 7 77 63 00
Email : crts@mtds.com

International Center for Agricultural Research in the Dry Areas (ICARDA) Course Schedule and Training Opportunities 1999

Headquarters Training Courses (Aleppo, Syria)*

Short-term Training Courses*		**Organizers/Coop.**
15-25 February	Soil and water management	ICARDA/Egypt
7-11 March	Human resource development on biodiversity conservation	ICARDA
14-25 March	Farm mechanization/experimental station operation management	ICARDA/Egypt
5-15 April	Breeding field crops for stress tolerance	ICARDA
25 April-6 May	IPM of cereal and legume crops	ICARDA
2-6 May	Agro-ecological characterization	ICARDA
2-13 May	Marginal water management for sustainable agriculture	ICARDA/CIHEAM
16-27 May	Complimentary *ex situ* and *in situ* conservation	ICARDA/IPGRI
6-17 June	Statistical design, data management and analysis of field experiments	ICARDA
6-17 June	Water harvesting systems-hydrology and design	ICARDA/CIHEAM
4-15 July	Molecular tools for biodiversity studies	ICARDA/IPGRI
12-23 September	DNA molecular marker techniques for crop improvement	ICARDA
3-14 October	Library and information management	ICARDA
3-14 October	Techniques for improving water use efficiency in agriculture	ICARDA/CIHEAM
1-11 November	Methods for predicting the nutritive value of feeds for small ruminants in WANA	ICARDA
7-11 November	Scientific writing	ICARDA

Announcements for Headquarters training courses, including course description and application procedures, will be sent to the concerned national agricultural research systems throughout the year, a few months before each course commences.

Non-headquarters Training Courses

Regional/Sub-regional Short-term Training Courses		**Location**	**Organizers/Cooperators**
20 Feb-4 Mar	Protected agriculture	Qatar	ICARDA/NARS
6-17 April	Variety description and breeder seed production	Morocco	ICARDA/NARS
2-11 May	Vetch production	Iraq	ICARDA/NARS
3-8 May	Design and analysis of durum variety trials	Morocco	ICARDA/CIMMYT
3-14 May	Soil and plant analysis methods	Morocco	ICARDA/NARS
10-21 May	Computer applications in wheat breeding	Kazakhstan	ICARDA/CIMMYT/NARS-CAC
7-11 June	Range rehabilitation and management	Turkey	ICARDA/NARS
7-18 June	DNA molecular marker techniques for crop improvement	Morocco	ICARDA/NARS
10-21 October	Utilization of expert systems in agricultural research and production	Egypt	ICARDA/NARS
In-country Short-term Training Courses**		**Location**	**Organizers/Cooperators**
5-10 April	Statistical data analysis	Jordan	ICARDA/Jordan
5-12 April	Seed health testing	Syria	ICARDA/Syria
2-13 May	Seed health and quality control	Iraq	ICARDA/Iraq
6-17 June	Experimental station operation management and legume harvest mechanization	Iran	ICARDA/Iran
12-21 June	Seed processing and economics	Yemen	ICARDA/Yemen
20 June-1 July	DNA molecular marker techniques for crop improvement	Iraq	ICARDA/Iraq
3-10 July	Seed processing	Iraq	ICARDA/Iraq
12-22 Sep	Management of seed programs	Pakistan	ICARDA/Pakistan
17-23 October	Seed processing and economics	Sudan	ICARDA/Sudan

The collaborating national program of each country administers these courses through the concerned ICARDA's Regional Program Coordinator. Applications can be accepted only from authorized national agricultural research organizations and universities in the host country.

*Application for these courses is open to all countries where ICARDA has active programs. Invitation letters and application forms for each of these courses will be sent to the concerned NARS's afew months before the course commences.

** Application for these courses is limited to participants from the host country.

Individual Training

Individual non-degree training: Specialized non-degree training is available for individuals or small groups of candidates if officially requested by their national agricultural research systems.

Graduate studies: ICARDA welcomes nominations from national agricultural research systems for graduate students to conduct their field research at/or through ICARDA. Funding from the Arab Fund for Economic and Social Development supports Arab Fellows from Arab countries in collaborative field research at the Center. A brochure on the ICARDA graduate studies program is available on request.

Financial Support

ICARDA encourages national agricultural research organizations and universities to secure funding from international, regional and bilateral donor agencies to support the direct costs of training participants at ICARDA. A limited number of scholarships are available from ICARDA. A grant from the Arab Fund for Economic and Social Development supports Arab country participants in these training activities.

For additional information, please contact the: Human Resources Development Unit. *ICARDA, P.O. Box 5466, Aleppo, Syria. Tel.: (963-21) 2225112, 2225012, 2213433, 2213477. Fax: (963-21) 2225105 or 2213490*
E-mail: ICARDA@cgiar.org

UP-COMING EVENTS

10th Meeting of the FAO-CIHEAM Sub-Network on Mediterranean Pastures and Fodder Crops: *Legumes for Mediterranean Forage Crops, Pastures and Alternative Uses*

4-9 April 2000, Sassari, Italy.

Topics

Papers dealing with the general topic of the meeting are solicited; they will be discussed into the following 6 main sessions:

1. Germplasm collection and improvement. Results of breeding activity.

2. Agronomic aspects of forage legume management and forage quality.
3. Eco-physiology at plant and community level.
4. Legume-rhizobia relationships.
5. Persistence, seed production and sward regeneration.
6. Role of legumes in forage systems, alternative uses of legumes.

Contributions

Papers can be written in English or French. The preliminary registration form with 100-word abstract of the paper must be sent before 15 February 1999. Only the 4-page papers sent before 31 October 1999 will be reviewed and published in *Options Méditerranéennes*. For further information:

Dr. Claudio Porqueddu
CNR – Centro Pascoli Mediterranei
Via E. De Nicola, 071000, Sassari, ITALY
Tel: 39 079 229 332. Fax: 39 079 229354
E-mail: legumed@ss.cnr.it

Sixth International Conference on the Development of Dry Lands. Desert Development: Challenges Beyond the Year 2000.

International Center for Agricultural Research in the Dry Areas (ICARDA)

22-27 August 1999, Cairo, Egypt.

Topics of interest

Subjects to be addressed include:

- Application of new technologies and technology transfer
- Soil and water conservation and degradation
- Range management, and forage and livestock production
- Conservation and biodiversity
- Ethno-botany
- Application of biotechnology for improvement of stress resistance
- Stress physiology
- Renewable energy
- Indigenous/traditional knowledge and heritage
- Sustainable development of oasis
- Population and desert communities
- Socioeconomic studies
- Role of NGOs and private sector

Persons planning to present papers at the Conference should submit a one-page, single-spaced abstract of 200-300 words. Deadline for submitting Abstracts is 28 February 1999. Completed manuscripts must be submitted latest by the start of the Conference.

For further information contact:

Prof. Dr. Adel El-Beltagy
Chairman of the Organizing International Committee
International Center for Agricultural Research in the Dry Areas (ICARDA),
PO Box 2416, Cairo, Egypt.
Tel.: (202) 5724358. Fax: (202) 5728099
E-mail: ICARDA-CAIRO@CGIAR.ORG

VI International Rangeland Congress

19-23 July 1999. Townsville, Australia.

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 summarizing the outcomes of sub-themes, 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, separate from the Congress Proceedings.

There will be 18 scientific sessions. 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. Abstract text should be under 250 words (1/2 page, single spaced, 8 pt). Include title, authors, postal and email addresses and submit by email, email attachment or on a computer disc. Label the file as authors name.abs. The preferred word processing programs to be used are MS Word and Wordperfect. Please advise in the body of the email or on the disk, the word processing package used. Include a second copy in ASCII (text) called authors name2.abs.
Abstracts should be submitted to:

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

or emailed to: editors-irc@nsw.edu.au
Papers, volunteered and invited, are due by 1 December 1998 and requirements
will be described in a later bulletin, on the web site and in the Registration Brochure. However, the size of volunteered papers will be about 2 x A4 pages.

International Herbage Seed Conference

23 - 28 May 1999, Perugia, Italy.

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.

10th International Soil Conservation Organization Conference

23-28 May 1999, Purdue University West Lafayette, Indiana, USA.

The Conference provides a forum for land and water conservationists from around the world to come together to exchange information and ideas and to express their views on the "state of the world" and what can and *must* be done to achieve sustainability in land use. The meeting also provides an opportunity to extend the personal and professional networks that are critical for finding solutions to any global problem. And the midweek conference tour, along with the pre- and post-conference tours and workshops, will introduce participants to the conservation challenges associated with agricultural systems in the United States.

The Shape of the Coming Agricultural Biotechnology Transformation: Strategic Investment and Policy Approaches from an Economics Perspective

17 –19 June 1999, University of Rome, Tor Vergata, Italy.

An International Conference organized by the International Consortium on Agricultural Biotechnology Research (ICABR) This conference is focused on the roles of economics in projecting and assessing the future structure of the biotech input sector and its effects on farmers and consumers in the EU, other developed countries and developing nations. The intent is to focus on the issues particular to these two areas.

Contributing papers are sought. Presented papers will be published in a proceedings volume. Proposals in the form of a maximum 500-word abstract should be sent to:

Vittorio Santaniello. Tor Vergata University, Rome, Italy. Tel.: ++39 06 7259 5705. Fax: ++39 06 2020500 Email: santaniello@economia.uniroma2.it

World Seed Conference

6-8 September 1999, Cambridge, UK.

Organized by The international Seed Testing Association (ISTA), The International Seed Trade Federation/International Association of Plant Breeders(FIS/ASSINSELL), the Organization for Economic Co-operation and Development (OECD) and the International Union for the Protection of New Varieties of Plants (UPOV).

For further information, contact the Conference Secretariat:

42 Devonshire Road, Cambridge CB 1 2 BL, UK. Tel.: +44-1-223 32 34 37. Fax: +44-1-223 46 03 96 E-mail: cc@confcon.demon.co.uk

Feed Blocks Technology and Its Impact on Improving Animal Performance

22-24 March 1999, Baghdad, Iraq.

A Workshop jointly organized by IPA Agricultural Research Center, The Mashreq/Maghreb Project and the Federation of Arab Scientific Councils. The workshop will be held at the auditorium of the Federation of Arab Scientific Research Councils. The languages of the workshop will be Arabic and English.

Workshop Topics:

1. The use of agro-industrial residues as a supplementary feed for ruminants.
2. Effect of feed blocks on the improvement of sheep productive and reproductive performance.
3. Economic assessment, adoption and impact of feed block technology.
4. Manufacturing feed blocks and the transfer of technology to the private sector and farmers.

For further information, contact the Workshop Secretariat:

C/0 Dr. Azhr H. AI-Haboby IPA Agricultural Research Center. P.O. Box 39094. Baghdad, IRAQ

The future of the Mediterranean Rural Environment: Prospects for sustainable land use and management

Spring 2000, Menemen, Turkey.

International Conference jointly organized by Cranfield University (UK) and the General Directorate of Rural Services - GDRS (Turkey). The conference aims to identify future strategies of sustainable land use and management in the Mediterranean rural sector, by examining processes of political, socioeconomic, technological and biophysical change in an integrated manner.

The Conference Committee welcomes the submission of papers and posters for the Conference. It is hoped that potential authors will submit offers of papers relating to work that is currently in progress, as well as work that is completed, so that delegates can have

information that is as up to possible. Please send a summary (c. 300 words) to the Conference Committee *by 1st May 1999*. Conference details will be regularly updated on our website: www.silsoe.cranfield.ac.uk

To receive a programme and registration form, please return contact:

Gill Burrows. Cranfield University
Silsoe, Bedford, MK45 4DU. UK
Tel: +44 (0)1525 863349. fax: +44 (0)1525 863344. E-mail: g.burrows@cranfield.ac.uk

Assessing the Impact of Agricultural Research on Poverty Alleviation

14-16 September 1999, CIAT, Cali, Colombia.

CIAT and other CGIAR centers are well aware that their effectiveness, now and in the future, will be judged by the extent of their contribution to poverty reduction. It is also clear to us that we can make progress toward this goal only through a strong partnership that unites the centers with national research programs, universities, nongovernment organizations, and the private sector.

For that reason, we invite you to join us in the search for more effective ways to lighten the burden of poverty for the children of the new century.

The information and insights that emerge from this workshop will better enable international centers and their national research partners to target projects to specific groups, such as low-income farmers and women, and to gauge the impact of this work.

Among other uses, the outcomes of the event will contribute importantly to a proposed global conference to be organized for the year 2000 by the International Food Policy Research Institute (IFPRI) and the Impact Assessment and Evaluation Group (IAEG) of the CGIAR.

Outcomes of the workshop

The workshop will seek answers to the following questions:

- What do we know about the extent and nature of poverty?
- How have the extent and nature of poverty changed over time?
- What are the main obstacles to reducing poverty?
- What do we know about the impact of agricultural research in reducing poverty?
- What are the best indicators available for measuring the impact of research in terms of poverty reduction?
- What evidence is there that poverty is linked with natural resource degradation?
- What are the implications of this link for designing research initiatives and measuring their impact?

For up-to-date information about the workshop, see the "events" section of our World Wide Web site: http://www.ciat.egiar.org. While there, have a look at the "impact" section as well, which you can access from the first page of our site. Also, feel free to contact:

Grant M. Scobie. CIAT. Apartado Aéreo 6713
Cali, Colombia. Tel.: 57-2-445-0000 (direct); 1-650-833-6625 (via USA). Fax: 57-2-445-0073 (direct); 1-650-833-6626 (via USA). E-mail: g.scobic@cgiar.org

NEW RELEASES

ICARDA Caravan No. 8 Winter/Spring 1998

Yemen—a hard place to farm. ICARDA's Director General encourages collaboration (Page 4)

Uzbekistan and ICARDA sign an agreement for strengthening their collaborative research (Page 5)

M.S. Swaminathan, one of the most distinguished figures in agriculture, delivers an address at ICARDA (Page 6)

Global warming—is the Central Asian steppe one of our best allies? (Page 8)

Irrigated forages deplete water resources, but in the Gulf, what's the alternative? Maybe we have found it (Page 9)

Reuse of water is causing pollution, salinity, and shortage of land in Egypt. Answers are being found (Page 12)

An arid area needs integrated agricultural development. How Egypt does it in Marsa Matrouh—and how ICARDA helps (Page 15)

Farmer-developed barley; the beginning of Year Three, and we are making progress (Page 18)

They hardly seem the place for biodiversity, but Matrouh's wadi tips are a treasurehouse of genetic resources (Page 19)

Sowing new scientists? How our Seed Unit for a multiplier effect in training (Page 21)

Training course in gender issues at ICARDA brings women and development together in the field (Page 23)

Caravan is published four times a year, by ICARDA.

Executive editor: Dr Surenda Varma.

THE ARID LANDS NEWSLETTER #44

Editor's note:

Water as source of life, water as source of cooperation? -----by Katherine Waser

Openness, sustainability, and public participation in transboundary river-basin:

- Part I: The scientific-technical paradigm of river basin management
- Part II: Regulatory, closed and top-down paradigms of river basin management
- Part III: Adapting the U.S.-Mexico paradigm

------by Lenard Milich and Robert Varady

Water, conflict resolution and environmental sustainability in the Middle East
-----by Bertrand Charrier, Shlomi Dinar and Mike Hinicker

The Euphrates-Tigris basin: An overview and opportunities for cooperation under international law
-----by Ibrahim Kaya

Toward *jointly* managing a transboundary aquifer: Creating a bi-national dialogue through community participation and education
-----by Elaine Hebard

Water as an instrument for sustainable regional development
-----by David Barkin and Carlos Pialles

Briefly noted:

Selected resources of interest
-----annotated by Elaine Cubbins

Selected news of interest
-----annotated by Elaine Cubbins

Please address letters of comment, article proposals, news items or any questions you may have about the Arid Lands Newsletter to:
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A. Nefzaoui. 1997. ***Olive tree by-products***. République tunisienne, Ministère de l'Agriculture. Institution de la recherche et de l'enseignement supérieur agricoles, Institut national de la recherche agronomique de Tunisie. Mashreq/Maghreb Project.

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Fairey, D.T. and J.G Hampton (eds.) 1997. ***Forage and Seed Production Volume 1: Temperate Species***. 1997.CAB INTERNATIONAL, The University Press, Cambridge.

LAST SEMESTER SHARE

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

We received several contributions related to the subject. The editor also compiled some published information and included some useful references.

ORIGIN OF CULTIVATION

Zohary and Hopf 1988

Common vetch, *Vicia sativa* L., is another member of the genus *Vicia* that characterizes Mediterranean grain agriculture. It is a minor crop cultivated for hay and for seed. Similar to bitter vetch, the seeds are not attractive for human consumption. The pulse is used today exclusively as an animal feed. Common vetch *is also a* frequent contaminant of lentil and bitter vetch cultivation. Seed of the latter pulses sold in local markets frequently contain scattered *V. sativa* seed.

The cultivated *V. sativa* is a diploid self-pollinated plant (chromosome number 2n = 12) with straggling or ascending habit and rounded, somewhat compressed, smooth seeds, 4.5--7.0 mm in diameter. The cultivars are closely related to an extraordinarily variable (and chromosomally complex) aggregate of wild types and weedy forms, the dustribution of which is centred in the Mediterranean basin (Zohary and Plitman 1979). All are now grouped, together with the crop, in the *Vicia sativa* complex. Most cultivars, together with morphologically closely related weeds and escapees are placed in *V. sativa* subsp. *sativa*.

Carbonized seeds of *V. sativa* have been reported from several Neolithic and Bronze Age sites in the Near East and Europe. But since seed sizes of weedy forms and wild types overlap considerably those found in the cultivars, it is difficult to conclude whether the remains represent cultivated forms, weedy contaminants or collection from the wild. More definite indications of common vetch cultivation are available only from Roman times.

The earliest archaeological records of *V. sativa* come from Natufian and Neolithic Tell Abu Hureyara, Syria (Hillman 1975) and from Pre-ceramic Neolithic Can Hasan III, Turkey (French and Hillman 1972). They are followed by several records from Neolithic and Eneolithic Bulgaria (Renfrew 1973, p. 188), Hungary (Hartyany and Novaki 1975) and Slovakia (Hajnalova 1975). Common vetch is also reported from several Bronze Age contexts such as the second half of the third millennium BC beds in AK-Tepe near Ashkabad. Turkmen SSR (Priscepenko 1973, as cited by Schultze-Model 1974) and from Slovakia (Kühn 1981).

Erskine *et al.* 1994

Vicia sativa is a wild and cultivated cosmopolitan species, which is highly variable. Five main taxa, at sub-specific level, may be distinguished in the complex. The variability in all taxa, or populations, of *V. sativa* is homologous, parallel and consequently overlapping many of the subdivisions are known to interbreed with each other, at least to some extent in this predominantly self-pollinating group (Davis 1970; Tutin *et al.* 1986). The origin and natural distribution centered around the Mediterranean basin (Zohary and Plitmann 1979).

Archaeological evidence is inconclusive regarding the domestication of the common vetch, because although carbonized seeds of *V. sativa* have been often found it is not possible to determine definitively if they were wild, weedy or cultivated. Seed size overlaps these types.

The earliest finds of *V. sativa* were at Tel Abu Hureyra in Syria from the Late Natufian phase (9200-8500

B.C.) and Aceramic Neolithic (7500-6500 B.C.) level (Hillman 1975), where *V. sativa* seed was rare and lentil seed, among the legumes, was most abundant. Common vetch is next identified from Can Hasan III in Turkey dated to about 6500 B.C. in levels where bitter vetch seed (*V. ervilla*) was frequent and lentil seeds few (French *et al.* 1972). In one of the four digging units examined, 40 seeds of *V. sativa* were found together with 8 seeds of einkorn (*Triticum monoccocum*), three seeds of lentil, c. 529 seeds of hackberry (*Celtis tournerfortii*) and thousands of achenes *Lithospermum arvense*, representing primarily wild plant material. The detail is given because this is the only case with *V. sativa* as the predominant legume species. Common vetch has been found at Neolithic and Eneolithic sites in Bulgaria. Hungary and Slovakia (Zohary and Hopf 1988). In Bulgaria common vetch seed appeared rarely among frequent lentils in the early Neolithic (4728-4770 B.C.) at Tel Azmak (Kohl and Quitta 1966 in Renfrew 1973). In the Eneolithic period it was associated with large finds of *V. ervilia* at the same site and also at Karanovo. *V. sativa* has also been found in the Zoser pyramid (3rd dynasty, 2900 B.C.) at Saqqarah in Egypt (Lauer, Laurent Tackholm, and Aberg 1950). From the Bronze Age *V. sativa* has been found in Turkmenia at AK-Tepe, in Australi at Burgschleinitz, in Slovakia and Hungary (Zohary and Hopf 1988). It has also been recovered from Roman Isca in Wales (Helbaek 1964 in Renfrew 1973).

White direct evidence for the domestication of common vetch is lacking from the archaeological record, several points stand out. Firstly, *V. sativa* is nowhere found as the predominant species, suggesting that it was not domesticated untill late in the archaeological record. Secondly, whenever, an indication of the frequency of the seed of *V. sativa* within finds is available, it is often rare where lentil or bitter vetch predominate. Only in a single sample at Can Hasan III was common vetch the dominant legume species in the sample were mostly collected from the wild. Thirdly, the arecheological records of *V. sativa* in Austria. Hungary, Slovakia and Turkmenia are outside the current distribution of wild *V. sativa*. These are circumstantial evidence for its early movement as a weed of bitter vetch and lentil.

Historical records of common vetch cultivation start with the Romans, who mention the use of three vetches: cracca for *Vicia cracca*, ervum or ervile for *V. ervilia* and vicia for *V. sativa* (White 1970). Common vetch was used in Roman agriculture in monoculture, both as a green manure crop and cut as fodder for cattle, and in mixed forage crops. Cato, the earliest Roman authority on agriculture writing in the middle of the second century B.C. indicated that the use of common vetch (or lupins or faba beans) as a green manure crop was excellent for succeeding grain crops.

To sum up, the archaeological record suggests that common vetch was a weed which spread to Central Europe with the pulses, lentil and bitter vetch, as part of the Near East early Neolithic crop assemblage.

LES SOUS-ESPECES DE *VICIA SATIVA*

Noun 1997
Ministry of Agriculture, Lebanon

Vicia sativa L. est l'espèce la plus variable et la plus ubiquiste du genre *Vicia*. Plusieurs sous-espèces, variétés et hybrides en sont connus. Maxted (1995) distingue 6 sous-espèces :

***Vicia sativa* L. subsp. *nigra* (L.) Ehrh.**

Folioles linéaires à oblongues cunéiformes, aigues, obtuses ou tronquées. Dents de calice plus courtes que le tube. Corolle 10-18 mm. Etendard pâle pourpre rougeâtre. Ailes similaires ou quelque peu plus foncées. Gousse non-contractée entre les graines, noire ou noir-brunâtre, d'habitude glabre. Graines 2-4 mm. 2n = (10); 12 ; (14).

Du niveau de la mer jusqu'à 2900 m d'altitude. Mauvaise herbe commune des régions tempérées et sub-tropicales, trouvée dans les terrains agricoles et détournés et aux marges des zones forestières. C'est la plus répandue parmi les autres sous-espèces (Maxted 1995). Elle est répandue dans toute l'étendue de l'espèce (Ball 1968). Spontanée dans le bassin méditerranéen (F.A.O. 1975). Jardins, buissons et boisements (Mouterde 1970). Elle est spontanée et cultivée en Turquie. Pentes rocheuses calcaires et champs du niveau de la mer jusqu'à 1900 m d'altitude (Davis 1969).

En Egypte, très commune dans la région mediterranéenne, dans la région du Nil, au Sinaï et dans les Oasis du desert lybien (Täckholm 1974). A coté d'Alep, à Aintab et à Damas (Jabal Kassiyoun et Wadi Barada) en Syrie. A Jericho, Jarash, Maadaba, Jerusalem, Wadi el Ghradi, Jaffa et Bâniyâs en Palestine.A Beyrouth, Jabal Knaysseh, Abayh et Baalkeck au Liban (Dinsmore 1932). En Irak, pentes montagneuses sous broussailles à Quercus, champs, dépressions désertiques cultivées et périmètres irrigués. Très commune dans la zone forestière, occasionnelle dans la région steppique et les plaines alluviales de la région désertique ; du niveau de la mer jusqu'à 1300 m (Townsend et Guest 1974). A Chypre, elle est signalée dans les terrains en friche, aux bords des chemins, dans les garrigues, sur les pentes pierreuses, sous les pinèdes en pentes et occasionnellement sur dunes de sable. Indigène sans aucune doute, elle pousse du niveau de la mer jusqu'à 1700 m d'altitude (Meikle 1977).

Vicia sativa subsp. *nigra* montre une meilleure adaptation aux hautes altitudes que les autres sous-espèces (Francis *et al.* 1994). *Vicia sativa* subsp. *nigra* tolère les sols hydromorphes. (Ehrman et Maxted 1989).

***Vicia sativa* L. subsp. *amphicarpa* (Dorthes) Ascherson et Graebner**

Plantes avec des tiges souterraines portant peu de fleurs apétales et une gousse blanche, irrégulièrement avec une ou deux graines, 15 mm. Folioles linéaires, aigues à obcordées. Dents du calice plus courtes que le tube. Corolle 20-25 mm. Etendard pourpre-rougeâtre foncé. Ailes plus foncées. Gousse 25-35 x 4-6 mm, non

contractées entre les graines, brun foncée, d'habitude glabre. Graines 4,5-5 mm. 2n = (10), 12, (14).

Elle est originaire des sols marginaux rocheux et non-labourables de l'Anatolie Centrale en Turquie (ICARDA 1995).

De 20 m jusqu'à 2900 m d'altitude. Elle préfère les sols calciques, bruns et *terrarossa*, calcaires crayeux bruns, crayeux blancs, noirs lourds et *terrarossa* dans les terrains secs détournés et agricoles (Maxted 1995).

Répandue au Sud de l'Europe (Ball 1968) ; spontanée dans le bassin méditerranéen (F.A.O. 1975). Preférence pour les sols pierreux, elle est clairsemée vers la côte, bien plus répandue vers l'intérieur, la seule présente aux environs de Damas et dans le désert (Mouterde 1970). Pentes rocheuses et calcaires, cultures et champs en friches du niveau de la mer jusqu'à 2000 m d'altitude. C'est le taxon le plus distinctif de *Vicia sativa* en Turquie (Davis 1969).

Vicia sativa subsp. *amphicarpa* est calcicole et est répandue dans les zones semi-arides. Elle présente des possibilités intéressantes ; elle est trouvée comme mauvaise herbe commune dans les champs aux marges de l'agriculture (250 mm de pluviosité). Son avantage réside dans ses gousses sous-terraines qui assurent une auto-régénération (Ehrman et Maxted 1989).

Très rare en Egypte. Trouvée dans la région côtière mediterranéenne occidentale (Täckholm 1974). Occasionnelle en Irak dans la région steppique de 100 à 700 m d'altitude. Champs d'altitude, autour des roches sous les collines et dans les Wadis (Townsend et Guest 1974). A Chypre, elle est signalée sur les pentes pierreuses et herbues, souvent sous les pinèdes. Elle pousse à partir de 100 m jusqu'à 1700 m d'altitude (Meikle 1977).

***Vicia sativa* L. subsp. *incisa* (Bieb) Arcangeli**

La plupart des folioles dentées ou incisées, obovées, tronquées, ou émaginées. Dents du calice à peu près aussi longues que le tube. Corolle 20 mm. Etendard bleu-pâle à violet. Ailes d'habitude plus foncées. Gousse glabre, 40 x 5-6 mm, non contractée entre les graines. Graines 4 mm. 2n = 14.

De 10 m jusqu'à 510 m d'altitude. Terrains détournés associés aux boisements (Maxted 1995). Répartition en Bulgarie, N. E. de la Grèce (Ball (1968). Lieux herbus et boisements (Mouterde 1970). En Turquie, collines et pentes rocheuses et calcaires, broussailles à Quercus, champs de maïs et friches et bords des chemins du niveau de la mer jusqu'à 1800 m d'altitude (Davis 1969).

***Vicia sativa* L. subsp. *sativa* L.**

Folioles oblongues-cunéiformes à obcordées, tronquées ou émarginées. Dents de calice aussi lougues ou plus longues que le tube. Corolle 18-30 mm, étendard rose à pourpre rougeâtre foncé. Ailes plus foncées. Gousse 35-7 x 6-6,5 mm. 2n = 10 ; 12.

Plante fourragère mineure au Moyen-Orient, elle est cultivée en Europe et en Afrique du Nord. L'ICARDA entrepend des efforts pour sa promotion pour remplacer les jachères dans les rotations avec l'orge. Elle pousse du niveau de la mer jusqu'à 2100 m d'altitude. Terrains agricoles détournés et aux marges des zones forestières (Maxted 1995).

Répandue presque partout dans l'étendue de l'espèce, introduite dans le Nord (Ball 1968). Cosmopolite, largement cultivée en Turquie comme plante fourragère. Souvent rencontrée comme mauvaise herbe échappée à la culture et apparemment spontanée. Pentes rocheuses et calcaires, champs de maïs et friches du niveau de la mer jusqu'à 1600 m d'altitude (Davis 1969). En Irak, commune dans les zones forestières et les plaines alluviales dans la région désertique, occasionnelle dans la région steppique. Souvent trouvée dans les zones montagneuses, et dans les Wadis de la steppe comme mauvaise herbe commune dans les champs, à leurs bordures et dans les vergers (Townsend et Guest 1974). A Chypre, elle est signalée dans les champs cultivés et les terrains en friche, aux bords des chemins, du niveau de la mer jusqu'à 700 m d'altitude. Elle est largement cultivée dans les terrains abaissés à Chypre et est souvent échappée à la culture (Meikle 1977).

***Vicia sativa* L. subsp. *macrocarpa* (Moris) Arcargeli**

Comme la précédente, mais les gousses 8-10 (-12) mm, larges, reticulées-veineuses, non-contractées entre les graines, brun-sombre à noir, plus ou moins glabres. Graines 5,5-8 mm. 2n = 10, 12.

Elle pousse de 45 m jusqu'à 2100 m d'altitude, aux marges des terrains agricoles et des zones forestières (Maxted 1995).

Région méditerranéenne et au Sud de la Bulgarie (Ball 1968). Terrains marginaux agricoles et forêts (Mouterde 1986). Haies, champs de maïs et friches. Elle est cultivée et spontanée en Turquie. (Davis 1969).

***Vicia sativa* L. subsp. *devia* J.G. da Costa**

Peu de données sont disponibles sur cette sous-espèce très localisée. Elle n'est décrite dans aucune des Flores de la région, citée seulement par Maxted (1995) d'après Boletim do Museu Municipal do Funchal, III (7): 62 (1948). Le nombre de chromosomes n'est pas connu.

Endémique à Madeira au Portugal (Maxted 1995).

AREA AND PRODUCTION

Precise estimates of recent area and production of common vetch are unfortunately not available. FAO reported that in 1985 nearly 1.30 million ha were sown to vetches globally with a yield of 1.69 t/ha and total production of 2.2 million tons. The following Table summarizes recent information published by FAO (1998).

In 1985, the estimates for West Asia and North Africa (WANA) were 0.34 million ha of area, 0.739 t/ha yield and 0.25 m ton production. Some recent reports suggest that the current area in WANA under vetches may be nearly 0.6 m ha, mainly in Turkey, Syria, Ethiopia, Morocco and Algeria, but also in Iraq, Jordan, Cyprus, Lebanon an Tunisia.

Area Grown to vetch in 1986 and 1996. (FAO. 1998. FAOSTAT – PC. FAO, Rome).

Country	1986	1996
Algeria	940	500
Egypt	550	625
Eritrea		9,000
Ethiopia	52,560	96,000
Iraq	1,550	1,720
Jordan	1,383	1,250
Kazakhstan		17,000
Lebanon	3,250	4,500
Morocco	19,300	20,000
Syria	43,725	43,000
Turkey	230,946	275,000
World	1,410,837	993,908

The table below lists a number of the largest producers of vetch. The major producer is the former Soviet Union.

Vetch seed production for 1990 and 1991: major producing countries (t) (Rees 1993)

Country	1990	1991
Italy	4 700	4 700
Germany, East	8 000	2 900
Greece	9 000	9 000
Poland	9 000	9 000
Ethiopia	60 000	62 000
Morocco	14 500	14 800
Syria	30 000	32 000
Turkey	186 000	183 000
Yougoslavia	26 587	26 000
Spain	41 900	35 700
Sweeden	83 600	88 400
CIS	1 100 000	780 000
Europe	191 326	183 274

Common vetch in Australia

D. Enneking
Centre for Legumes in Mediterranean Agriculture (CLIMA). University of Western Australia, Nedlands WA 6907. Australia

Because of its diverse utilization options, common vetch (*Vicia sativa* subsp. *sativa*) has gained popularity as a crop in Australia. It can be grown for fodder, hay, green manure or seed production. As a legume it fits well into cereal rotations, provides nitrogen to the soil, and if properly managed can reduce the incidence of diseases in succeeding crops.

Australian farmers, especially in South Australia and Victoria, have been able to increase the profitability of their farming operations through the inclusion of common vetch into their rotations. Excellent hay crops can be produced if vetch is sown together with oats. Good seed yields can also be obtained from common vetch crops.

The cultivar "Languedoc" is very well adapted to dryland farming conditions and seed yields of up to 2 t/ha have been achieved in a short gowing season 400 mm/annum environment. The cultivar "Blanchefleur" is later flowering and requires more moisture for optimum seed production. The seeds of this cultivar have red cotyledons. When the seed is split it resembles that of red lentils.

Vetch seeds are high in protein (28-32%) and are a quality feed for ruminant animals such as sheep and cattle. Vetch seeds are, however, known to be toxic to monogastric animals such as rats and poultry. Rats show reduced growth. Poultry fed a diet containing 50% common vetch have high mortality rates and have recently been observed to go blind. Up to 10% vetch may be included in diets fed to pigs without noticeable production losses.

PERFORMANCE OF AWASSI LAMBS GRAZING COMMON VETCH IN ON-FARM AND ON-STATION TRIALS.

F. Bahhady[1], S. Christiansen[1], E.F. Thomson[1], H. Harris[2], K.M. Eskridge[3] and A. Pape-Christiansen[1]

[1]ICARDA, P.O. Box 5466, Aleppo, Syria, [2]Armidale, NSW, Australia, [3] University of Nebraska, Lincoln, NE, USA

Lamb fattening trials on common vetch (*Vicia sativa*) were conducted on the ICARDA research station for 13 years in two trials (the first from 1980 to 1983, the second from 1987 to 1995), and on vetch and chickling (*Lathyrus sativus*) in northwest Syria (from 1987 to 1992). The objective of the experimentation was to assess the value of introducing legume crop rotations into wheat- or barley-based farming systems in northwest Syria, and of using forage legumes to fatten lambs. Weaned lambs were grazed in spring until the pasture was consumed. Average rainfall was 339 mm/yr at the research station. Thirty six lambs/ha were grazed for an average of 42 days, resulting in a mean daily gain of 196 g and a liveweight production of 263 kg/ha. In the farm trials, the average rainfall was 275 mm/year. Forage legumes supplied 33 days grazing at a stocking rate of 33 lambs/ha, resulting in mean daily gains of 184 g and a liveweight production of 196 kg/ha. Lamb fattening on forage legumes provides several benefits. The plants add nitrogen and organic matter to the soil and a rotation with cereals gives farmers a solution to the problems of cereal monoculture. Grazing avoids the difficulties and expense of harvesting forage legumes and, because the plants are grazed earlier (when green), leaves more water in the profile for the subsequent cereal crop.

A STUDY ON THE INFORMAL SEED SYSTEM OF VETCH SPP. IN THE CENTRAL HIGHLANDS OF TURKEY

C. Talug[1], B. Sürmeli[1], S. Chiristiansen[2], H. Firincioglu[3], Z. Bishaw[4], S.P.S. Beniwal[5] and V. Uzunlu[3]

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In Turkey, feeding of livestock is mainly dependent on common pastures, cereal straw, barley seed, vetch straw (mainly in mountainous areas) and supplementary feeds. Vetch is an important crop in

Turkey. It covers approximately 265,000 ha, out of which 60–70% is located in the Central Highlands. Although both common vetch (*Vicia sativa*) and Hungarian vetch (*Vicia pannonica*) are grown in this region, common vetch is the most important vetch grown for seed and straw yields. Also, it is mainly in the Central Highlands that farmers still use local landraces, which are well adapted to local conditions but have low seed and straw yields. Interestingly, the area under Hungarian vetch, which has a reasonable cold tolerance, has increased in the Central Highlands over the last five years. According to market surveys, vetch seed collected from different counties in the region is sent to the main market of Çubuk town in Çubuk county, where it is sold to private merchants and finally transported to Mersin for export. However, no seed of Hungarian vetch is sold in Çubuk market. It was also found that sale of common vetch has been declining since 1992 because of decreasing demand from major importing countries and unfavorable policy issues. Seed quality in terms of physical purity and germination, though variable, was not considered a major problem.

In the second phase of the study, a total of 40 farmers were surveyed in five different villages of Çubuk county. For common vetch, farmers use their own seed, but purchase new seed every three to four years, either from neighbors or seed merchants. The plots reserved for seed that will be used in the coming season are mostly selected before harvest. This seed is usually cleaned, treated with chemicals and stored. The remaining harvested seed is sold in the market and only a small part is saved as livestock feed. In Çubuk county, Hungarian vetch is only produced by farmers with an average farm size of over 20 ha and who are major livestock producers. It can be concluded from this study that common vetch is generally grown by resource-poor farmers, whereas the Hungarian vetch is grown by relatively larger and richer farmers.

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Working with annual medics (especially *Medicago rigidula & rigiduloides*) in an effort to replace the fallow phase of the winter wheat-summer fallow system on the US Great Plains in an effort to integrate crop and livestock production and all of the soil building benefits provided by a self-regenerating pasture legume. I have also recently begun breeding work with Austrian winter pea (*Pisum sativum* subsp. *arvense*) as a partial substitute for fallow in the same system.

SHARE OF THE SEMESTER

Saltbushes (*Atriplex* spp.)

Saltbushes (*Atriplex* spp.), have been promoted as feed banks in Mediterranean semi-arid and arid zones. Many countries have embarked on large-scale plantation programs of these fodder shrubs.

This semester aims at reviewing and updating general and regional knowledge on *Atriplex* spp. in arid and semi-arid zones. Our readers are kindly requested to exchange experience and information on *Atriplex* spp. promotion and use with colleagues of the region. The editors will compile the information and publish it in a coming issue of the *News*. reviewing and updating general and regional knowledge on *Atriplex* spp. in arid and semi-arid zones

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