Improving Food Security and Livelihoods in Dry Areas and ICARDA's Contribution in Collaboration with Partners

31st FAO Near East Regional Conference

Side Event: FAO - ICARDA Collaborations for Sustainable Agriculture Production and Improving Livelihoods in the Near East Region,

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Mahmoud Solh
Director General
International Center for Agricultural Research in the Dry Areas (ICARDA)

Outline

- The changing world & the food insecurity in the dry areas
- Challenges facing enhancing food security in dry areas
- ICARDA's Strategy and mandate to address challenges facing dry areas
- Research achievements towards enhancing sustainable agricultural productivity in the dry areas
- Beyond research to achieve sustainable impact
- FAO-ICARDA collaboration
- Conclusion

The Changing World …..
and Food Insecurity in Dry Areas

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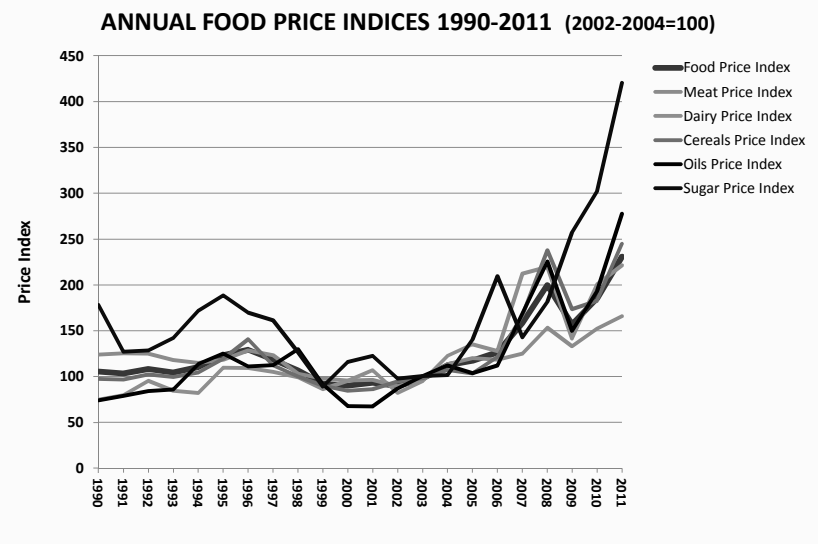
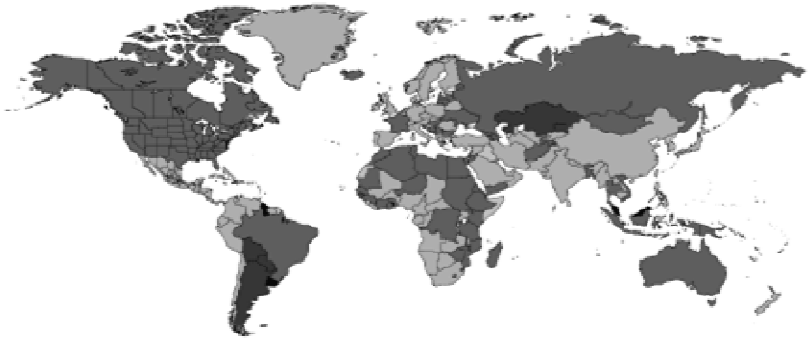
Changes in price indices of major food crops



Source: FAO 2011. http://www.fao.org/worldfoodsituation/foodpricesindex/en/

Impact of Food Price Increases on Trade Balances, 2007-2008



Large losers (trade balance worsening > 1% 2005 GDP)
Moderate losers (trade balance worsening < 1% 2005 GDP)
Moderate gainers (trade balance improving < 1% 2005 GDP)
Large gainers (trade balance improving > 1% 2005 GDP)
No data

SOURCE: The World Bank

Crop Prospects and Food Situation, April 2008 FAO.

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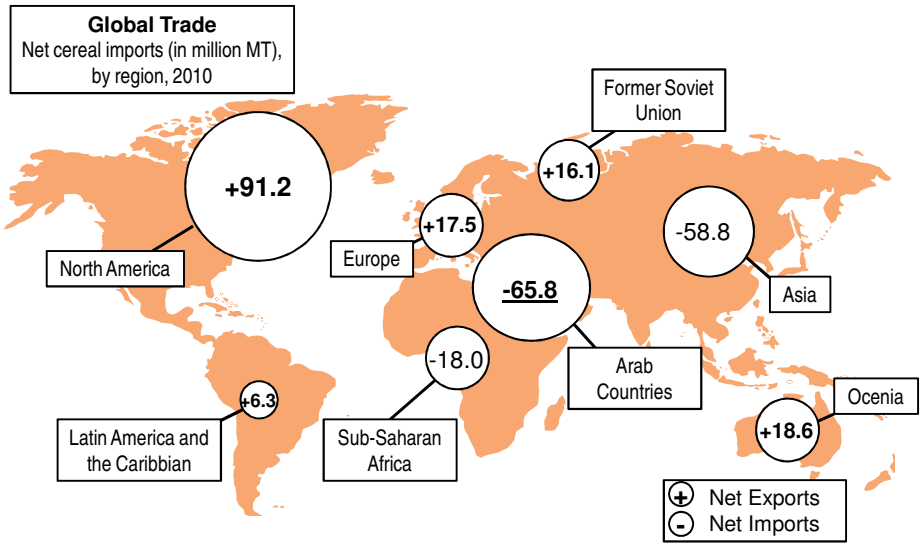
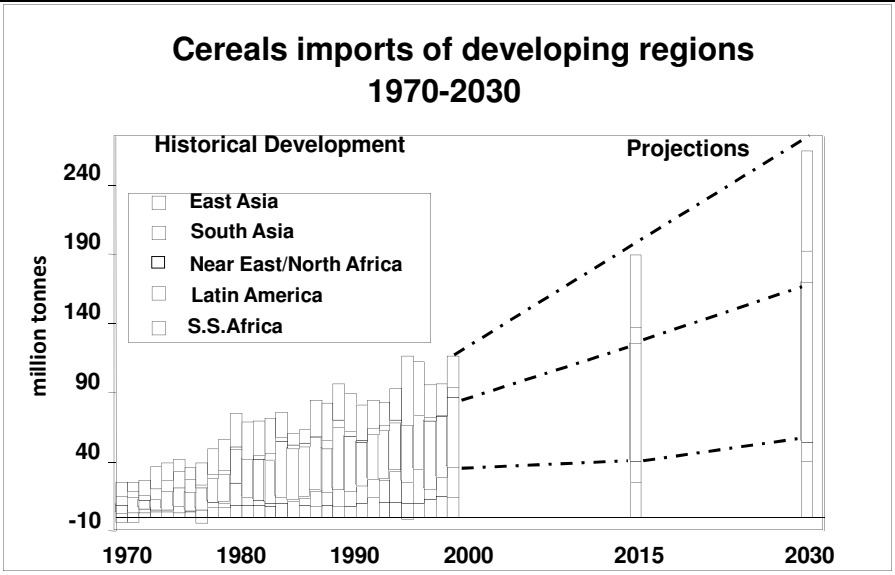
Arab Region is the largest grain importer (2010 million metric tons)



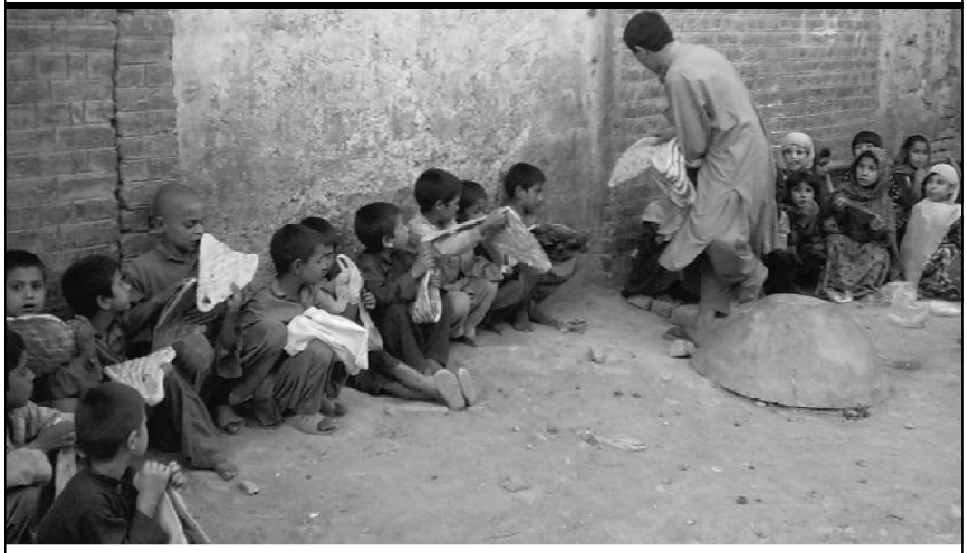
Sources: adapted from USDA 2011

Food Insecurity in Developing Regions of the World



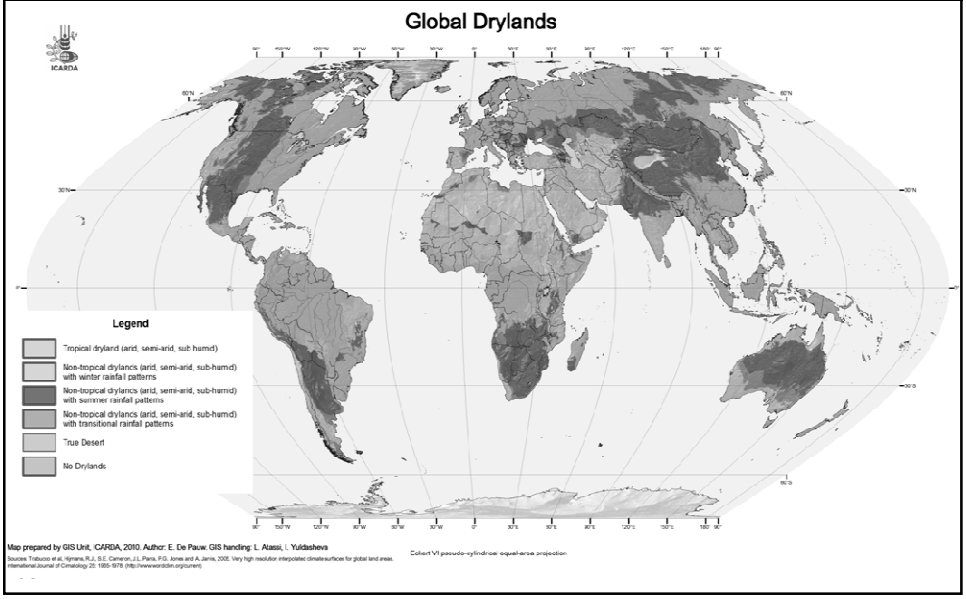
Source: FAO, 2002 World Agriculture: towards 2015/30, http://www.fao.org/es/ESD/gstudies.htm

Implications of the Food Crisis:
Countries moving from self-reliance to self sufficiency



The Challenges Facing Food Security in Dry Areas

Drylands of the world

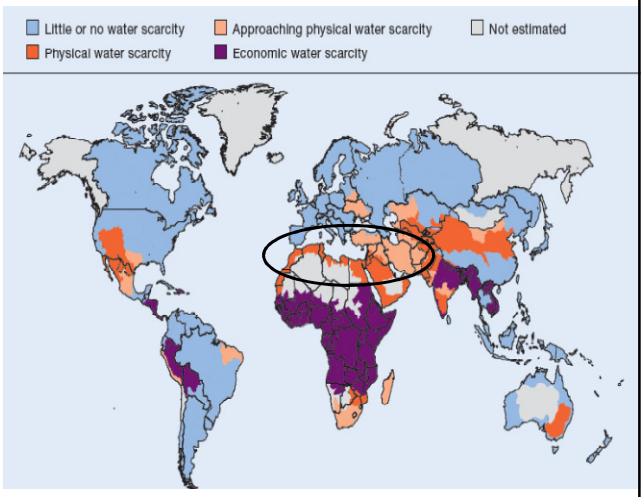


The Dry Areas

Dry areas cover 41% of the earth's surface, and are home to over 1.7 billion people – and the majority of the world's poor. About 16% of the population lives in chronic poverty, particularly in marginal rainfed areas.

Dry Areas: Fragile Eco-systems

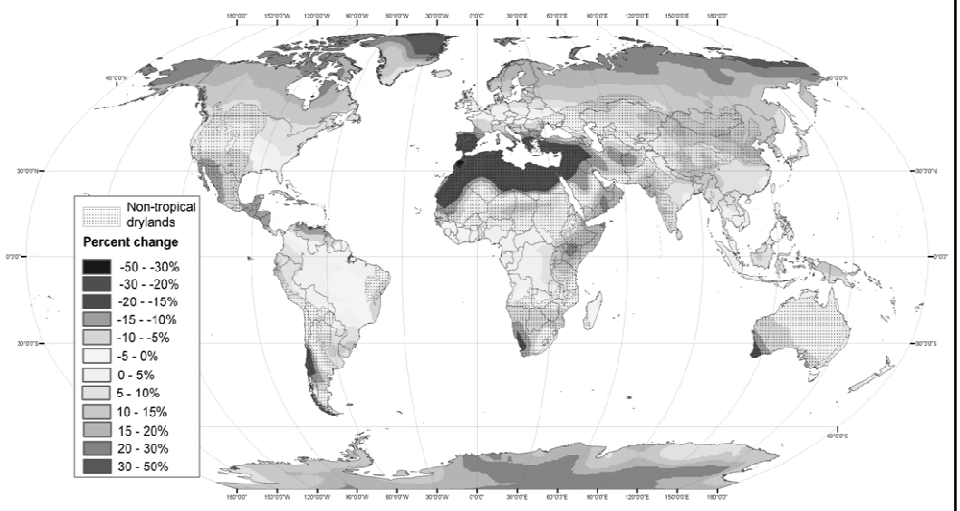
- Physical water scarcity
- Rapid natural resource degradation and desertification
- Groundwater depletion
- Drought
- Salinity
- Climate change



Implications of Climate Change

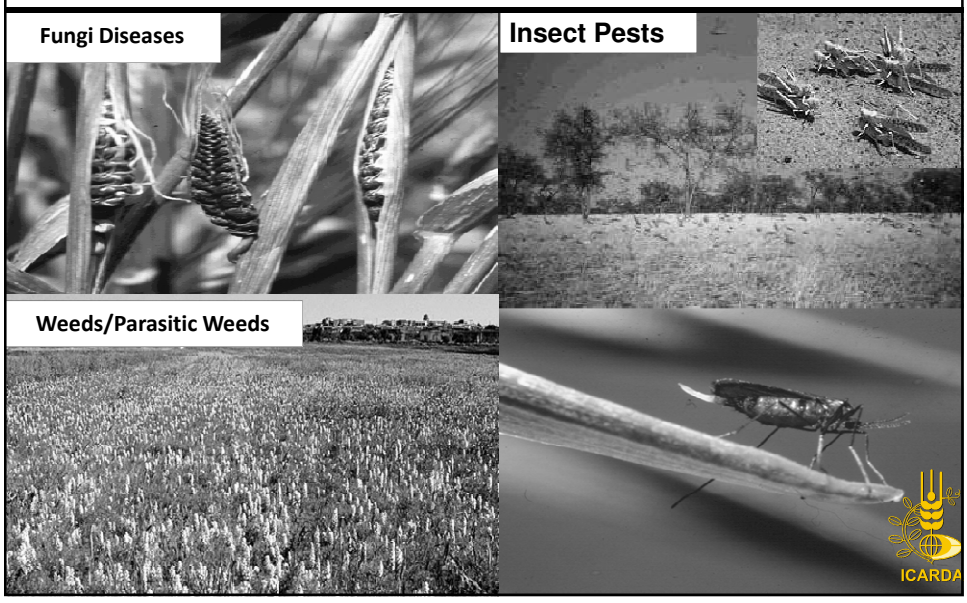
- Changes in precipitation and drought
- Extreme temperatures
- Changes in climatic zones;
- Shorter growing season;
- Emerging diseases and insect pests.

Relative change of mean annual precipitation
1980/1999 to 2080/2099



Relative change of mean annual precipitation 1980/1999 to 2080/2099, scenario A1b, average of 21 GCMs (compiled by GIS Unit ICARDA, based on partial maps in Christensen et al., 2007)

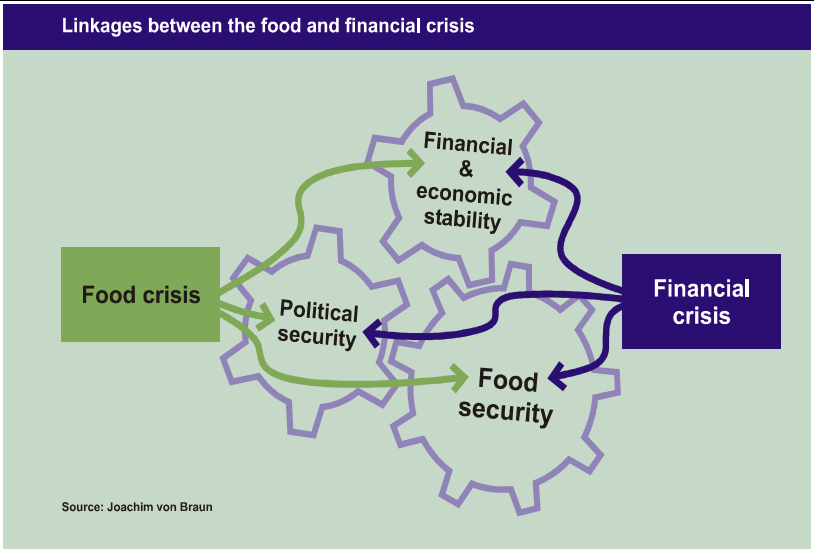
Challenges to Food Security: Biotic Stresses



Further Challenges to Food Security in Developing Countries

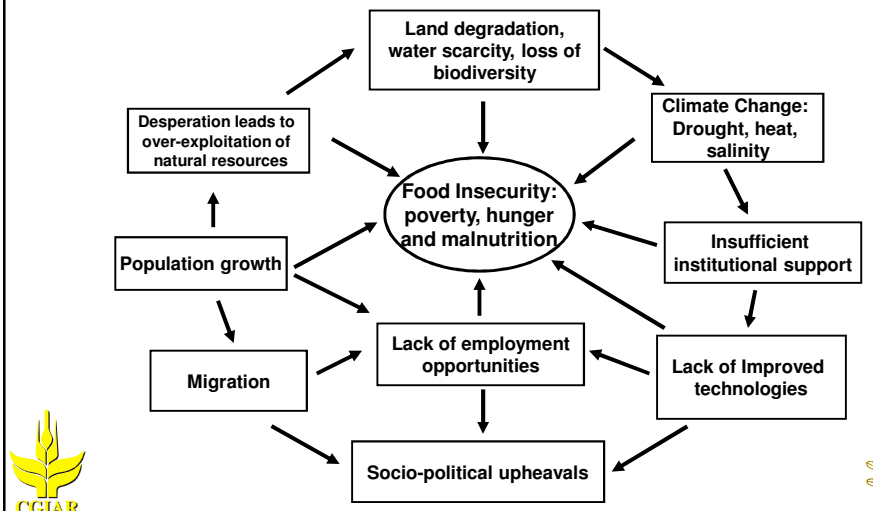
- Inadequate agricultural policies for sustainable agricultural development
- Insufficient investment in agricultural research and development

Politically volatile region: Importance of economic and political stability



The Food Insecurity Trap

Interrelationships between key challenges in developing countries



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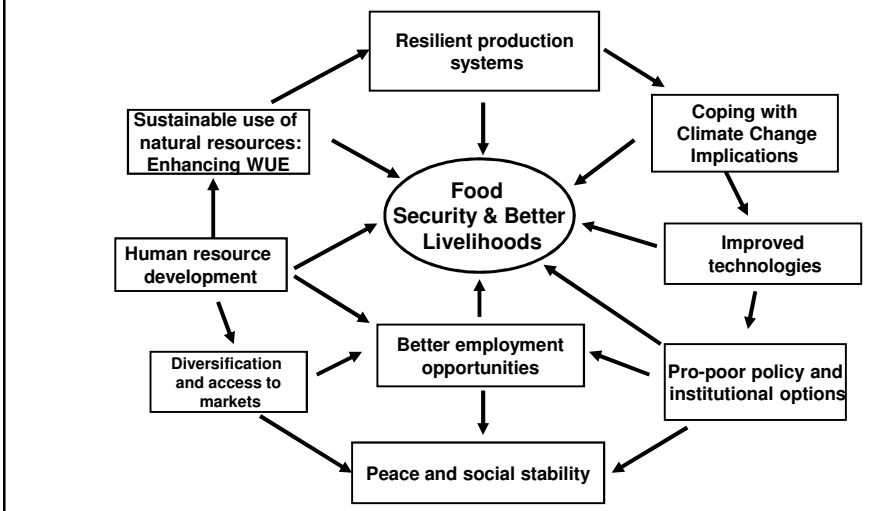
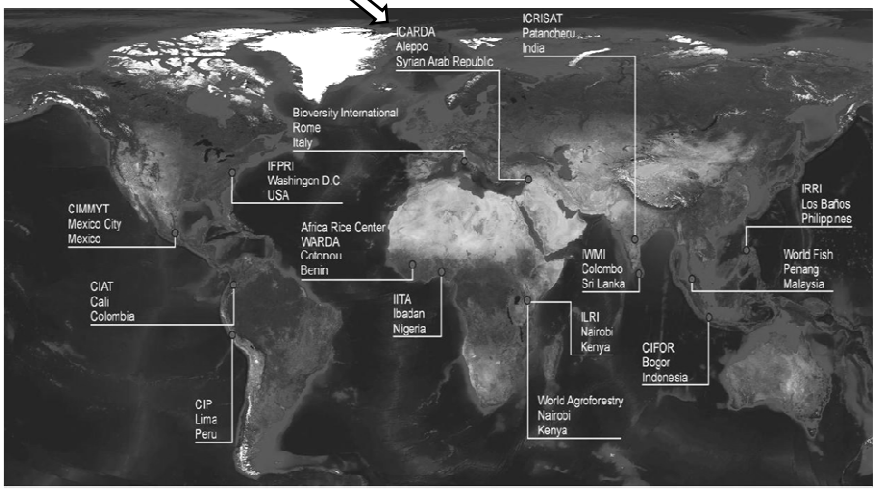
Pathways towards Food Security in developing countries



The CGIAR and ICARDA's Strategy and Mandate

CGIAR Centers Around the Globe



CGIAR's New Vision

To reduce poverty and hunger, improve human health and nutrition, and enhance ecosystem resilience through high-quality international agricultural research, partnership and leadership.

CGIAR's Strategic Objectives

FOOD FOR PEOPLE
Create and accelerate sustainable increases in the productivity and production of healthy food by and for the poor

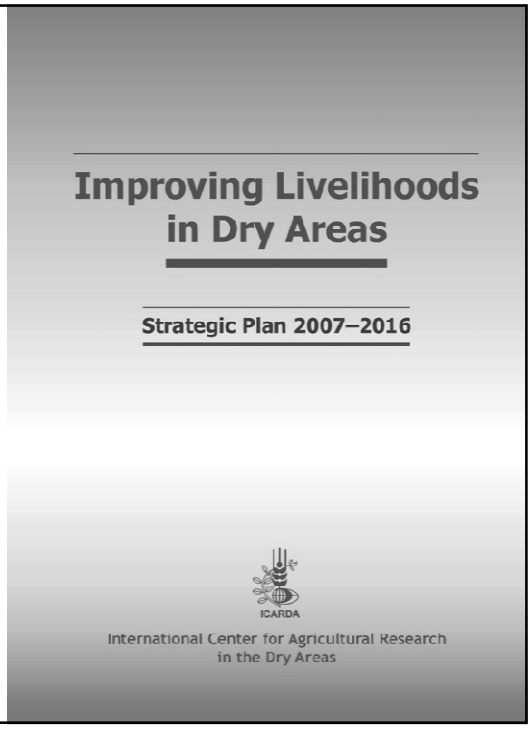
ENVIRONMENT FOR PEOPLE
Conserve, enhance and sustainably use natural resources and biodiversity to improve the livelihoods of the poor in response to climate change and other factors

POLICIES FOR PEOPLE
Promote policy and institutional change that will stimulate agricultural growth and equity to benefit the poor, especially rural women and other disadvantaged groups

To overcome
these challenges

and enhance
food security

in a
changing world …



Strategy emphasis

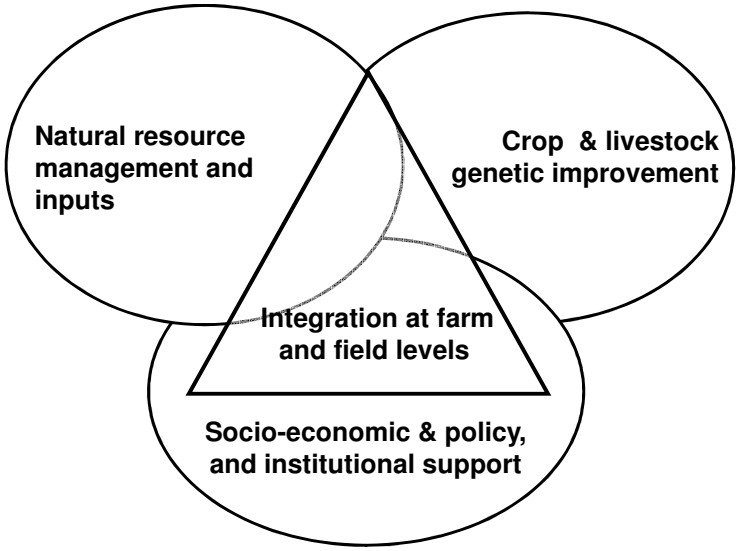
Besides conservation of biodiversity and crop genetic improvement, ICARDA is emphasizing:

- Risk management, drought mitigation, and adaptive capacity of agriculture to climate change
- Integrated water and land management
- Socio-economic research to strengthen community and institutional frameworks
- Diversification and marketing research for income generation and improving nutrition
- Shifting to market-oriented production
- Greater global coverage of dry areas (Sub-Saharan Africa, South Asia, China, and Latin America)

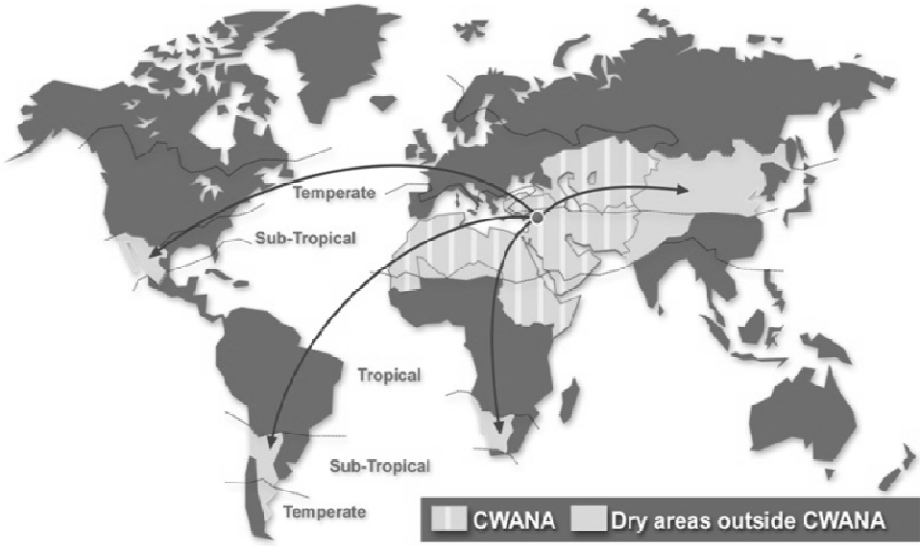
ICARDA Vision
Improved livelihoods of the resource-poor in dry areas

ICARDA's Research Programs

Enhancing and maximizing impact through integration of research outputs for sustainable agricultural development

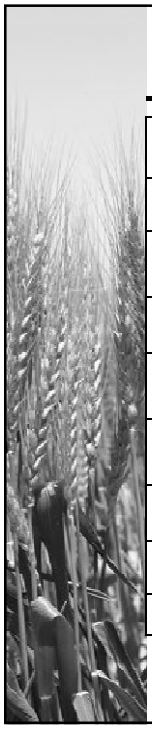


ICARDA's geographic mandate



Examples on ICARDA's Achievements:

**Germplasm Conservation and Crop Improvement ….
to Enhance Agricultural Productivity and Improve livelihoods**



ICARDA Gene Bank Holdings
(up to **2010**)

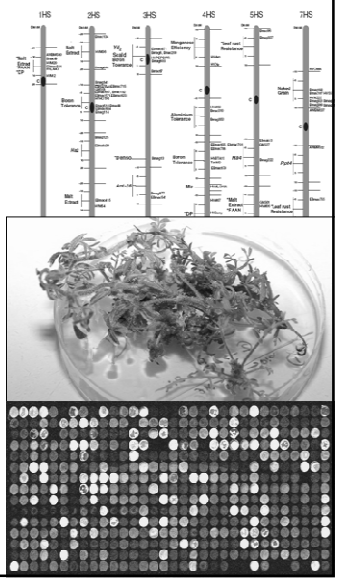
Crop	Accessions
Barley	**24,975**
Wheat	**34,227**
Wild cereals	**7,671**
Food legumes	**33,313**
Wild Food legumes	**857**
Forage legumes	**28,469**
Forage and range spp.	**5,744**
Total	**135,256**

Mostly landraces and unique set of wild relatives

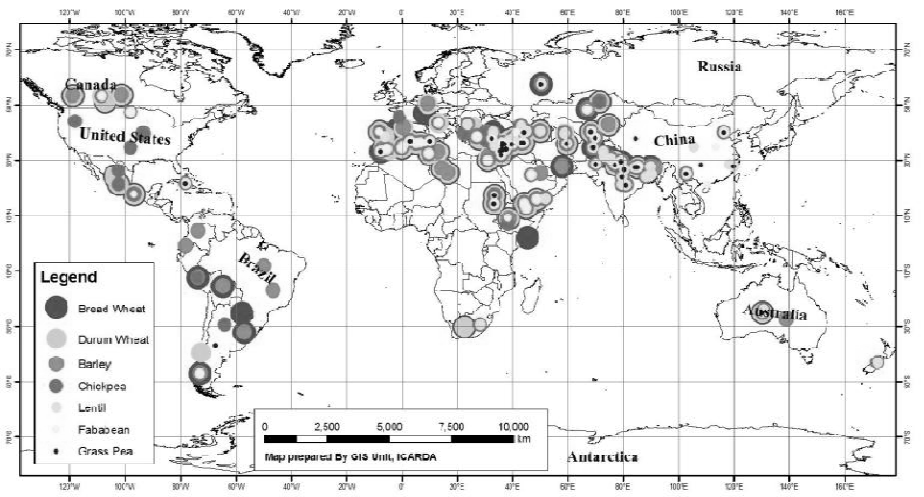
Conventional Plant Breeding

Biotechnology Tools

- Genomics
- Marker Assisted Selection
- Double Haploids
- Embryo Rescue
- Tissue Culture
- DNA Fingerprinting
- Genetic Engineering



Distribution of cereal and food & forage legume international nurseries and germplasm



Crop Improvement: Varieties Released using ICARDA Germplasm Worldwide, 1977 to 2010

	1977 - 2010		Last 2 years
Crop	**Developing Countries**	**Industrialized Countries**	**All Countries**
Barley	175	31	6
Durum Wheat	102	14	1
Bread Wheat	224	6	9
Chickpea	108	31	9
Faba Bean	51	6	1
Lentil	96	16	9
Forages	30	2	2
Peas	9	0	0
Sub-Total	761	120	
Total	**881**		**37**
NET ESTIMATED BENEFIT = about US $850 m / year			

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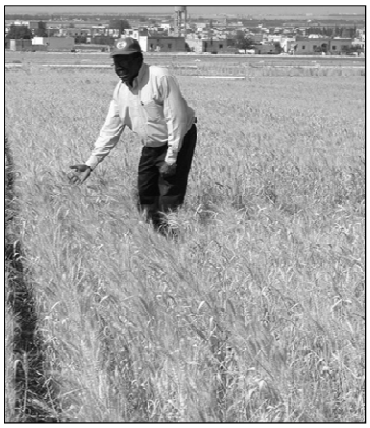
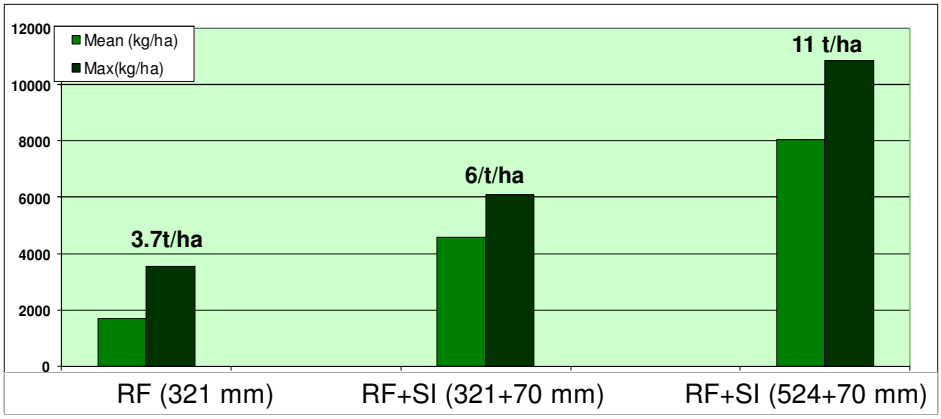
Wheat crossed with wild relatives: Synthetic wheat, tolerance to excessive drought



Parent Variety	Yield t/ha	% recurrent parent
Cham 6*2/SW2	1.6	147
Cham 6*2/SW2	1.5	138
Cham-6	1.10	100
Attila-7	1.3	-

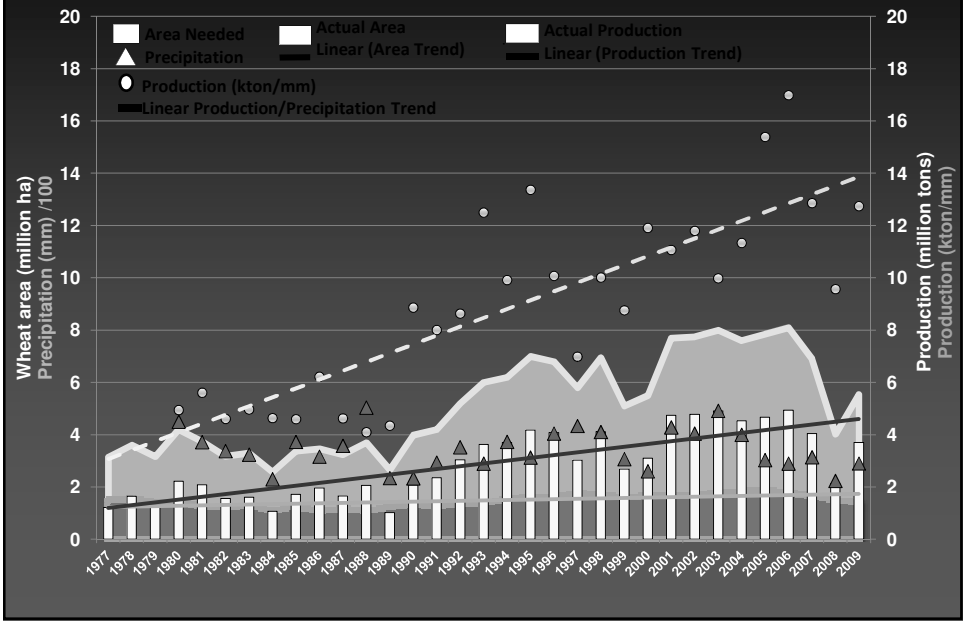
Yield of "synthetic derivatives" compared to parents under drought stress. (Tel Hadya 2008 -- 211 mm)

Yields (kg/ha) of promising durum wheat genotypes under rainfed (RF) and supplemental irrigation (SI)



RF = Rainfed; SI = Supplemental Irrigation

Wheat in Syria: Enhancing rainfall productivity



Irrigated heat-tolerant wheat in Sudan

Winter vs. spring chickpea in West Asia & North Africa

Drought tolerant chickpea variety survived 2007 drought in Turkey

Gokce is used on about 80% of the chickpea production areas (over 550,000 ha). With a yield advantage of 300 kg/ha over other varieties, and world prices over USD 1000/t, this represents an additional USD 165 million for Turkish farmers, in 2007 alone.

The Kabuli chickpea, 'Gokce', developed by Turkish national scientists and ICARDA scientists , has withstood severe drought in Turkey and produced when most other crops failed in 2007.

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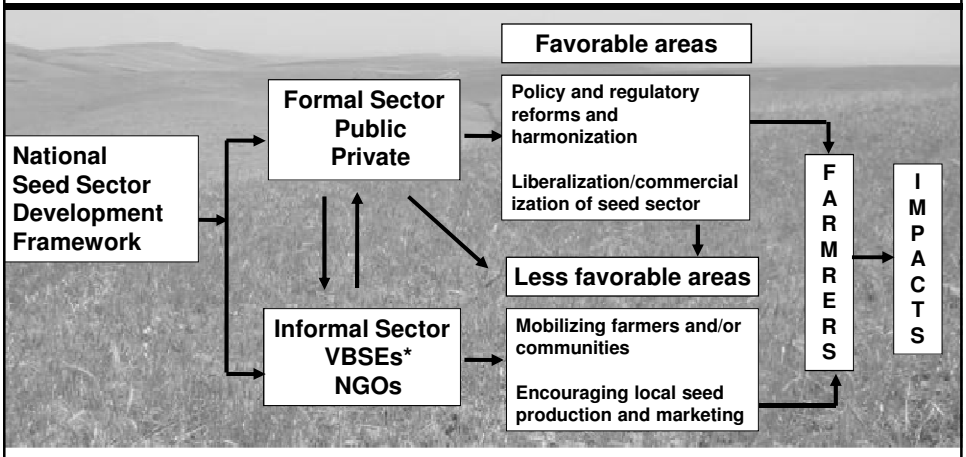
Examples on ICARDA's Achievements:

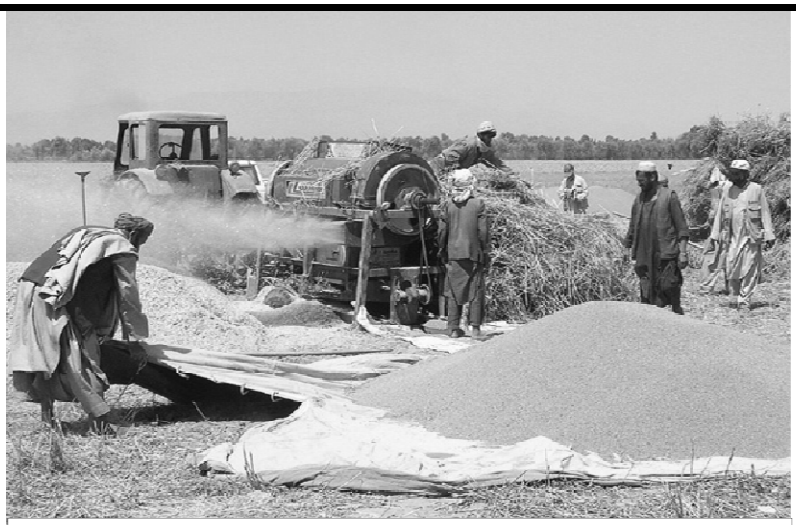
Seed Production & Seed Delivery Systems….

Research on Seed Delivery Systems
Capacity Development in the Seed Production Sector



* VBSEs: Village-based seed enterprises

Village-Based Seed Enterprises (VBSE) in Afghanistan



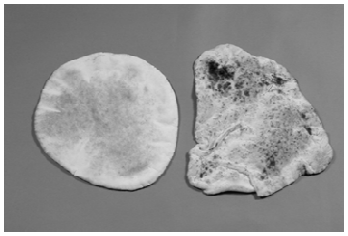
VBSE: Afghanistan (33), Algeria (1), Egypt (2), Eritrea (1), Morocco (1), Pakistan (4), Tunisia (1).

Examples on ICARDA's Achievements:

Plant Protection and Integrated Pest Management (IPM)

IPM: Sunn Pest in wheat

- Effects > 15 million ha in West and Central Asia & Eastern Europe;
- Sunn pest injects enzyme that decomposes grain gluten, vital for bread baking;
- If 2-3% of a grain lot is infested, entire wheat lot is ruined with respect to baking quality

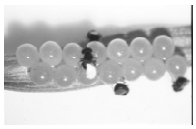


Sunn pest IPM options

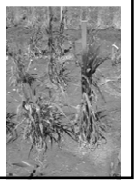
- **Hand collection of Sunn pest in overwintering sites**

- **Use of insect-killing fungi in overwintering sites**

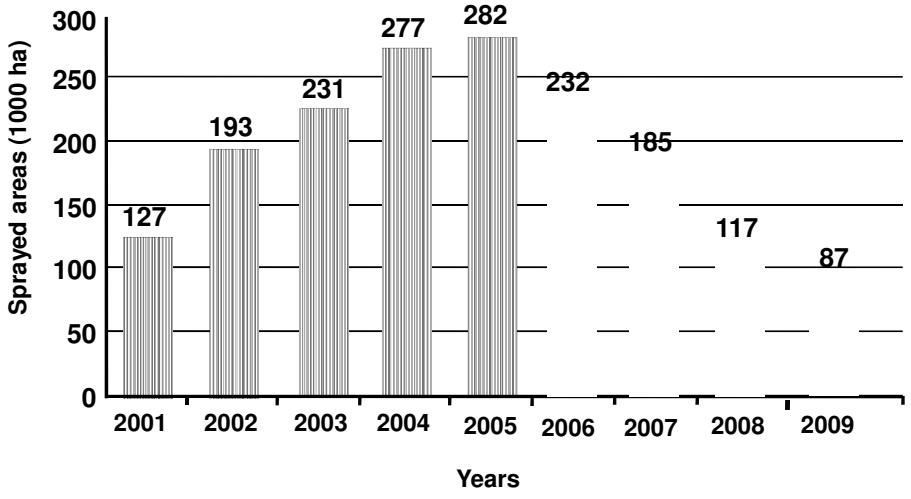
- **Enhancement and conservation of egg Parasitoids**



- **Genetic resistance at the vegetative stage**



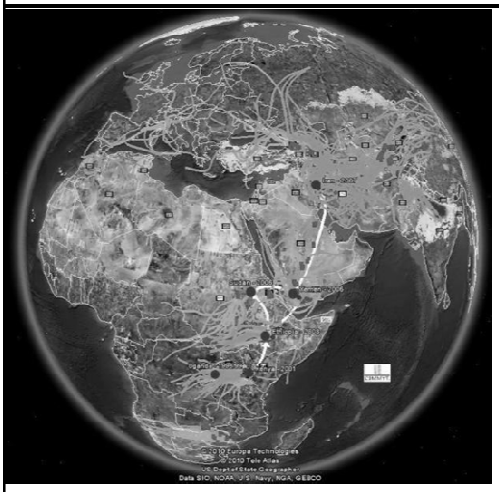
Evolution of area sprayed against Sunn Pest in Syria



Examples on ICARDA's Achievements:

Coping with Trans-boundary Diseases

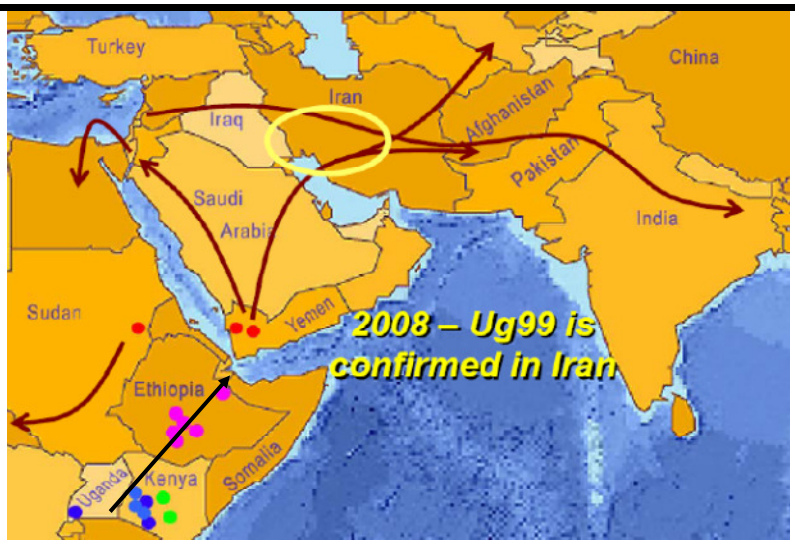
The Borlaug Global Rust Initiative: a coordinated campaign to combat Ug99 stem rust



- Ug99 disease surveillance
  - Geographical Information System (GIS)
  - Trap Nurseries
  - Race analysis
- Breeding for durable resistance
- Multiplication of seed of resistant varieties
- Global collaboration between:
  - CIMMYT, ICARDA, FAO
  - Cornell University
  - ICAR India
  - NARS of Africa & Asia
  - USDA/ARS
  - CSIRO Australia
  - Agriculture & Agri-Food Canada

Supported by the Gates Foundation, USAID, Canada, Arab Fund, IFAD, India and others

Potential Migration Routes of Ug99



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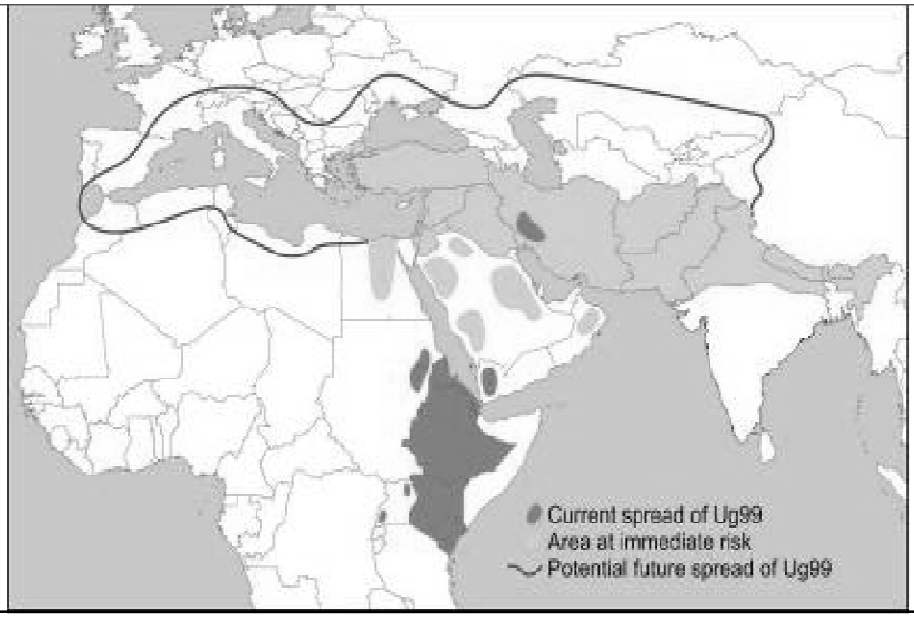
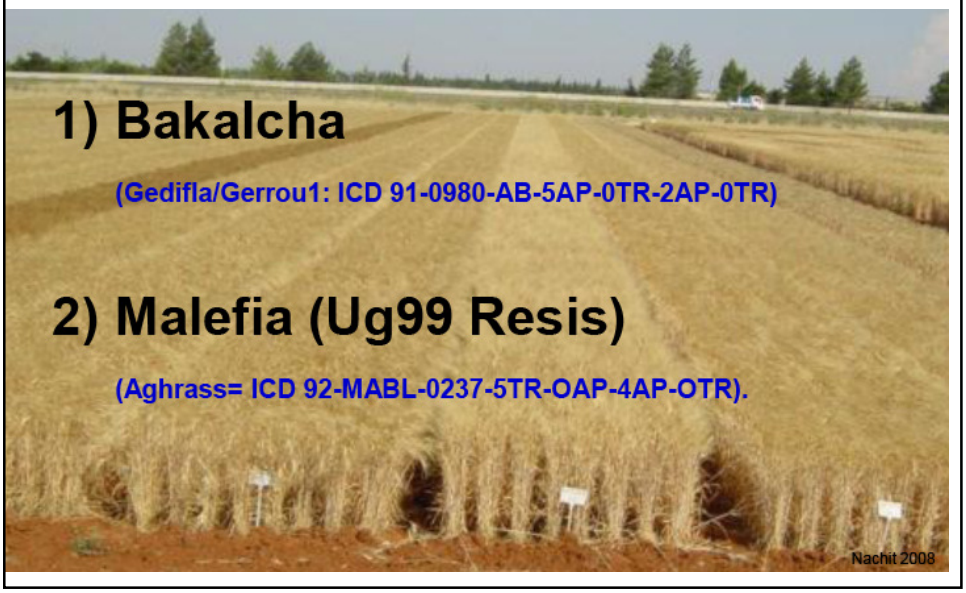
Areas Vulnerable to Ug99



Resistance to Ug99: Screening in East Africa in 2008

- 3,825 lines screened under heavy disease pressure in both Ethiopia and Kenya.
- 1,243 lines (32%) with acceptable level of resistance to Ug99**.**

Stem Rust Resistant Durum Lines Released in Ethiopia



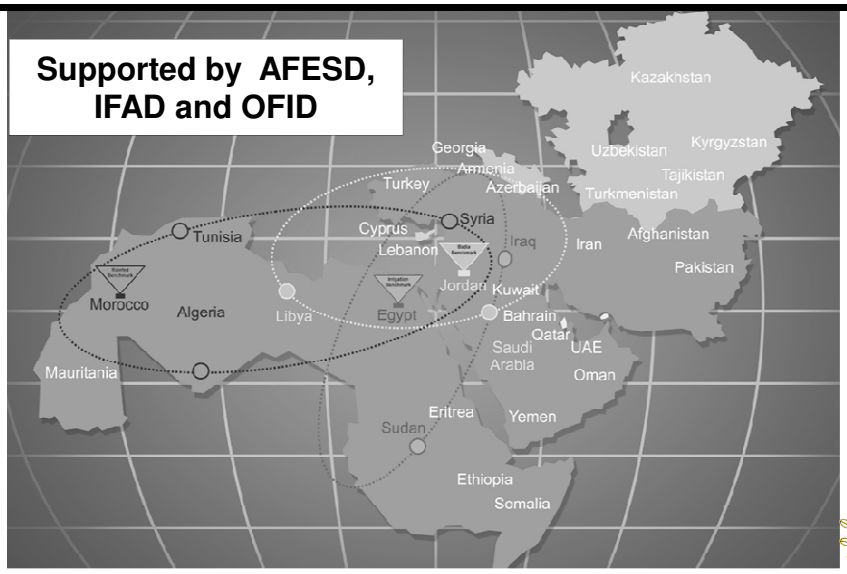
Examples on ICARDA's Achievements:

Better Natural Management and Water Productivity

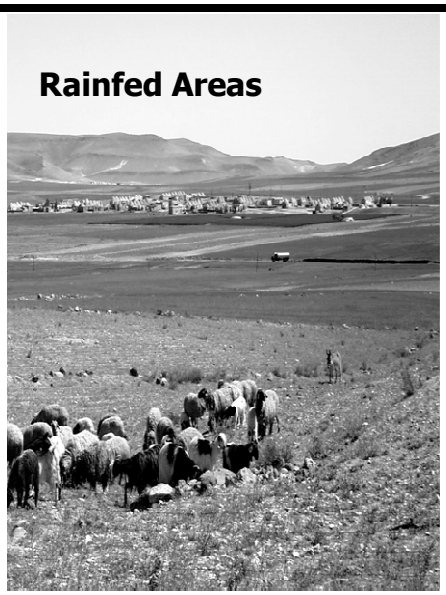
Water Research: Scales and drivers to conserve and optimize water productivity

- At the basin level:
  - ✓ Competition among uses (Environ., Agric., Domestic.)
  - ✓ Conflicts between countries
  - ✓ Equity issues
- At the national level:
  - ✓ Food security
  - ✓ Reduce imports
  - ✓ Socio-politics
- At the farm level:
  - ✓ Maximizing economic return
  - ✓ Nutrition in subsistence farming
- At the field level:
  - ✓ Maximizing WUE, productivity & income

Benchmark Sites for Integrated Water & Land Management



Implementation in Three Agro-Ecologies



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Research Outputs & Technologies in Water Management

Enhancing water productivity Through:

- **Changing Irrigation Systems and Modifying Cropping Patterns**;
- **Supplemental Irrigation** (Systems and management);
- **Macro- and Micro-Water Catchments** (Vallerani and other types);
- **Deficit Irrigation** as a water management strategy for the water scarce areas;
- **Watershed management.**

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Conservation Agriculture

Major Practice Worldwide

- minimum soil disturbance/zero tillage
- stubble retention
- many rotations (legumes, oilseeds)

Benefits

- savings in time, fuel, machinery wear
- better soil structure
- better soil moisture conservation
- improved traffic ability – timely sowing
- higher yield potential
- less soil erosion



Local fabrication of zero-tillage seeders in Iraq and Syria

Amazon – imported

Iraq-Mosul Co

Imported seeders
Price: $ 30,000 – 70,000

Qabbasin - local

Local seeders (Iraq & Syria)
- Price ≈ $1400 – 5,000
- Performance excellent

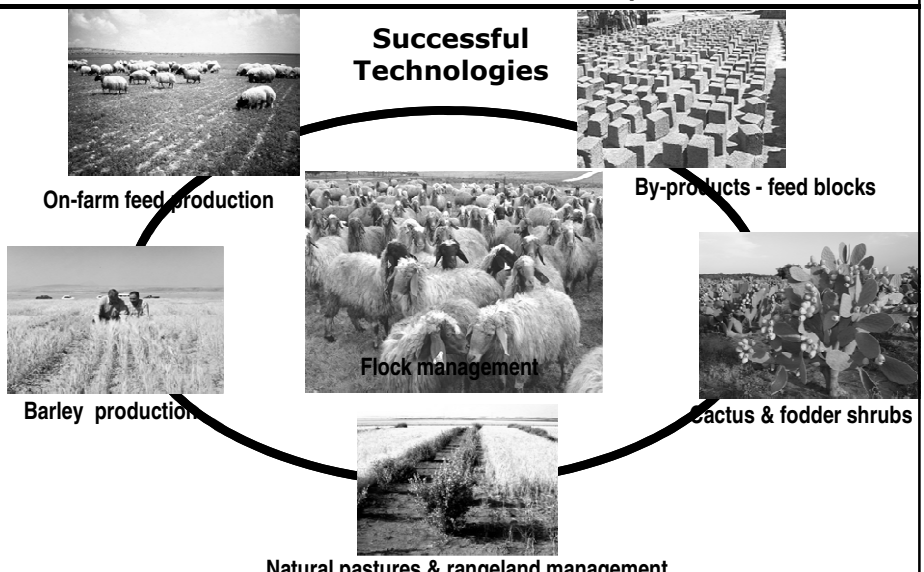
Syria-El Bab - local

Syria-Kamishley - local

Examples on ICARDA's Achievements:

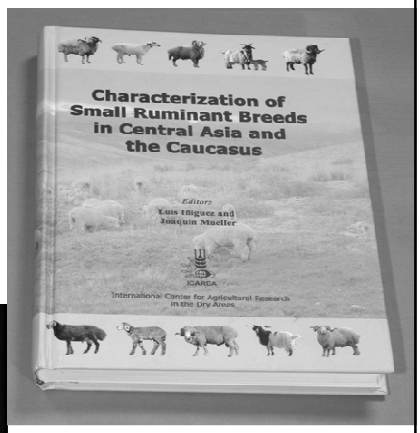
Enhancing Agricultural Productivity and Better Livelihoods in Marginal Land

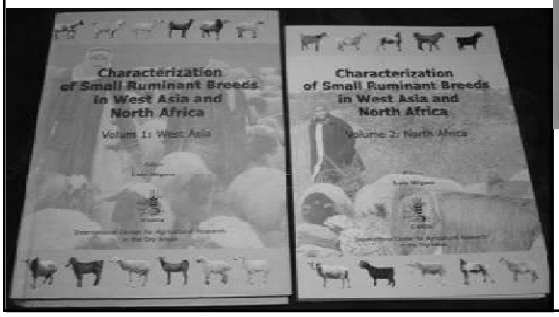
Integration of Crop, Rangeland and Livestock Production Systems



Small Ruminant Breed Characterization

- The focus of the books ⇨
  - Production systems
  - Characteristics – 48 breeds
  - Threats to animal diversity
- Completes CWANA series
  - West Asia & North Africa and Central Asia & Caucasus





Increasing incomes by adding value

Technology for improved cheese processing

Problems:

- Eye formation
- Sourness and/or off flavor
- Risk of Brucellosis

Solutions:

- Milk pasteurization prior to cheese making
- Use of thermometers for right temperature for pasteurization

The benefits:

- Hygiene & high quality product reducing risks to transmission of diseases
- Improved marketability and increased net income

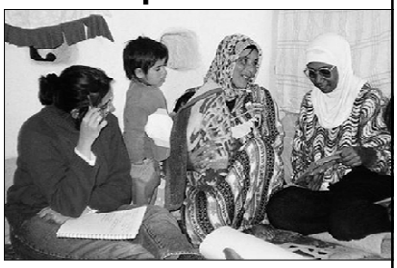
Examples on ICARDA's Achievements:

Socio-Economic and Policy Consideration

Socio-economic consideration and policy options to enhance food security & improve livelihoods

Integral part of any agricultural research portfolio

- Integrated approach, working closely with all stakeholders including policy makers and end users;
- Analysis – poverty, livelihood strategies, gender & poverty mapping;
- Adoption & Impact assessments
- Studies of markets, policies, institutions;
- Natural resource economics & policy options on sustainable use of these resources.



Mapping of poverty in Sudan* to better target development

Composite index of life expectancy, deprivation of knowledge, lack of access to public and private services

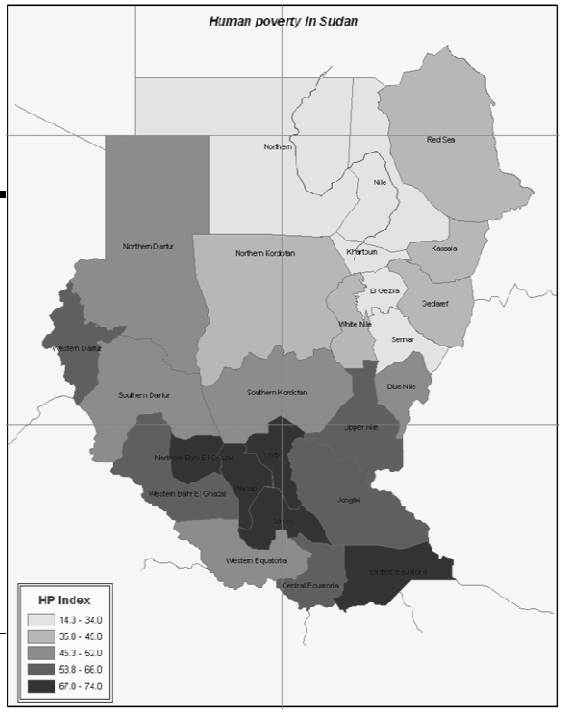
Based on data from two national surveys;

The 2000 Multiple Indicators Clusters Survey (MICS)

• including 2006 Health Survey

•Human poverty is the highest in the South

* before separation of Southern Sudan



Beyond Research for Sustainable Impact on Agricultural Development

Capacity Development:

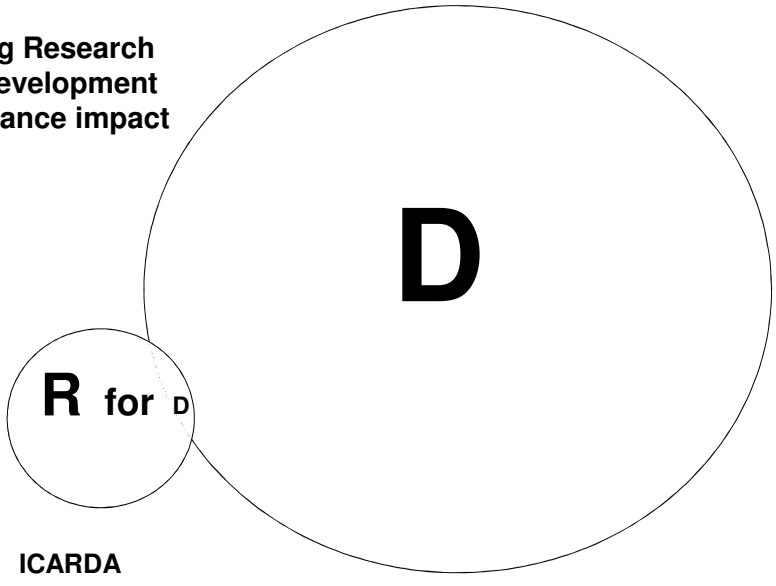
Number of Trainees in ICARDA's Group and Individual Training

Subject/Specialization	2000 - 2012
Crop improvement	1175
Genetic resources conservation and utilization	361
Biotechnology applications	537
Seed production systems	1910
Water and other natural resources management	1218
Agronomy and crop management	289
Livestock production & (forage, rangeland)	485
Protected agriculture	404
Socio-economics	471
Geographic Information System (GIS)/RS	138
Experimental station management	161
Statistics and other advanced tools	529
Communication and information technology	346
Others	230
Total	8254

The Grand total Number of Trainees since ICARDA was established in 1977: 18,044 Out of those 650 are Ph.D. and M.Sc. Degree Training

Linking Research with Development

Linking Research with Development to enhance impact



ICARDA

Approaches to Technology Transfer: Research for Development Continuum

- Poverty Mapping & Livelihoods Analysis to Target Research
- Integrated Research Sites as Platforms for Technology Transfer and Development
- Technology transfer through Researcher-Extension Agent-Farmer Linkages
- Studies Adoption of technologies and Impact Assessment
- Technology Transfer through Community Approach
- Farmer Participatory Approach

These are not mutually exclusive ..

ICARDA

Partnerships and Institutional Linkages

- **National Agricultural Research Systems**
- **CGIAR Centers**
- **Regional and International Organizations**
- **Advanced Research Institutes (ARIs)**
- **IFAD, FAO and Other UN Organizations**
- **Civil Society Organization, e.g. NGOs**
- **Private Sector**

ICARDA

Looking Ahead …….

ICARDA and the CGIAR Research Programs (CRPs)

ICARDA and CGIAR Research Programs

CRP1: Integrated agriculture systems for the poor and vulnerable
- CRP1.1 Integrated agricultural production systems for Improving Food Security and Livelihoods dryland systems (Lead by ICARDA)
- CRP1.2 Integrated agricultural production for tropical humid systems
- CRP1.3 Integrated coastal/aquatic systems

CRP2: Policies, institutions, and markets for enabling agricultural incomes for the poor

CRP3: Sustainable productivity increase for global food security
- CRP3.1 Wheat-based Rice-based production system
- CRP3.2 Maize-based production system
- CRP3.3 Rice-based production system
- CRP3.4 Roots and tubers, bananas and plantains
- CRP3.5 Pulses and legumes
- CRP3.6 Dryland Cereals
- CRP3.7 Livestock and fish

CRP4: Agriculture, nutrition and health

CRP5: Water, soils and ecosystems

CRP6: Forests and Trees

CRP7: Climate Change

- **Lead**
- **Member**

CRP1.1: Integrated Agricultural Production Systems for Improving Food Security and Improving Livelihoods in Dry Areas

Objectives:

- Sustainable productivity growth and intensified production systems at the farm and landscape levels;
- More resilient dryland agro-ecosystems that can cope with climate variation and change;
- Less vulnerable and improved rural livelihoods ;
- Agricultural innovations systems that improve the impact of research and development investments.

CRP1.1: Integrated Agricultural Production Systems for Improving Food Security and Livelihoods Dry Areas *(cont'd)*

Two main target agro-ecosystems:

- Most vulnerable systems;
- Systems with the greatest potential for impact.

Geographical Regions:

1. West African Sahel & Dry Savanna;
2. Eastern & Southern Africa;
3. North Africa & West Asia;
4. Central Asia;
5. South Asia.

CRP1.1: Integrated Agricultural Systems for Improving Food Security and livelihoods in Dry Areas

- Integrated agro-ecosystems approach to:
  - natural resource management;
  - risk management & adaptation to climate change ;
  - crop, livestock, tree and fish production systems;
  - enabling policy and institutional support;
- Demand driven, participatory and community-based approaches;
- Benchmark sites and pilot locations linked to other CRPs as platforms for up scaling;
- Research on effective partnership strategies for linking research with development.

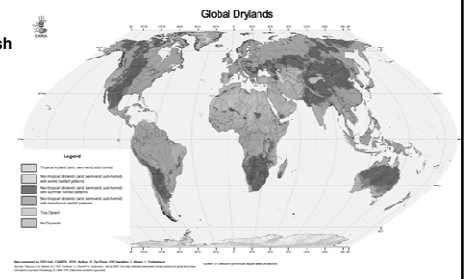
Global partners in the design & development of CRP1.1 (7 Stakeholder Workshops)

International centers

- **ICARDA** **Bioversity** **FAO** **ILRI** **WorldFish**
- **ICRISAT** **CIAT** **ICBA** **IWMI**
- AVRDC CIP ICRAF SSA-CP

Global and Regional Fora

- AARINENA CACAARI FORAGRO
- ASARECA CORAF/WECARD GFAR
- APAARI FARA



National Research Institutions

- Afghanistan: MAIL
- Bangladesh: BARI
- Brazil: EMBRAPA
- Burkina Faso: INERA
- China: CAAS
- Egypt: ARC
- Ethiopia: EIAR, Arba Minch University
- France: CIRAD
- Ghana: ARI, CSIR
- India: ICAR, CRIDA, CAZRI, FES, NRAA, Watershed Organization Trust
- Iran: AREEO
- Jordan: NCARE
- Kazakhstan: South-Western Scientific Production Center of Agriculture
- Kenya: KARI
- Mali: INSAH/CILSS
- Morocco: INRA
- Niger: INRAN
- Nigeria: ARC
- Pakistan: BARI, CSO, PARC, SSD
- South Africa: CSIR, Univ. of Ft Hare, WRC
- Sudan: ARC
- Syria: GCSAR, Agha Khan Foundation
- Tajikistan: TAAS
- Tunisia: IRA
- Turkmenistan: National Farmers' Association, NAS
- Turkey: AARI
- USA: USDA
- Uzbekistan: Kashkadarya Research Institute
- Zambia: University of Zambia

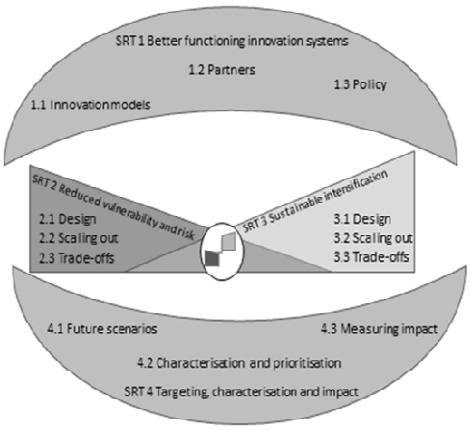
Overview of CRP1.1: Strategic Research Themes (SRTs) and their outputs

***SRT1**: Approaches and models for strengthening innovation systems, building stakeholder innovation capacity, and linking knowledge to policy action*

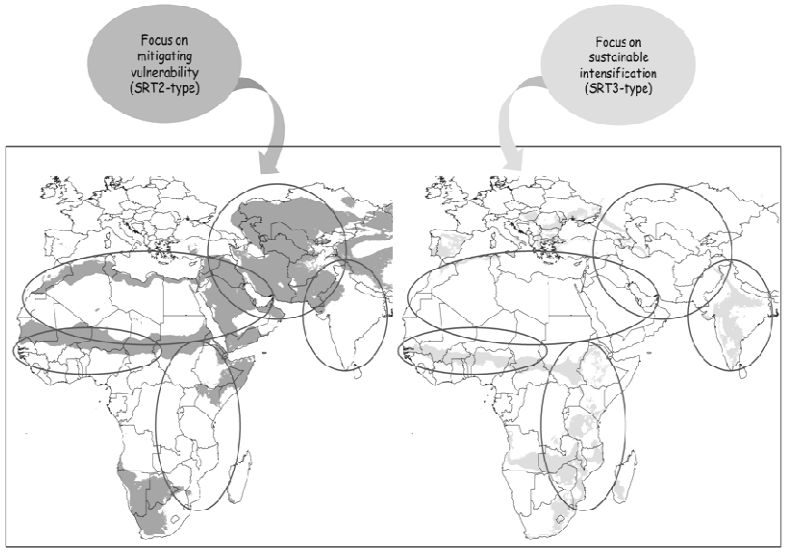
***SRT2**: Reducing vulnerability and managing risk*

***SRT3**: Sustainable intensification for more productive, profitable and diversified dryland agriculture with well-established linkages to markets*

***SRT4**: Measuring impacts and cross-regional synthesis*



CRP1.1 / Dryland Systems: Selection of action sites & benchmark areas



FAO ICARDA Collaboration

2005 - 2012

Areas of Collaboration between FAO and ICARDA

- **Germplasm Improvement**
- **Seed Production**
- **Natural Resources Management**
- **Genetic Resources Conservation**
- **Human Capacity Development**
- **Information Management**
- **Livestock**
- **Integrated Farming Systems**

FAO- ICARDA Collaboration (2005-2012): Germplasm Improvement

- On-farm Conservation and Mining of Local Durum and Bread Wheat Landraces of Morocco for Biotic Stresses and Incorporating Ug99 Stem Rust Resistance.
- Expert Group Meeting on Harnessing Biotechnology and Genetic Engineering for Agricultural Development
- Organization of the "Assessment and design strategies to strengthen national plant breeding and biotechnology workshop"
- Follow-up activities for the development of IPM strategies for Sunn Pest

FAO- ICARDA Collaboration (2005-2012): Germplasm Improvement

- Support for the organization of the 10th International Barley Genetics Symposium
-
- Expert Group Meeting on Harnessing Biotechnology and Genetic Engineering for Agricultural Development
- Regional Workshop on Biosafety Assessment of genetically modified (GM) crops
- Support of the organization of the First Central Asia and Caucasus Barley Improvement Workshop
-
- Wheat Stem Rust Surveillance and Monitoring

FAO- ICARDA Collaboration (2005-2012): Germplasm Improvement

- **Workshop on Bio-safety regulations regarding genetically modified organisms in Arab countries**
- **Bio-safety regulations regarding genetically modified organisms in Arab countries**
- **Building Consensus for Strengthening Biosafety Capacity in the WANA Sub-region**
- **Wheat Rust Assessment: Impact assessment of wheat rust**

FAO- ICARDA Collaboration (2005-2012): Germplasm Improvement

- **Improved preparedness and response capacities in countries affected by a new virulent strains of the stem rust (Ug99) and yellow rust (Yr27 virulence)**
- **Wheat Rust Assessment: Wheat rust surveillance capacities**

Undertake an impact assessment of the effects of wheat diseases, with emphasis on rusts, livelihood and farming practices of small-scale wheat farmers and analyze the effectiveness of national policies, regulatory frameworks and programs including services provided by the extension and seed sectors in support of the livelihood of these wheat producers.

The impact assessment study conducted in representative countries that are affected by Ug99 or by major yellow rust epidemics, namely Azerbaijan, Iran, and Yemen.

- **Reducing risks of wheat rusts threatening livelihood of resource-poor farmers**

1. Training/Workshop on Wheat rust
2. GPS regional training course for Cereal Rust Monitoring Central Asia and Caucasus

FAO- ICARDA Collaboration (2005-2012): Germplasm Improvement

- **Support of conducting a field assessment of wheat pests**

1. Collect available information
2. Meet with national counterparts and organize field visits to major wheat growing region, to assess the status of sum pest and other main pests, and identify specific conditions of wheat growing, pest spread and management

- **Establishment of effective monitoring and early warning system for wheat rust diseases in the project countries**

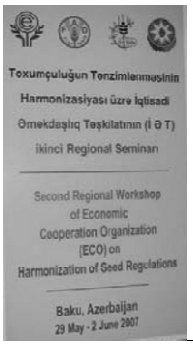
1. Training in wheat rust race analysis
2. Training in the establishment and assessment of trap nurseries and provision of seeds of differential wheat varieties
3. National field days in selected countries
4. Field validation of wheat distribution by Geographic Information System (GIS) maps.
5. Training in wheat rust race analysis organized at the Recipient Organization's headquarters

FAO and ICARDA collaboration in Seed Delivery Systems

Strengthening Seed Supply in the ECO Region

Harmonization of regulatory framework for ECO member countries on:

- Variety release mechanism
- Seed certification scheme
- Sanitary and phytosanitary measures



Strengthening Seed Supply in the ECO region (cont'd)

Capacity strengthening on seed marketing, key issues:

- Overview of the seed sector and key problems of seed marketing
- Country presentations focusing on the status of the seed industry and seed marketing
- Roundtable discussions on seed marketing problems and issues
- Discussion by participants on key issues raised
- Market research by the seed enterprise
- Seed industry development
- Development of a marketing plan
- Seed marketing and the private sector in Turkey.
- Business planning for seed enterprises
- Business planning: exercises and discussion points
- Seed pricing structure and costing
- Seed distribution systems
- Financial analysis and planning
- Promotional activities and materials

Strengthening seed supply in the ECO region (cont'd)

Establishment of Regional Seed Association

In 2009, ECOSA (ECO Seed Association) was officially established by national seed associations and seed companies. A yearly regional seed congress is initiated in 2009 to serve as a regional forum.

FAO Expert Consultation on Seed Policy Formulation

Points of focus:

- Seed policy issues
- Seed policy contents
- Seed policy formulation
- Seed policy implementation

Workshop on Seed Policy in the ECO Region

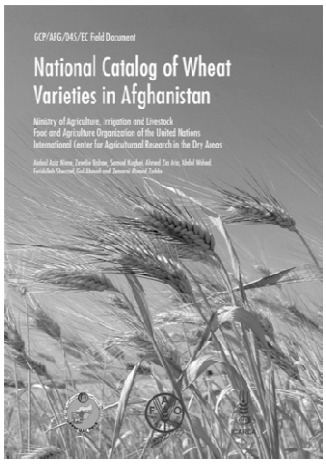
Summary of outputs:

- Providing a long-term vision and framework for the development of the seed sector
- Harmonization of seed policy and action plan with other strategic documents
- Improving the quality, choice and security of seed supply to farmers in all parts of the country
- Defining the roles of the public and private sectors, and facilitating coordination
- Clarifying the relationship between the seed policy and existing/proposed laws for seeds and varieties
- Consultation among stakeholders
- Embracing all components of the seed system

Establishing variety registration system

Collaborative seed project components

- **Three institutions worked together to establish a mechanism for conducting variety registration system.**
- **Teams of national experts working with the project in different locations and trained by FAO**



Human Resources Capacity Development (cont'd)

Training in variety description and maintenance

- Procedures for maintaining varieties and for the production of breeder and foundation seed of the target crops like cereals and legumes.
- Familiarize and provide training about the theoretical and practical aspects of the variety maintenance training program and seed activities at ICARDA.
- Implement maintenance methods and procedures for the wheat and barley varieties adapted to the Iraqi agro-ecological conditions and assist to develop varietal catalogue for varieties suitable for Iraq.
- Assist in developing procedures, formats, work routines and guidelines related to maintenance of genetic purity of breeder and foundation seed.
- Identify equipment and facilities required for maintaining breeder and foundation seed.

FAO- ICARDA Collaboration (2005-2012): Seed Production

Consultancy for training in testing Value in Cultivation and Use (VCU) and Distinctness, Uniformity and Stability (DUS) in Afghanistan

1. **Train seed certification officers in organization trial systems for official testing of new varieties**
2. **Provide training in morphological variety description**
3. **Provide training in field inspection**
4. **Prepare hands-on manual and post control plot testing**
5. **Collect information pertaining to wheat varieties in Afghanistan**
6. **Discuss draft catalogues with farmers, project staff, and research institutions**
7. **Supervise an Afghan counterpart registered for MSc in agronomy**

Consultancy for training in testing Value in Cultivation and Use (VCU) and Distinctness, Uniformity and Stability (DUS) in Afghanistan

1. **Provide training in morphological variety description for major seed crops**
2. **Discuss final draft catalogues with farmers, project staff and research institutions both national and international**

FAO- ICARDA Collaboration (2005-2012): Natural Resources Management

- Applied research on "Appropriate methods of restoration ecology"
- Joint Workshop on Impact Indicators of the Soil and Water Conservation and Water Harvesting Works
- Integrated Water Resources Management Workshop

FAO- ICARDA Collaboration (2005-2012): Genetic Resources Conservation

- Support of the preparation of the Second State of the World's Plant Genetic Resources for Food and Agriculture
- Organization of the West Asia and Arabian Peninsula Workshop on Technical Support to the International Treaty on Plant Genetic Resources for Food and Agriculture (PGRFA)
- Workshop on Gene Bank Development for the Conservation of Animal Genetic Resources
- Implementation of National Studies for Georgia and Armenia on Elements of a National Integrated Strategy for Plant Genetic Resources Management and Use

FAO- ICARDA Collaboration (2005-2012): Human Capacity Development

- Regional Meeting on Need Assessment for Agricultural Research for Development
- Study Tour for Iraqi Senior Officials under the Project on "Rehabilitation and Development of the National Seed Industry
- Support in conducting extensive training workshops Development of a Vegetable Seed Production Program

Human Capacity Development (cont'd)

- Workshop on the Methods of Negotiation in Tunis;
- Training Courses on Farmer Field Schools (FFS) and Integrated Pest Management (IPM).
- Training of Trainers courses to create the capacity to implement FFS on wheat IPM
- Training on *Orobanche* Weed Management in Leguminous Crops;
- Training on GMO Detection and Biosafety;
- Participants from member countries in Lebanon, Syria, Jordan, Sudan, D.A.E. and Yemen.

Human Capacity Development (cont'd)

- **Training course on Potato Tissue Culture**
- **Training course on Olive Production and Processing**
- **Variety Maintenance Training**
- **Training course under the Project OSRO/IRQ/602/UDG**

Human Capacity Development (cont'd)

- **Project OSRO/IRQ/501/UDG Training on the use of insect-killing fungi for the management of pests**

1. Isolation of Entomopathogenic Fungi (EPF) from infected insects.
2. Harvesting fungi
3. Mass production of EPF on grains
4. Long term storage of EPF.
5. Formulation and field application of Beauveria finish product.
6. Cleaning Isolates with mixed fungi in the culture.
7. Sterile Media preparation

- **Training of Iraqi Nationals under project TCP/IRQ/0167**
- **Organization and delivery of the training program on variety verification and GMO identification**

FAO- ICARDA Collaboration (2005-2012): Integrated Farming Systems

- **Applied research component of project GCP/PAK/095/USA Food Security/Poverty Alleviation in Arid Agriculture Baluchistan- Pilot Project**;
- **Applied research to focus on appropriate methods of stand establishment under rainfed conditions of key forage species for Syria and KSA;**
- **Focus on appropriate methods of crop stand establishment under rainfed condition;**
- **Workshop on Animal Identification, Traceability and Performance Recording;**
- **GIS Tools for Practical Application of Production Environment Descriptors (PEDs) for Animal Genetic Resources.**

FAO- ICARDA Collaboration (2005-2012): Integrated Farming Systems

- Organization of a working group on on-farm research on wheat-based systems in North Africa;
- Development of spatial interpolation software to create agro-climatic/rainfall surfaces;
- FAO Support for the International Conference on Food Security and Climate Change in Dry Areas;
- Organization and preparation of the CACTUSNET Newsletter/Proceedings of the Workshop on *Improved utilization of cactus pear for food, feed, soil and water conservation and other products in Africa.*

FAO- ICARDA Collaboration (2005-2012): Integrated Farming Systems

- Sustainable agriculture practices in the drought affected region of Karakalpakstan, Uzbekistan
- 2nd phase of TCP on Sustainable agriculture practices in the drought affected region of Karakalpakstan, Uzbekistan
- Oat and Vetch Network for the Maghreb Countries (REMAV) 2006 meeting
- Organization and preparation for the Seventh General Meeting of the FAO-ICARDA International Technical Cooperation Network on Cactus Pear and Cochinea

FAO- ICARDA Collaboration (2005-2012): Information Management

- Arabic-language publication of The State of the World's Animal Genetic Resources for Food and Agriculture;
- Preparation of the Proceedings of the International Sunn Pest Conference;
- Assessment of information and communication needs to institutions and stakeholders;
- Preparation of the Syrian Land and Water Information System (SYLWIS);
- Preparation of one issue of the International Technical Cooperation Network on Cactus Pear (CACTUSNET);
- Producing a manual on Conservation Agriculture in Uzbekistan

On-going Collaborative Activities

- FAO Support to the International Wheat Stripe Rust Symposium and Rgional Rust Surveillance Workshop;
- Strengthening National Programs on Disease Management Cereal Pathology Component & Wheat Rust Component;
- Strengthen national program capacity on disease management to include surveillance systems, farm seed multiplication systems, and organization of farmer field days to raise awareness among farming communities;
- National Catalogue of Wheat Varieties in the Islamic Republic of Afghanistan;
- To publish a national catalogue of wheat varieties in Afghanistan in which ICARDA is responsible for copyediting and typesetting the work, including the preparation of final files for print and electronic dissemination;
- Support in conducting FAO/ICARDA Regional Training Workshop on Sustainable Crop Production and Conservation Agriculture

On-going Collaborative Activities

- Conservation Agriculture for the Irrigated Areas in Azerbaijan, Kazakhstan, Uzbekistan and Turkmenistan
- Regional Consultation Meeting for North Africa, Near East, and Central Asia
  - Support of the participation of 28 official country representatives in the regional consultation for North Africa, Near East and Central Asia with the purpose of gathering inputs for the preparation of the first draft of the updated Global Plan of Action.
- FAO co-sponsored the International Conference on Food security and Climate Change in the Dry Area that was held in Amman, Jordan
- Regional project on IPM and farmers field school, implemented in Iraq in cooperation with ICARDA/IFAD project on IPM and Organic Farming.

Suggested Areas for Future Collaboration Between FAO and ICARDA

Suggested Areas for Future Collaboration

Discussions with Sub-Regional Office in Ankara a few strategic collaborative issues

- Conservation agriculture
- Plant genetic resources and germplasm enhancement
- Sustainable land management in the framework of CACILM II in Central Asia and the Caucasus
- Forestry

- Rangeland: Discussions with FAO Near East Forest Commission

Proposed Areas for Cooperation

Discussions with FAO-RNE, Cairo Office

- Diversification and sustainable intensification of production systems
- Livestock production and animal health
- Conservation and development of animal and plant genetic resources (regional issues)
- Designing community breeding programs for adapted small ruminant breeds;
- Adaptation of agriculture to climate change and contribution to mitigation
- Integrated land and water resources management
- Sustainable management and improvement of rangelands
- Risk mapping (disease and drought), early warning, and livestock insurance for the Near East
- Capacity building programs
- Emerging issues such as soaring food prices, climate change/drought, disease threats (e.g. Ug99, Rift Valley Fever, etc)
- Regional joint ventures, sharing ideas, activities, workshops, networks (e.g. AARINENA, NERAKIN) and commissions (e.g. ALAWUC, NEFC,

Summary of Major Areas for Future Collaboration between FAO and ICARDA

- **Food Security**
- **Adaptations to climate change,**
- **Plant genetic resources;**
- **Small Ruminant (sheep and goats) genetic resources;**
- **Seeds production, seed technology and seed policy**
- **Capacity Development**
  - Short- and long-term training program
  - Support for degree training
  - Young agricultural scientist program
  - Farmer field schools

THANK YOU