Coordination of the Agricultural Research In the Mediterranean Area

D 1.3 COUNTRY REPORT

Overview on the research system and research programmes on Mediterranean agriculture

ISRAEL

MOARD

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BACKGROUND.

Most of the given data exists and is updated annually at the Chief Scientist Office (CSO) of the Ministry of Agriculture and Rural Development (MOARD). Missing data required for the data mapping of ARIMNet was aquired by distributing the questionnaires to the majority of the research centres in which agricultural R&D is performed, which also help to update and confirm the existent data in CSO, which is the major granting body of Israel Agricultural R&D and the governmental body responsible for Israel public supported agricultural R&D.

GENERAL ORGANIZATION.

MOARD Chief Scientist's major goals are to identify agricultural problems in which knowledge gaps exist, to determine research goals aimed to bridge such gaps, to fund such research activity and to monitor research performance.
The public agricultural research in Israel is carried out and is primarily funded by MOARD (about 80%) (www.moag.gov.il). Other sources of funding include national, bi-national and international funds (14%), while the farming sector funds research through the production and marketing boards and the Farmers Organization (6%). The private sector funds the additional ~15% of the agricultural research, which is carried out mainly by manufacturers of agriculturally related products (e.g. fertilizers, seeds, irrigation equipment, pesticides etc.) and is partially supported through joint venture projects by CSO and the Ministry of Industry and Trade.

Financial support is given by approving grants through open calls for research programs within ministry units as well as to universities and other research centres:

The main units in MOARD which perform agricultural research are:

- The Agricultural Research Organization (ARO) (www.agri.gov.il). This governmental research institute (previously named Volcani Institute) carries out the vast majority of the applied agricultural research in Israel. The ARO is involved in solving problems in Israel's agricultural production for the benefit of farmers and consumers with the introduction of new products, processes and equipments.
- The Agricultural Extension Service (SHAHAM) (www.shaham.moag.gov.il).
- The Plant Protection and Inspection Services (PPIS) (www.ppis.moag.gov.il/ppis).
- The Veterinary Services including Kimron Veterinary Institute (www.vetserv.moag.gov.il).

The other main research groups, located at different universities and research centres are:

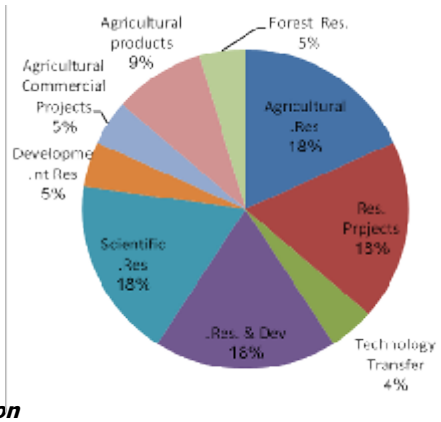
- The Hebrew University of Jerusalem, including the Faculty of Agriculture, Food and Environmental Quality Sciences (www.huji.ac.il).

- Tel-Aviv University (www.tau.ac.il).
- The Weizmann Institute of Science (www.weizmann.ac.il).
- Technion – Israel Institute of Technology (www.technion.ac.il).
- Ben Gurion University of the Negev (www.bgu.ac.il).
- University of Haifa (www.haifa.ac.il).
- Bar-Ilan University (www.biu.ac.il).
- The National Centre for Mariculture (www.ocean.org.il).
- Peripheral-Regional Research and Development (R & D) centres. These regional agricultural R & D units are located in several locations throughout Israel, mostly in remote peripheral regions of national importance and unique agro-climatic conditions.

MAPPING OF RESEARCH PROGRAMMES.

Agricultural research in Israel is funded mainly by three bodies: (1) The Ministry of Agriculture and Rural Development via its Chief Scientist Office which manages and funds three major programmes: National Central Fund for Agricultural Research & Development (average annual budget: 7.1M EU), Target-Oriented Applied Projects (average annual budget: 2.2M €) and Agricultural Industry-Oriented Projects (average annual budget: 0.2M EU). (2) The US-Israel Bi-National Agricultural Research and Development fund (BARD) (average annual budget: 6M €). (3) The Jewish national Fund (JNF) which funds mainly forest management and conservation programmes (average annual budget: 0.32M €). Other small funding bodies are associated to the Farmer's Union and support specific crop and livestock-directed R&D (total budget of about 20 independent funds, for all crops and livestock produced in Israel, is ~4M €). All programmes which are managed and funded by these bodies are national, except for those related to BARD which is bi-national. All programmes except one, Agricultural–Industry Oriented programme, are closed date, fully competitive and directed to encourage research in non-profit organisations. These programmes are funded according to the full cost model with indirect flat rate and the policy is that the intellectual properties are owned by the research organisation. The last, Agricultural–Industry Oriented programme, is non-competitive and initiated by the private sector (SME and large private companies) and is aimed at development of innovative fresh agricultural products. MOARD granting up to 45% of the project total budget, while the intellectual properties, if produced, are the company's property.

The thematic areas of these programmes are presented (AGROVOC level 1) at the pie chart (% from total thematic areas). It can be seen that the majority of the programmes focus on thematic areas which are related to research: agricultural research, research projects,



research and development and scientific research (18% each). Other thematic areas are agricultural product (9%); agricultural commercial projects development research and forest research (5%) and technology transfer (4%).

The main research lines foreseen by the owners' organisations of the programmes are:

- Natural resources: 3/17
- Animal production: 2/17
- Biotechnology: 2/17
- Fisheries: 2/17
- Food Science: 2/17
- Transport: 2/17
- Forest management: 1/17
- Forest management and conservation: 1/17
- Handling, transport, storage and protection of agricultural products: 1/17
- Rural infrastructure: 1/17

The main objectives of the programmes (AGROVOC level 2) are (Alphabetical order):

- Forest assessment and monitoring, Forest management
- Forest protection
- People and forests
- Forest and environment
- Forest products and services
- Research aimed at overcoming knowledge-gap needed
- Improved animal production and aquaculture
- Food safety & quality; organic farming
- Horticulture & ornamental plants: quality improvement & new varieties
- Efficient & safe water management (potable; brackish; recycled; desalinated)
- Market-oriented novel agricultural products
- Sustainable and ecological agriculture; Alternative pest management
- Shelf-life Improvement of fresh agricultural products

- Reducing manpower need for agriculture
- Rural and peripheral agricultural R & D

OWNERS

1. Ministry of Agriculture and Rural Development

See also the section "General Considerations"

Functions and Structure

The Ministry of Agriculture and Rural Development plans the growing and distribution of farm produce. The Ministry helps rural settlements develop agriculturally and economically, manages the nation's water supply and lands (the Minister chairs the Israel Lands Council), and collaborates with the Rural Settlement Department of the Jewish Agency in the establishment and consolidation of new communities.

Major Spheres of Activity

The Ministry's activities embrace the 11 subdivisions and topics listed below, in addition to other units and organizations subject to the jurisdiction of the minister.

☐ **Planning and Development of Rural Communities and Agriculture:** The Ministry deals with all problems of short- and long-term agricultural planning; produces consumption and strategic market-research forecasts; allocates sectorial growing and production quotas; draws up annual and multi-annual programs and development plans for agricultural infrastructure, regional enterprises, and settlement patterns; performs agricultural and rural-settlement research; and manages international projects in agriculture and development of backward regions. Activities also include relations with international institutions abroad and management of agricultural production in Judea-Samaria and the Gaza District.

☐ **The Soil Conservation and Drainage Department** is responsible for developing programs at the local, regional, and national levels for the utilization of effluents, for conservation of land resources, surface water, and natural vegetation, and for drainage projects to protect agricultural and built-up areas from floods. To these ends the Department collects and analyzes field data and decides how to implement the programs. The Department is responsible for 23 drainage authorities and eight pasture authorities that implement the regional and national plans. Through the district soil conservation offices it guides and instructs farmers on projects for local drainage and runoff impoundment. The Department has professional units for mapping, land and pasture surveys, soil conservation planning, regional and local drainage, reservoirs,

pasture, and applied research, performed by the Department's runoff research station. All soil and pastureland conservation plans are based on land and vegetation surveys.

☐ **The Agricultural Research Administration,** comprising research institutes and farms throughout the country, deals with issues ranging from the development of new strains to the adaptation of agricultural mechanization and technologies. The Administration also engages in the development of disease- and pest-resistant strains and modern storage methods suitable for agricultural exports in the late twentieth century.

☐ **The Credit and Development Division** provides agricultural financing and credit. Since the establishment of the Moshav Debt Arrangement Administration, the Division has participated in the Administration's routine activities; its director is deputy director of the Administration on behalf of the Ministry of Agriculture. The Division has three departments: Moshav Credit and Finance, Kibbutz Credit and Finance, and Development. The two credit departments assess entrepreneurs' financial capacity to undertake investments, approve small-scale projects within the framework of the law, draw up and assess farm financial plans, reschedule the debts of farm settlements not covered by the Ravid arrangement, and manage an assistance and working capital fund. Division activities at the level of Arrangement Administration regional teams include drawing up detailed plans for rural settlements, evaluating plans, and providing the administration with professional services. The Development Department releases funds to entrepreneurs on account of investments approved by the Agricultural Investments Administration, after receiving instructions and approval from the Investments Administration, in accordance with implementation reports and budgetary constraints.

☐ **The Extension Service** assists farmers by providing individual guidance, sectorial and farm development planning, and crop guidelines to permit optimum utilization of the means of production in the various parts of the country, in accordance with their climatic and agricultural conditions. The Extension Service coordinates the full range of activities in the areas of guidance, development, and professional advancement of all agricultural sectors and activities. The Service's professional units advise the Ministry's administration on formulation of policy, and guide and advise the district and regional extension offices and field services. The ten district and regional extension offices provide agricultural guidance and advice, organize field visits and demonstrations, offer workshops and short courses, and, most important of all, extend guidance to individual farmers on their farms. In coordination with the Ministry's other units, the Service places special emphasis on activities to promote exports, import substitutes, and guidance to fledgling settlements, in accordance with the Ministry's goals and objectives.

☐ **The Agricultural Investment Administration** encourages capital investment in agriculture, development of agricultural exports, and utilization of the agricultural

sector's natural conditions and professional experience. The Administration was set up in order to implement the Encouragement of Capital Investment in Agriculture Law, passed by the Knesset in 1980. The Administration's director is appointed by the Government (upon the recommendation of the Minister of Agriculture); its members are appointed by the Ministers of Agriculture and Finance. The Administration approves projects in accordance with planning guidelines formulated by the Ministry for each fiscal year, after scrutiny of economic, professional, and sectorial considerations.

The above-mentioned law encourages investments in two ways. The first is a grant equal to 40% of the investment. The second is income tax benefits for every approved plan, in the form of accelerated depreciation and an income-tax ceiling of 30% for corporations, 15% for recipients of corporate dividends, and 30% for non-incorporated individuals who keep double-entry books separately from an approved enterprise. Individuals who do not keep separate books of account are entitled to a 17% income-tax credit. These benefits are granted for the first five profit-showing years of a project, but not beyond the twelfth year after its approval. Farmers with land, water, and production quotas may apply for approval of their plans.

☐ **The Plant Protection and Control Division** is responsible for preventing the incursion of new blights by monitoring imports and quarantining plants; for issuing health certificates for agricultural exports as required by importing countries; for detecting diseases, monitoring their spread, and drawing up lists of diseases found in Israel; for detecting and eradicating new diseases before they spread and for treating blights that have penetrated and preventing their spread. The Division licenses, registers, and supervises the use of agricultural pesticides and monitors pesticide residues. It manages a computerized information centre, in cooperation with the Extension Service; regulates trade in plant reproduction materials; inspects commercial seeds and certifies improved strains. The Division sees to the marking and registration of root-stock trees and plants; inspects agricultural produce for export (fruit, vegetables, and flowers); inspects and licenses fodder and livestock feed supplements. It helps farmers in the control and prevention of diseases and pesticide and fodder testing. Finally, it conducts applied research in all the above areas.

☐ **Veterinary Services:** The Livestock Health Office and the Veterinary Institute are responsible for supervising sanitation and for the prevention of livestock disease.

☐ **The Centre for International Development and Cooperation** provides assistance to developing countries, particularly in Africa, Asia, and Latin America, in the form of direct training, advanced courses in Israel, on-site courses overseas, and consultancy on and planning of agricultural facilities. The Centre (Cinadco) coordinates joint research studies for developing countries, staffed by scientists from Israel, from other sponsoring countries, and from developing countries. These studies are coordinated with Israel's agricultural research centres in Israel, including the Volcani

Institute, the Agriculture Faculty of the Hebrew University, Ben-Gurion University, Tel Aviv University, and the Technion. As a result of the fruitful cooperation among Israeli researchers and research institutes, the sponsoring countries and the developing countries, the sponsoring countries are expanding their funding of these activities for the coming years. Cinadco also collaborates with a number of non-governmental agencies abroad, often with the participation of outside funders, to develop projects, courses, and research. These links are undertaken in full coordination with the Foreign Ministry's International Cooperation Department.

The Ministry also operates through various production boards, run jointly by the government and the farmers. The boards are responsible for production and marketing in their areas of agriculture and for allocating subsidies and/or quotas, where these exist, to farmers. The Minister is responsible for other public agencies and state-owned enterprises, such as Tahal (the Israel Water Planning Authority), Mekorot, the Natural Damage Fund, Agrexco, and Agridev.

2. US-Israel Binational Agricultural Research and Development Fund

BARD is a competitive funding program for mutually beneficial, mission-oriented, strategic and applied research of agricultural problems, jointly conducted by American and Israeli scientists. Most BARD projects focus on increasing agricultural productivity, particularly in hot and dry climates, and emphasize plant and animal health, food quality and safety, and environmental issues. BARD also supports international workshops. BARD offers fellowships for postdoctoral research, senior research scientists and graduate students. BARD is empowered to fund scientists affiliated with public or not-for-profit, private entities and to encourage the exchange of agricultural scientists, engineers or other agricultural experts.
During its 30 years of operation BARD has funded over 1000 projects with a total investment of more than $250 million. In addition it is administrating collaborative research between agricultural scientists in Israel and their colleagues in Canada and Australia.
Recently BARD established the MARD program to promote cooperative agricultural research and development activities between scientists in Israel, Jordan, the Palestinian Authority and the United States. During its five years of operation, MARD has funded numerous successful regional workshops, mutual visits, training seminars and similar activities that have enhanced the spirit of collaboration between Palestinian, Jordanian, Israeli and US investigators. MARD now offers Facilitating Grants to enable small multinational research groups to jointly prepare a detailed research proposal to be submitted to other international granting organizations.

3. **The Jewish National Fund**- JNF sponsors a network of regional agricultural R&D stations in Israel's peripheral regions where leading scientists and technicians work closely with local farmers, research institutes and universities to increase agricultural sustainability, profitability, and stability. The cutting-edge technologies developed at these stations keep Israeli farmers at the forefront of their field, providing them with innovative, cost efficient ways to grow produce under arid conditions and allowing them to compete in the global market. Breakthroughs include irrigating crops with recycled and brackish water; developing biological methods of combating harmful pests to minimize chemical use; and optimizing growth regime variables such as light, temperature, and humidity to cut costs and increase crop efficiency.

Funding management.

Implementation procedures of the programmes

The topic selection for the call is done mainly by the programme owners together which are supported by the scientific steering committee and stakeholders. The decision of the research objectives and topics is determined according to the priorities of the strategic research agenda, the guidelines of the Ministry of Agriculture and Rural development and Farmers union and the recommendations of the Extension service. In BARD topics are determined by the Board of Directors. The application procedure could include one-step or two-step (pre and full) proposals. In all programmes guidelines are provided to the applicants. In the two-step procedure pre-proposals are submitted to a steering committee which evaluate if the proposal agrees with the strategic agenda of the programme, then full proposal is written and submitted and being evaluated according to its scientific quality. The full proposals are sent to 5-7 referees and all vies are being discussed in the scientific board. A matter of opinion is written and a grade is given. If the procedure includes one step of full proposal the proposals are submitted directly to the scientific board.

The final decision is being taken by the scientific secretariat and the Chief Scientist.

Referees and committee members are chosen according to their scientific expertise and experience on the sector from pre-existing register or ad-hoc. The evaluators could be internal or external to the funding organisation. The main evaluation criteria are:

- Relevance to objectives of the programme/call
- Scientific quality
- Innovation
- Expected benefits and use of results
- Expertise of applicant

- Adequacy of management and resource utilisation
- Formal Requirements
- Costs/ benefits
- Quality of collaboration

Reviewing and Selection Processes

Generally, research projects which are funded by the programmes are monitored for both financial control and scientific work progress with the exception of the JNF. MOARD monitor its funded projects in an ongoing control and at the end, BARD monitor them yearly and JNF monitor its funded projects for their scientific work every six month. The penalty, for projects which do not comply with their objectives or delayed submission of the scientific or financial reports, is financial. The evaluation is done by scientists and external specialists for the written report and at the field or at the lab.

The main criteria which are used for the evaluation are:

- Relevance to strategic agenda
- Scientific quality of the results
- Innovation
- Obtained benefits and use of results
- Adequacy of management and resource utilisation
- Costs/ benefits

MAPPING OF RESEARCH INSTITUTIONS.

Governmental Research Institutes and Centres

1. **The Agricultural Research Organization (ARO)** is the main institute for Agricultural research in Israel and therefore is responsible for most of the agricultural research conducted in Israel (~65%). The ARO focuses mainly on target-oriented applied agricultural research projects. It is comprised of a main research centre located at Bet-Dagan (Volcani Centre) and two regional centres in the north (Newe Yaar) and south (Gilat). The ARO is divided into six research institutes according to the thematic areas which are studied by the researchers. The professional staffs include around 200 scientists, about 250 engineers and technicians and a similar number of students.

There are 6 research institutes comprising the ARO:

a. The Institute for **Plant Sciences** is the largest institute. Its research work is done by 75 scientists and 131 technicians, engineers and secretariat employees who are working in four departments: Agronomy and Natural Resources, Fruit and Tree Sciences, Ornamental horticulture and Vegetable Research. The studies are focused on the broad fields of plant biology, agro-technology, and agro-environmental issues.

b. The Institute for **Animal Science** main goals are to conduct research to support animal breeders and farmers and to benefit the consumers of their products. The goal of the research is to enhance production efficiency and reduce losses and product costs, thereby increasing outputs of meat, eggs and milk, reducing environmental pollution and maintaining the quality of the environment. There are two departments: Poultry and Aquaculture, and Ruminant Science and Genetics. The institue holds facilities for dairy cattle, sheep and goats, chickens, turkeys, and fish, an additional beef cattle unit, operated by two additional researchers and a few support staff, located at the Northern Research Centre, Newe Ya'ar, and a honey bee facility. Of the 54 members of Institute's staff (not including MSc and PhD students), 23 are PhD-level researchers; the rest are engineers, technicians, and administrative and support staff.

c. The institute for **Plant protection** research agenda deals with all aspects of plant disease including detection, control, mechanisms and resistance caused by insects, fungi, bacteria, viruses, phytoplasma, weeds and nematodes. Precision application of chemicals and environment-friendly alternative methods of pest control are among important research aspects. The institute is divided into two departments: the Department for Entomology, Nematology and Chemistry units and the department of Plant Pathology and Weed Research. Both departments have 36 scientists, 45 technicians and engineers.

d. The Institute for **Soil, water and Environmental Sciences** is engaged in basic and applied research concerning the soil-plant-atmosphere continuum. It is dedicated to improving agricultural productivity without compromising environmental quality, and to conserving soil and water, two of Israel's most limited natural resources. The Institute of Soil, Water and Environmental Sciences comprises two departments: Environmental Physics and Irrigation; and Soil Chemistry and Plant Nutrition - in which 22 scientists, 24 engineers and technicians, and more than 20 visiting scientists and students are engaged.

e. The Institute for **Technology and Storage of Agricultural products** comprises two departments – Postharvest Science of Fresh Produce; and Food Science – staffed

by 72 employees of whom 22 are PhD-level researchers and the rest are engineers, technicians, and administrative and support staff. The Institute addresses current and anticipated problems related to fresh, dry and processed agricultural products, both plant- and animal-derived, that are intended for export as well as for local markets. This involves studies of basic processes and development of new methodologies to support practical research. The aims are to understand how food and ornamentals can be best protected against undesirable changes, to improve their quality and to preserve their nutritional value. This includes development of improved methods of preservation and treatment in order to maintain structure, firmness, color, taste and aroma, and to eliminate diseases and pesticide residues; all to meet the demands of increasingly sophisticated markets.

f. The Institute for **Agricultural Engineering** general objectives are to develop and introduce new concepts, methods and systems that will advance Israeli agriculture and assist Israeli farmers. The activities of the Institute are mostly application-oriented and R&D projects that cover a wide range of subjects, such as harvest and post-harvest systems, greenhouse technologies and environmental control, zoo-technology, soil disinfestation and chemical application systems, quality control and production management. The Institute collaborates with farmers, commodity groups, regional processing plants, the Ministry of Agriculture's Extension Service, and industry, as well as with national and international research organizations and universities. The institute for Agricultural Engineering counts 8 researchers, 17 technicians / engineers and 4 scholars.

2. **The Agricultural Extension Service (SHAHAM)** fulfills advisory and applied research functions in the governmental framework of the Ministry of Agriculture and Rural Development. As a government advisory and R&D entity, it provides high-quality advisory services with focus on applicable know-how to the farming clientele in order to promote the growers over the whole range of their farm-related and production activities.

3. **The Plant Protection and Inspection Services (PPIS,** www.ppis.moag.gov.il/ppis), is responsible for regulation and inspection of all aspects of plant protection, use of pesticides and herbicides and import of new plants and agricultural products. Its research involves developing new monitoring systems and implementation of integrated pest management.

4. **The Veterinary Services including Kimron Veterinary Institute (KVI)** comprises the diagnostic and research arms of the Israeli Veterinary Services and Animal Health, part of the Ministry of Agriculture. It is the sole diagnostic institution for comprehensive

veterinary diagnosis in Israel, and aspires to fulfill the needs of veterinarians and farmers to provide a complete service of reliable diagnosis and a core of expertise to advise animal health professionals and the public. Field visits to investigate serious or unusual syndromes are an integral part of the services provided by the KVI. The KVI comprises 18 laboratories, 17 of which are located at Bet Dagan, and one satellite diagnostic laboratory in northern Israel. The laboratories are organized into 5 divisions, which share common resources of staff, equipment and space. About 5,000 necropsies and 660,000 laboratory examinations are performed annually. Five of the KVI labs are also National Reference Laboratories: rabies, botulism, brucellosis, food residues, mastitis and milk quality.

5. **The National Centre for Marinculture** deals mainly in oceanography and sea fishery and is complementary to the fishery department in MOARD which is involved in aquaculture and sea fishery R&D.

Peripheral-Regional Research and Development (R & D) centres.

These regional agricultural R & D units are located in seven locations throughout Israel, mostly in remote peripheral regions of national importance and unique agro-climatic conditions. The current activity is governed by an Administrative R&D Director, together with a Scientific Director nominated by the ARO, whose aim is to initiate, manage and promote research in the organization and to encourage researchers and other institutes to carry out research and collaborate in programs to support the regional agriculture and farmers.
Since the goal is applied research, the researchers spend some time working in the Experimental Centre and the rest of the time instructing the farmers in their commercial plots. The advantage of this system is that the knowledge accumulated in the Centre is transferred directly to the farmers and problems that arise are immediately passed back. The activities are carried out in experimental stations and farmers sites. The emerging knowledge is transferred to the farmers through everyday advisory, end-season meetings, internet newsletters and fliers. In addition, there are occasional open-days, lectures, and trips on various topics.

A. **Northern Region R&D & Migal-Galilee Technology Centre** is specializing in biotechnology, agriculture and the environment. Migal in the Galilee Technology Centre is based in the Northern part of ISRAEL (Galilee) dealing with regional agriculture production systems. It covers regional applied research needs in 10 different disciplines. The different climatic areas mean various agricultural activities whose responsibility is for different work groups within Migal Agro Innovation. Not only that the areas of activity of Migal Agro Innovation are characterized by extreme differences of

topography and climate, but they also include a wide variety of different forms of settlement and business models. The scientific agenda of Migal Agro Innovation reflects a "Bottom UP" approach whereby the farmer's participant regularly in setting up objective for the overall activity. Migal Agro Innovation is based on scientific staff of Ph.D. level, which caters for 50% of the personnel. The rest of technicians and extension service are of M.Sc. and B.Sc. level. There are eight working groups in the organization dealing with different plant and animal sciences. Each work group sets up its own objective in a process of analysing the needs and requirement resulted from a continuous and transparent discussion with farmers all year round. Migal also provides laboratory and consulting services in microbiology and chemical analysis, and is involved in undergraduate education in the life sciences at Tel-Hai Regional College. The centre's interdisciplinary team includes 30 scientists at the Ph.D. level, backed by a staff of 140 engineers, graduate students and technicians. Facilities include 4,500 sqm of state-of-the-art laboratories. Migal Agro Innovation's scientific mode of operation is maintained and reflected in different national, regional, Bi-lateral and International programs such as Ministries of Science, Agriculture, Industry & trade, INCOMED, MERC, CDR, BARD, FP6 and others.

B. The River Jordan Valley regional R&D centre is focused on regional research of the Jordan valley area and includes R&D related to crops like grapes, dates and ornamentals.

C. Agricultural Research and Development, Central Mountain Region, Israel. The central mountain region. *Mop HaHar*'s Goals are: developing new agricultural products; researching new high-value crops for niche markets; educating young people in modern agriculture; spread knowledge about new ideas in farming

D. Southern regional R&D centre: major activity is to improve the yield and quality of various crops such as oranges, potato, ornamentals, pepper and tomato in field and in greenhouses.

E. Ramat Negev Desert regional R&D centre operates within the framework of the Ramat Negev Regional Council. It is funded by JNF, Ministry of Agriculture, the Office of Development of the Negev and Galilee, and the Settlement Division of the Zionist Federation. Ramat Negev R & D is directed by a broad board of directors including representatives of sponsoring governmental offices, JNF, Office of Science, Ministry of Agriculture and the local farmers. Ramat Negev is located in a desert region. The average yearly rainfall is 80 mm. There is a big contrast between day-time and night-time temperatures. Brackish water can be found in underground aquifers at a depth of 800 to 1200 meters, and is pumped out of drilled wells. Taking advantage of

all these conditions, Ramat Negev R & D focuses on developing advanced agriculture in arid conditions, irrigating with brackish water. The feasibility of irrigation with brackish or saline water is tested on varieties of olives, pomegranates, jojoba, rootstocks for wine grapes, tomatoes, peppers, fresh herbs and ornamental flowers. The extent of agricultural production in the Ramat Negev area increases over the past years.

F. Central and Northern Arava regional R&D centre activity is governed by a directory comprised by representatives of Jewish National Funds (JNF), Central Arava and Tamar regional councils, Agriculture Research Organization (ARO), Agricultural Extension Service (SHAHAM), Plants Council, heads of agricultural committees and sector coordinators.
The R&D includes seven sector centres: vegetables, ornamentals, plant-protection, orchards, organic agriculture, fishery, and produce quality. Each sector coordinator acts as the head of a committee comprised of farmers, extension service staff, and researchers, who assemble to determine a priority scale of the major issues to be encountered and solved.

G. Southen Arava regional R&D centre extends over the entire area of the Hevel Eilot Regional Council, and is operated by Ardom Management and Holdings. Funding and operation of the R&D are primarily through grants from the (JNF). Additional funding comes from the following organizations: The Ministry of Agriculture and Rural development, The Negev Development Authority, WZO- Settlement Division, JCA in Israel, Plants Production and Marketing board, Hevel Eilot Regional Council. The climate in the southern Arava is extreme desert, characterized by very high temperatures in the summer, minimal precipitation (annual average of 20 mm.), intense radiation and relatively low humidity. Irrigation water is saline, and combined with climate conditions, presents a formidable limitation to the development of sustainable agriculture. In agricultural enterprises attempting to cope with desert conditions the R&D has a unique function, more so than in other regions. The R&D operates in the following areas: Efficient use of water; Increasing profitability of existing crops; Decreasing use of pesticides and safeguarding the environment; Development of new crops and products; Technological developments towards reduction in manpower.

Universities and Graduate Schools

6. The H. Smith Faculty of Agriculture, Food and Environmental Sciences, The Hebrew University of Jerusalem is the only University in Israel offering degrees in agriculture and is also home to the only Schools of Nutritional Sciences and of Veterinary Medicine. The Faculty today has a student body of 2,300 students.The Faculty offers academic programs leading to B.Sc., M.Sc. and Ph.D. degrees in

Agriculture, B.Sc. and M.Sc. degrees in Nutrition, and a Doctor of Veterinary Medicine degree.
The Faculty's teaching and research activities continue to play a central role in advancing agriculture to strengthen the Israeli economy; protecting and rehabilitating the environment; increasing food production and reducing world hunger and mobilizing agriculture to meet human health needs and improving the quality and purity of agricultural products.
The Agriculture Faculty has nine departments: Agricultural Economics and Management; Animal Science; Entomology; Plant Pathology and Microbioogy, The Segram Centre for Soil and Water Sciences; Institute of Biochemistry, Food Science and Nutrition; The Robert H. Smith Institute of Plant Sciences and Genetics in Agriculture; The Koret School of Veterinary Medicine; Hotel, Food and Tourism management. Some of the Faculty research achievements and innovations include methods of drip irrigation and fertigation; tomatoes and other fruits and vegetables bred with long shelf life, improved taste and disease resistance; returning the fragrance to flowers; intensive arid-zone agriculture; soil solarization - a nonchemical method of controlling soilborne plant diseases; green-farming techniques - use of natural biofertilizers and biocontrol by biofungicides and parasitic insects - to reduce the use of chemical fertilizers, fungicides and pesticides; recycling technologies for waste-water reclamation and composting of solid municipal and agricultural wastes; using plants to purify water polluted by heavy metals.

7. Tel-Aviv University is the biggest University in Israel but its involvement in agriculture R&D is limited to the fields of plant scince, botany and biotecnology (such as biofuels), and to is entemological collection centre and botanical gardens.

8. The Weizmann Institute of Science is one of the top-ranking multidisciplinary research institutions in the world. Noted for its wide-ranging exploration of the sciences and technology, the Institute gathers together 2,500 scientists, technicians and research students. Since The Weizmann Institute of science is oriented toward basic research, applied Agricultural Scientific reserach is not one of of its direct thematic areas. Nevertheless, the agriculturul research is affect from the discoveries which were gathered over the years in plant genetics, computer science and animal physiology.

9. Technion – Israel Institute of Technology offers degrees in science and engineering, and related fields such as architecture, medicine, industrial management and education. The Technion is considered to be among the world's top ten research universities.

10. **Ben Gurion University of the Negev** was established in 1969 with the aim of bringing development to the Negev, a desert area comprising more than sixty percent of the country. Today, Ben-Gurion University is a major centre for teaching and research, with campuses in Beer-Sheva, as well as in Eilat and Sede Boqer, More than 18,000 students are enrolled in the Faculties of Engineering Sciences, Health Sciences, Natural Sciences, Humanities and Social Sciences, the Guilford Glazer School of Business and Management and the Kreitman School of Advanced Graduate Studies. The University also includes major research institutes such as the National Institute for Biotechnology in the Negev, the Jacob Blaustein Institutes for Desert Research with its Albert Katz International School for Desert Studies and the Ben-Gurion Research Institute for the Study of Israel and Zionism.

11. **The University of Haifa.** The University considers the link between academic excellence and social responsibility as its flagship, and service to the community as one of its important goals. Some 17,000 students are studying toward a degree (B.A., M.A., or Ph.D.) in 2008/09. The University offers six Faculties: Humanities, Social Sciences, Sciences and Science Education, Law, Social Welfare and Health Studies, and Education; and five Schools: Business Administration, Social Work, History, Public Health, and Political Sciences.

12. **Bar-Ilan University.** Within this university, the Department of Plant Science involved in agricultural research in the fields of plant biotechnology, plant physiology and plant protection.

MAPPING OF RESEARCH FACILITIES.

- Two research institutions reported hold **shared equipment** which include: Electron Microscope, Lysimeters, climate controlled greenhouses, soil and water laboratories, chemical laboratories and high-care rooms (sterile room).
- Seven research institutions own **Experimental stations** which include experimental field farms, green houses, plantations, irrigation facilities and laboratories.
- Two research institutions own **Animal research facilities**: which include Hutches, Hen-Houses, aquaculture farms.
- Three research institutions have **engineering prototypes** for Mechanical Cultivator of Medjool dates, Irrigation and fertilizing facilities, green houses coverage.
- Four research institutions have facilities related to **Pilot plants** in the areas of cultivation varieties of Sunflower, long term preservation of Moist Medjool Dates, Acclimatization of water-saving Desert Plants and introduction of new plants.

- Four research institutes include **National reference centres**: Local centre to distribute internal knowledge, Israel Plant Gene Bank, The Official seed testing Laboratory.
- Four research institutes supply **Database services**: Genetic resources, local monitoring of environmental conditions,
- Two research institutions have **Technology platforms** for a special variety of green houses facilities.
- One research institute has a **Biohazard facilities**, a special green house coverage.

All facilities are open-access.

MAPPING OF TRAINING SCHEMES.

The Hebrew University is the only University which holds a faculty which is dedicated to the teaching and research of Agriculture on its many facets. Courses are given for graduates, master and doctor training as well as for fellowships. The thematic areas of the courses are: Crop production, Livestock production, diseases of Animals and Plants, Aquaculture, Biotechnology, Nutrition, Agricultural Economics.