

Regional Consultation on Linking Producers to Markets:
Lessons Learned and Successful Practices
Cairo, Egypt
January 29–February 2, 2006

A multidisciplinary study of herbal, medicinal and aromatic plants in
Southern Tunisia: a new approach

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1. Introduction

In spite of its small area, Tunisia has a large plant biodiversity (Le Houerou, 1995) . In fact, its flora accounts more than 2150 species (Pottier-Alapetite, 1979,81) growing on various bioclimatic zones from sub-humid to arid and Saharan and giving particular landscapes and agro-ecosystems such as oases and Jessours in southern part of the country. Nevertheless, the high human and animal pressure resulting from the increase of rural population needs, has led to degradation of this patrimony (Floret & Pontanier, 1982). In fact, more than 26 species are actually qualified as endangered. Many spontaneous plants are considered as multipurpose and are susceptible to produce valuable substances, essential oils and original aroma useful for agro-food, pharmaceutical and cosmetic industries. Actually, 200 to 350 spontaneous species are considered herbal, medicinal and aromatic plants (HMAP) and used in traditional phytotherapy mainly by rural communities having developed a large local knowledge (Le Floc'h, 1983 et Boukef, 1986).

Major part of Tunisian herbal, aromatic and medicinal plants are produced in rain-fed conditions and are highly dependent on environmental factors. About 800.000 ha of forestlands in the north and 4.700.000 ha of rangelands in south Tunisia are suitable for spontaneous HMAP production. Almost 80 % of forest cover is rosemary and myrtle. However, only a small amount of forest and rangelands are, annually, exploited for spontaneous HMAP harvesting.

Tunisian HMAP production is still traditional and is characterized by a limited species number generally harvested during similar or overlapping periods. Cultivated area was about 1030 ha in 2001 mostly without use of chemicals or pesticides. Total HMAP production is estimated to about 8000 tons, 23 % of them are exported mainly to European countries. Major part of HMAP production is processed for essential oil distillation. HMAP marketing represents an important part of annual income of many rural households. Total HMAP value represents 0,06 % of DGP. The export value of HMAP essential oils and other manufactured products contribute significantly to the national economy. It was 44,6 million TND in 2003, a 5 % of the total value of exported agricultural products (Ghoudi, 2002).

Tunisian HMAP production presents many advantages comparatively to other countries (low production costs, favourable climatic conditions, large areas of spontaneous HMAP, closeness to the biggest importing markets, availability of laboratories and supervision services...). However essential oil exportation is considerably decreasing despite the increasing

international demand (Jehle, 2004). Export decrease is due to degradation and low productivity of the main used species. HMAP are facing many constraints (limited used species number, rare and none qualified labor, lack of scientific research, limited number of distillation units, lack of collaborative development bilateral projects ...).

However, despite the importance of the HMAP sector in generating income of many poor rural households and its increasing contribution to the DGP, this sector is still marginal and traditional and is characterized by a limited cultivated species number generally harvested during similar or overlapping periods, in small areas (1030 ha in 2001). Considering desertification problems and water scarcity, development of HMAP cultivation instead of other water consuming crops will contribute to better manage limited natural resources. Local HMAP could behave well even under stress conditions. Obtained products are of high quality and may have an important added value.

The ethno-botanical knowledge and use of Tunisian plants have been transferred through generations. In addition to enhancing health care and well-being medicinal and aromatic plants (in the wild or in cultivation) protect the soil from excessive degradation and desertification in the range and forest areas of Tunisia. Medicinal and aromatic plants are important for the well-being of the population, especially of the rural poor who depend on these resources to treat human and livestock ailments and diseases. Additionally, they are a potential source of income for the resource-poor people, especially women, who are involved in most of the fieldwork, processing and marketing of medicinal plants. Preservation of these species and knowledge of their uses will require specific intervention to ensure that this knowledge and these plants are not lost through environmental degradation, agricultural expansion and over-exploitation.

For the promotion and the organization and the establishment of a national strategy of this sector, a research development project was implemented by IRA Tunisia, ICARDA and USDA-ARS during the period 2002-2004 in order to preserve biodiversity, promote the use of HMAP, and to create business opportunities for Tunisians, mainly poor rural population. The project supports the conservation, management, and sustainable utilization of medicinal and aromatic plants in Tunisia, through conservation, cultivation and propagation as opposed to collection from the wild. It also contributes to development of effective *in-situ* protection of threatened habitats and ecosystems.

The intervention and activities of the project allow for global benefits and alleviation of poverty conditions through productivity improvement integrated with sustainable management of natural resources, including medicinal and aromatic plants.

2. Objectives and methodological approach

The overall objective of the project is to improve livelihoods in rural areas through sustainable use, conservation, management, and marketing of herbal and medicinal plants in southern Tunisia. The project's specific objectives are to:

- (i) Conserve, manage, and use effectively, both *in situ* and *ex situ*, medicinal, herbal and aromatic plants in arid and semi-arid areas;
- (ii) Strengthen partnerships of collaborating institutions to form a coalition of stakeholders, which include scientific research institutes, extension services, universities, NGOs, industry, *etc.* to increase the value of medicinal, herbal and aromatic plants through processing, chemical analysis and marketing;
- (iii) Improve public awareness of the importance of medicinal plants and build on traditional knowledge and cultural heritage;
- (iv) Prepare a national database on indigenous medicinal and aromatic plants, starting with southern Tunisia, in order to assess their use and status within key ecosystems.
- (v) Increase plant database and disseminate research results and progress in product development by a) development of a project website, b) attendance of project scientists to national and international meetings, c) participation of project scientists in exchange programs/visits and scientific capacity building efforts (e.g. graduate student and scientist postgraduate training), and d) publication of research results generated from the project in peer-reviewed scientific publications.

To meet the project objectives, a new multidisciplinary approach was developed. The project has initiated a national network of collaborators by connecting more than 100: societies, research organizations, NGOs, individuals, *etc.* These partners include project management and research (IRA), extension agencies (CFRA, CRDA, IRA), plant and food science institutions, pharmacists and other health professionals from universities and private sector, marketers and exporters, development agencies, *etc.*

3. Accomplishments and achievements of the project:

The results of the project showed that all fixed objectives have been accomplished. The main achievements in the framework of the project are the followings:

3.1. Choice of the target plant species

In Tunisia, the number of species considered as aromatic and medicinal varies from 40 to 200 according to inventories and according to several factors such as the width of the inventory areas, the major use of species targeted by the survey (medicinal, aromatic, condiment...) and the economic and social importance of the considered species. The choice of the important species depends indeed on the objectives of activities to undertake on these species and the natural region considered.

At the time of discussions that took place on occasion of the different meetings organized in the framework of the project (meetings of the steering and technical committees, monitoring missions...) it has been suited to select a limited number of species. It is about those presenting higher ecological, economic and social interests at the level of the project zone (*Allium roseum*, *Artemisia herba-alba*, *Rosmarinus officinalis*, *Thymus capitatus*, *Capparis spinosa*,...).

3.2. Development of technical brochures for target species

Technical brochures have been developed for *Capparis spinosa* and *Rosmarinus officinalis*. They include several informations on biological characteristics, geographic distribution, ecological requirements, multiplication, propagation and cultural techniques, uses, conservation, *etc.* Technical brochures for three other species are being prepared.

3.3. Establishment of a data base about HMAP and a website about the project

Many activities have been accomplished for the establishment of a data base about HMAP and a website for the project. Among these activities we mention:

- The establishment of a national database for indigenous, herbals, medicinal and aromatic plants including several species and hundreds accessions. The information includes collection site, origin, germination and cultivation requirements, *etc.*

- A database of literature references about HMAP (leaflets, thesis, articles and technical reports) was developed. These references have been searched both at national and international

levels. Thanks to USDA-ARS researchers' help and support, many references about target plants for the project have been identified.

- Establishment of GIS with several layers of information relative to the following parameters: climate, soil, vegetation, level of exploitation, infrastructure... A training session for 2 researchers was held at ICARDA headquarter.

- The creation of a website for the project in collaboration with ICARDA specialist. In this site, the following information is available:

- Presentation of the project (objectives, expected results, partners,...);
- Presentation of target species;
- The list of the main scientific and technical reports produced in the framework of the project;
- Photos illustrating the different activities undertaken in the framework of the project.

3.4. Socioeconomic importance and HMAP chain study

This study was carried out at three levels: local, national and international.

❖ Local level:

At the local level the study presented the cultural and socio-economical importance of HMAP in the rural areas of the Matmata Mountains (the project target zone). The methodology followed relied on questionnaires that covered a representative sample of household heads involved or interested in HMAP (Sghaier et *al.*, 2004).

The main results of this local level study are the followings:

* 63.5% of farmers exercise an activity outside the farms. The collection and the sale of the HMAP constitute an important source of income for some households of the zone;

* The collection of the HMAP in the Matmatas chain is largely destined to the auto-consumption. However, 25% of households may sale the plant material when they find the opportunity. Of weak appearance, this proportion hides an important potential of a latent predisposition of the population to develop the economic activities based on the valorisation of HMAP;

* From a total of 72 species collected and used at the level of the study zone, the sale of the PAMS is limited to 4 main species (*Rosmarinus officinalis*, *Thymus capitatus*, *Juniperis phoenicea* et *Artemisia herba-alba*). The disposed mean quantity on the market is 750 kg/year by household (30 kg to 4500 kg).

* Selling prices and the sold mean quantities of the HMAP are marked by a big variability in relation to the species, the period of sale, the climatic conditions of the year and the quality of the product. The frequency of sales is more important for *Thymus hirtus* and *Rosmarinus officinalis*.

* Chain maps of main species are relatively simple expressing a limited number of intervening parties (producers / operators, mediators, local consumers).

* The main problems hindering the development of the HMAP sector according to households are related to drought, inadequate methods of harvest, overgrazing and overuse.

❖ National level:

At the national level the study covered several aspects including the importance of HMAP within several sectors, their contribution to the Domestic Gross Product(DGP), exports, imports, contribution to the trade balance equilibrium, and national stakeholders and a global sector chain. The main results of this national study are the followings (Ghoudi, 2000):

- On the basis of exports of the twentieth century last decade and evaluations of the local consumption, the mean national production of the main HMAP and their derivatives are about 8500 tonnes/year among which 23% are exported.

- The value of this production is estimated to 14,2 millions TND of which 5,7 millions (40%) are generated by the exported products, mainly, to the European countries. The essential oils contribute of more than 65% of the value of these exports.

- About 13,3 MD/year, the part of the GDP generated by the main HMAP represents 0,06% of the total GDP and 0,4% of the GDP generated by the agricultural sector.

- The mean value of imports during the last ten years is about 2,3 MD recording a relative decrease of 17% during the last five years.

- The commercial balance of HMAP during the last ten years is however still positive with a mean cover rate of about 180% in 1992.

❖ International level

An international market study titled “building an international marketing strategy for the Tunisian HMAP sector : Identifying opportunities for and constrains on the export of Tunisian HMAP to EU and USA” has been completed (JEHLE, 2004). This study described the global HMAP market trends, described and assessed the potential Tunisian HMAP export market, identified the constrains and opportunities through contacts with Tunisian HMAP processors and

exporters, and developed recommendations for the improvement of the Tunisian HMAP export sales.

The study evaluates how Tunisian aromatic and medicinal plants can better compete in the global aromatic and medicinal plants market. The term AMP is used to refer to herbal, aromatic, and medicinal plants, as well as, the extracts and essential oils from these plants. The study provides also an overview of the international market for AMP, identifies constraints and opportunities for increased exports from Tunisia, and recommends measures to overcome the identified constraints and maximize opportunities.

In Section I of this study, the Tunisian AMP export market and details on the production, transformation, and export of AMP and derivative products are characterized. The principal cultivated and wild collect AMP varieties used for essential oil, and as medicinal and culinary herbs, and spices for export are discussed. Flavour and fragrance compositions, essential oils and natural extracts, and aroma chemicals have the greatest potential for entering EU countries and the U.S. increasing vertical integration of production and the growth of contract production with foreign partners are identified as important market parameters.

In Section II, the constraints and opportunities for expansion of the AMP sector are presented; these were ascertained through meetings with Tunisian AMP exporters and processors, literature reviews, and by collating responses to *Tunisian Exporter Marketing Survey*. Long-term and short-term marketing constraints and the way to capitalize on Tunisia's comparative advantages and marketing opportunities are recommended.

Section III looks at the AMP market parameters and trends. The USA, EU, and Japan consume 78% of world AMP and derivatives; the market is worth tens of billions of US\$ per year, when all uses are included. Competition among suppliers creates margin squeeze for primary products and market volatility is compounded by the market entry of new producers - China, India, and Turkey. Value-added and medicinal applications allow manufacturers and exporters to differentiate their products by standardizing natural extracts, promoting organics and chemical free production, and promoting compound natural ingredients and development of nutraceuticals and herbal medicinal. World demand for essential oils grew at an average rate of 6%, botanical extracts at 15%, plant-derived chemicals at 10%, and gums, gels and resins at 7%. The growing importance of quality control, phytosanitary regulations, product traceability, and organic certification is discussed.

In Section IV project findings based on visits to production areas, transformation facilities, and interviews with industry leaders and government officials are presented. Principal concerns identified were lack of information about international market parameters, the competitiveness of Tunisia's AMP products in the world market, establishing and maintaining contact with foreign buyers and end-users, and how to promote Tunisian AMP products abroad.

Section V sets out the study recommendations.

1. Diversify AMP cultivars and production methods.

a. Allocate funding for Tunisian research facilities to assess new plant varieties and biotechnologies.

b. Increase production of marjoram, orange, white Artemisia, geranium, verbena, peppermint, clove, wild rose, arbutus, vanilla, lavender, and chamomile since world demand for essential oils of these AMP cultivars and wild collect AMP exceeds world supply.

c. Increase the production of carob, prickly pear, and fenugreek for national consumption and export.

d. Evaluate the potential for malva and white Artemisia in cosmeceutical, nutraceutical, or pharmaceutical preparations.

2. Undertake structural changes in AMP production and invest in infrastructure development.

a. Promote greenhouse production.

b. Investigate potential for drip irrigation in Tunisia and assess the feasibility of introducing new varieties under drip irrigation production systems.

c. Develop an organic certification program and foster organic AMP production and marketing in Tunisia.

d. Convert to modern distillation equipment; offer credit programs or tax incentives.

e. Encourage vertical integration of production, processing, distillation, and export and establishment of strategic partnerships by initiating direct contact with the major industry players, pharmaceutical houses and major international end-users through trade missions and participation in trade shows.

3. Build on existing Tunisian infrastructure.

a. Promote the analytical and quality control services provided by the Tunisian laboratories and encourage coordination between researchers and industry on the development of AMP standards for Tunisia.

b. Encourage import substitution through the development of value-added processing and manufacturing activities in Tunisia.

c. Encourage import substitution of bergamot, peppermint, geranium, clove, white artemesia, lavender, and citrus essential oils by increasing local production of cultivated AMP and extending the harvest seasons through greenhouse and drip irrigation.

d. Initiate an evaluation of existing infrastructure for processing dried herb and spices to assess the need for drying, processing, and storage facilities.

e. Encourage import substitution by increasing production of cumin, coriander, caraway, corette, fennel, sesame, anise, and fenugreek.

f. Intensify local collection of capers as the regeneration and proper management of the caper-producing rangelands and forests allows for controlled harvests and encourage development of modern caper processing facilities in Tunisia

g. Facilitate the development of value-added activities through incentives.

h. Strengthen the commercial viability and competitiveness of women's organizations and woman-owned businesses manufacturing AMP products.

i. Intensify agronomic and botanical research foci on marketable cultivars and wild collect species – by establishing marketing advisory committees made up of Ministry of Agriculture officials and key exporters to communicate marketing knowledge to the agronomic and botanical research communities.

j. Differentiate Tunisian AMP products on the international market; establish and promote geographical indications and appellations of origin.

4. Undertake a second phase of research to develop and implement international marketing strategies for the Tunisian AMP sector.

a. Prepare Tunisian AMP sector promotional materials.

b. Prepare Tunisian AMP supplier directory.

c. Develop trade show representation as an AMP marketing tool.

d. Prepare a directory of European and North American end-users of AMP products.

e. Establish AMP exporter group to develop commercial linkages.

- f. Set up a seed program for institution building of marketing and industry associations.
5. Conduct a study of principal AMP processing and transformation facilities in Tunisia.
6. Develop a regional marketing strategy to service the southern Mediterranean basin region.

3.5. National and international conferences and meetings

Besides to the annual meetings of the steering and the technical committees, an international conference on medicinal, herbal and aromatic plants in the Mediterranean Basin was organized and held on June 1-3, 2004, and attended by about 150 participants representing many Tunisian stakeholders and participants from 6 other countries (Morocco, Algeria, Greece, Egypt, France, and Jordan). The conference fostered cooperation and communication among stakeholders, establishing a mechanism for regional cooperation between Tunisia and other countries interested in sustainable use of HMAP, exchanging ideas, know-how and disseminating technological and marketing information. The participants recommended the establishment of a regional network involving all stakeholders, with a focal person in each country to: (a) organize regular meetings to promote herbal and medicinal plants; (b) initiate mechanisms to elaborate a regional project on herbal and medicinal plants in the Mediterranean Basin; (c) harmonize legal laws in the Mediterranean region on herbal and medicinal plants and their use in accordance with international regulations; (d) publish a newsletter for participants of the regional network; (e) develop national strategies using national expertise and research results on herbal and medicinal plants; and (f) promote multilateral cooperation in the area on these plants.

3.5. Training and extension

This action aims not only at presenting the project to the potential partners but also permitting to the large public to know all plants with herbal, aromatic and medicinal uses and to be sensibilized to the ecological and economic interest of these plants being severely threatened by disappearance.

To meet the above cited objectives, the following activities are developed:

- diffusion of information through media (newspapers, radios and TV). Project news articles were published in different national magazines and newspapers;
- presentation of South Tunisian plants with medicinal interest among neglected species in the framework of a scientific documentary called "underutilized crops", achieved by Austrian Broadcasting Corporation / radio 8 television (ORF) in collaboration with IPIGRI;

- presentation of the project in several meetings held in Tunisia and organized by different institutions and NGOs;

- teaching of a module about HMAP for master degree students at the faculty of pharmacy of Monastir;

- convinced by the results of the project, many partners have expressed their hope to valorize these achievements. Such valorization which has taken many forms was assured by several cooperation conventions signed with governmental and private agencies for the technical support and supervision for producing target species seedlings.

5. Conclusion and lessons learned

The major learned lessons from the information collected through the studies relative to the HMAP sector in Tunisia is the necessity to treat this sector as a global chain with a set of functions with several operators. Since it concerns actors from several departments (Health, Agriculture, Research, Trade, Industry...), the development of this sector can be assured only through a multi-departmental and multi-disciplinary approach implying the different operators in order to assure the requisite complementarity and the discounted synergism in the framework of a national strategy.

Moreover several, other lessons and results are learned and achieved by the end of the project. They are the followings:

- Identification of the main actors involved and grouping them in order to assume a good complementarity according to their role in the chain.

- The choice of the target medicinal plants must take into account their efficient and/or potential utilization and their economic interests both at national and international levels, so that it is necessary to establish some specific lists for each agro-ecological zone.

- The promotion of this sector requires :
 - . to institute an economic and legislative environment permitting to encourage the production and transformation dynamics as well as the development actor initiatives (private and public)

- . and to develop a multidisciplinary research to permit a better knowledge of HAMP heritage, to preserve it and to suggest solutions to all questions asked at different levels. Consequently, the Institut des Régions Arides (IRA) has established a plot of 4 ha which has been prepared and devoted to the cultivation of several HMAP. This plot will be important for

research and extension and will eventually be converted into a national park for promotional and educational purposes.

- Due to the increase of the awareness about the importance of HMAP the project is welcomed by the general population and regional participating institutions, who consider its continuation as a great help for biodiversity, research, education, and financial gain for Southern Tunisia.

- Special emphasis has been placed on the knowledge and role of farmers and local inhabitants in the management and use of medicinal plants for human and livestock needs.

Concerning the perspectives, many activities are programmed to be achieved in the near future. The most important are:

- Preparation of a development project request for financial support;
- Organization of an international symposium "SIPAM2006" in November 2006.

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