



ICARDA'S Strategy and Contribution to Enhance Food Security and Improve Livelihoods in Dry Areas

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**Sharing Knowledge Across the Mediterranean
1-3 March 2010 JORDAN**

International Center for Agricultural Research in the Dry Areas



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Outline



- Constraints leading to food insecurity and poverty in Dry Areas.
- What can make a difference?
- ICARDA Strategic Plan 2007-2016: Agricultural Research for Development in Dry Areas.
- Technologies towards food security & better livelihoods
- Approach for technology transfer
- Technology impact



**Constraints leading to Food Insecurity
and poverty in dry areas**

Predominance of Dry Areas



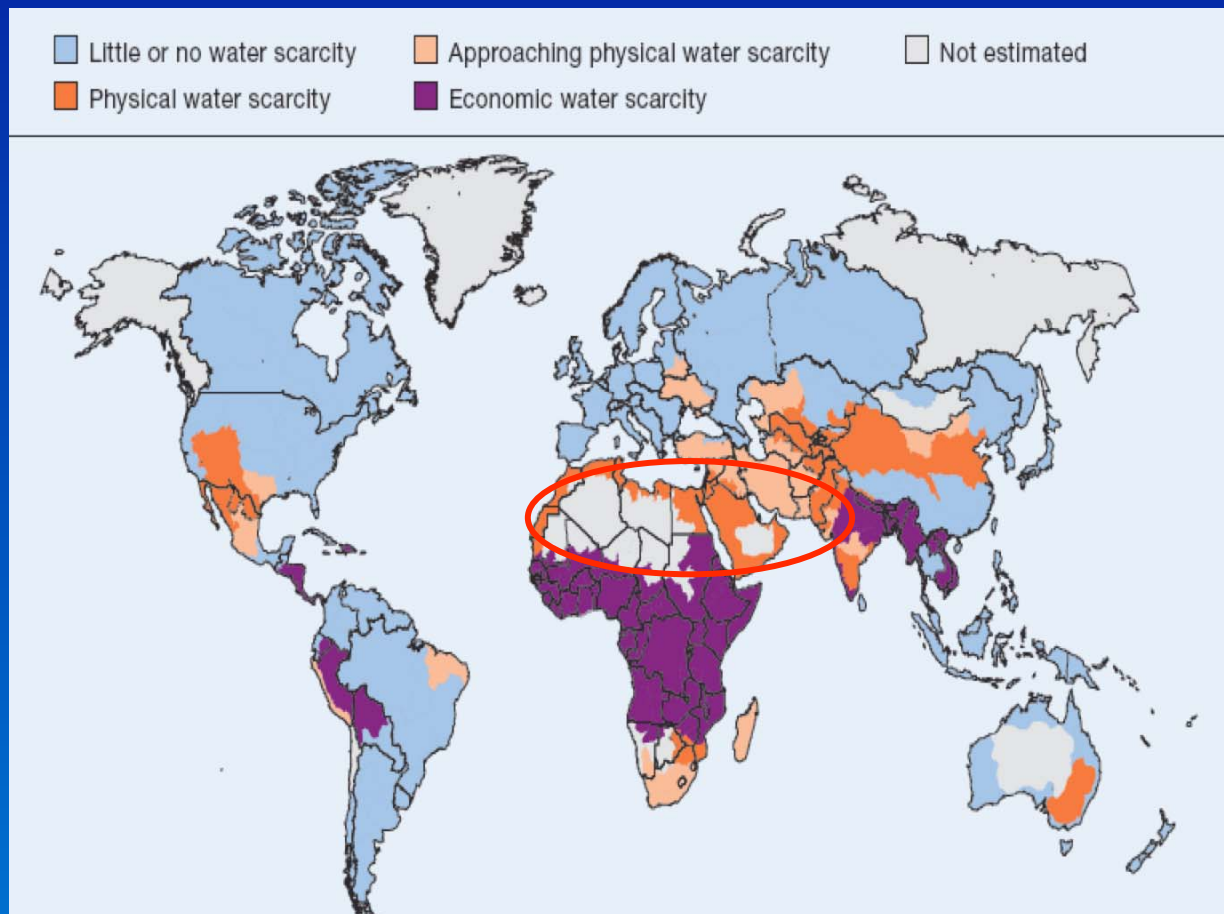
Dry areas cover 41% of the earth's surface, and are home to over 1.7 billion people – and the majority of the world's poor. About 16% of the population lives in chronic poverty, particularly in marginal rainfed areas.



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The Dry Areas Of NENA Region: Fragile Eco-systems

- Physical water scarcity
- Rapid natural resource degradation and desertification
- Groundwater depletion
- Drought
- Climate change will make it drier



Climate Change Severest Impact: Near East, North & Sub-Saharan Africa

Major threats

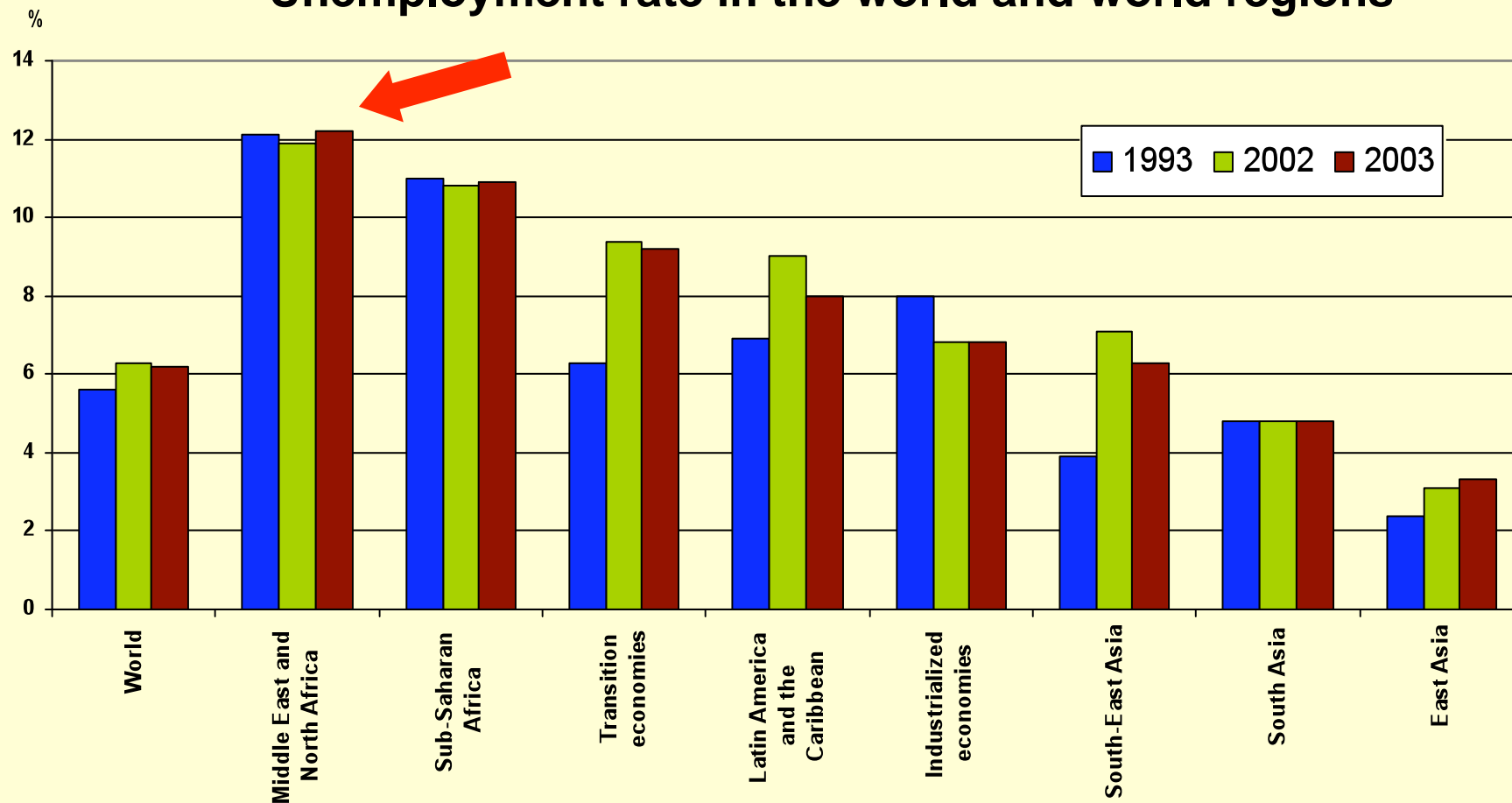
- Temperature extremes – both heat and cold
- Water scarcity
- Loss of agro-biodiversity through habitat loss
- Increased vulnerability of pastoralists
- Smaller and more erratic harvests

Further Challenges towards Food Security

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

High Level of Unemployment

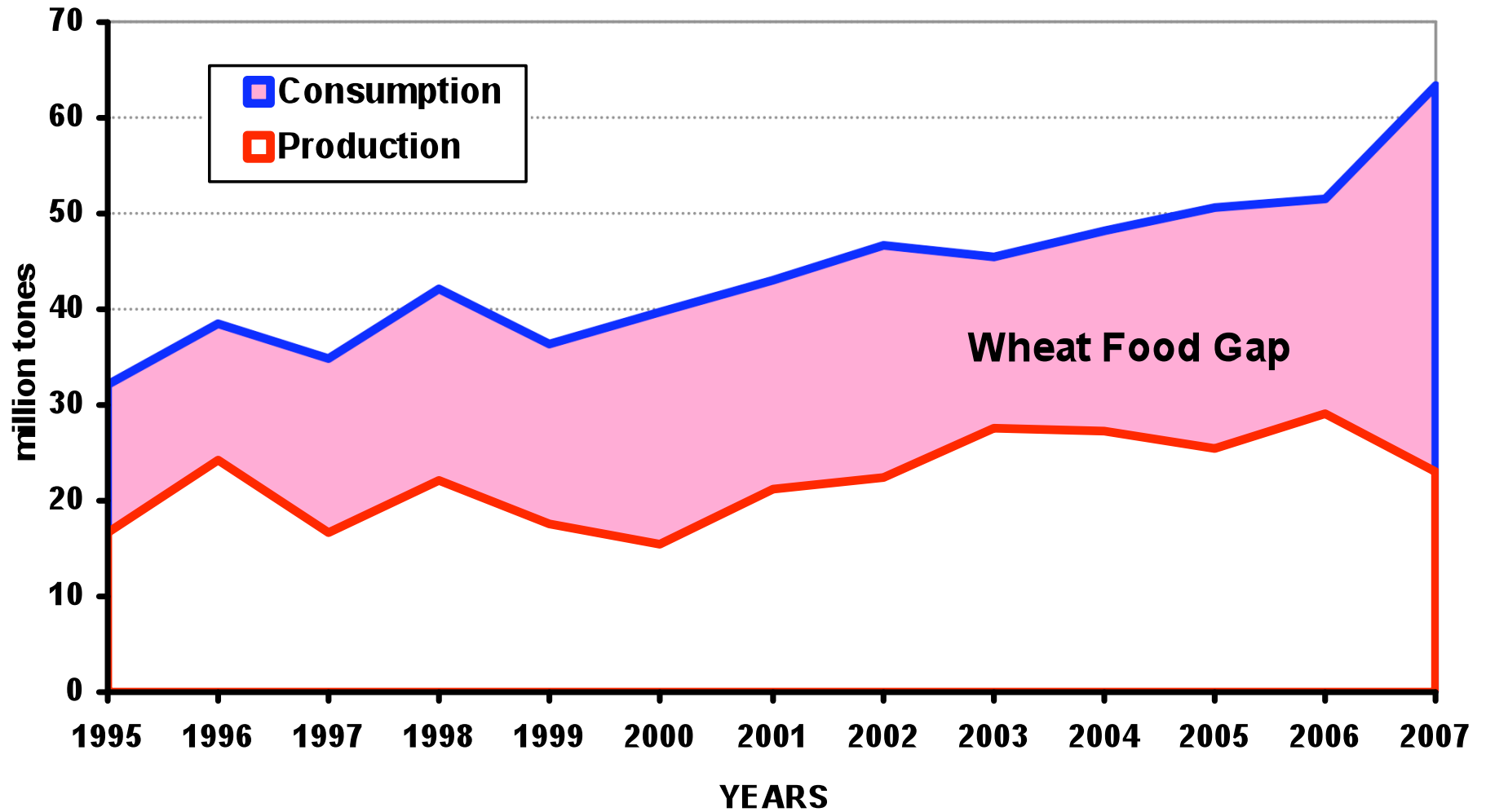
Unemployment rate in the world and world regions



Source: World Employment Report 2004-05: Employment, productivity and poverty reduction. ILO, December 2004.

Widening Food Gap in Arab Countries

Production and consumption of wheat in Arab countries



Food Security: What Can Make the Difference?

- Enabling policy and political will
- Advances in S & T
- Integrated approaches and better NRM for economic growth
- Sustainable intensification of production systems
- Public awareness of the long term benefits of conservation technologies
- Capacity development & institutional support
- Partnerships



**Agricultural
Research for
Development
in Dry Areas**

**Improving Livelihoods
in Dry Areas**

Strategic Plan 2007–2016



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The CGIAR Centers



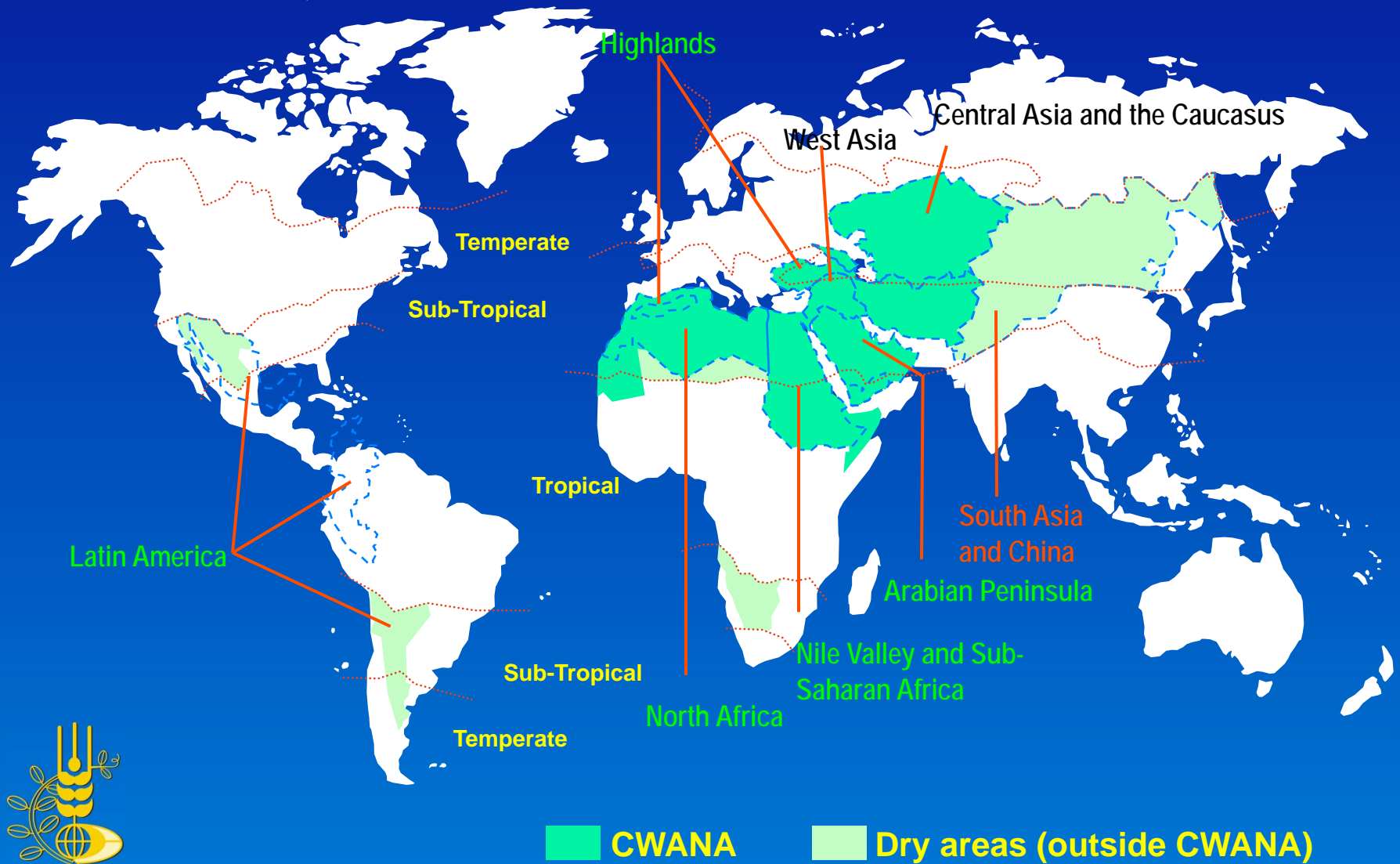
Strategy Emphasis

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
- Increased global coverage (Sub-Saharan Africa, South Asia, China, and Latin America)



ICARDA's Outreach Programs: Center without Walls



ICARDA Vision

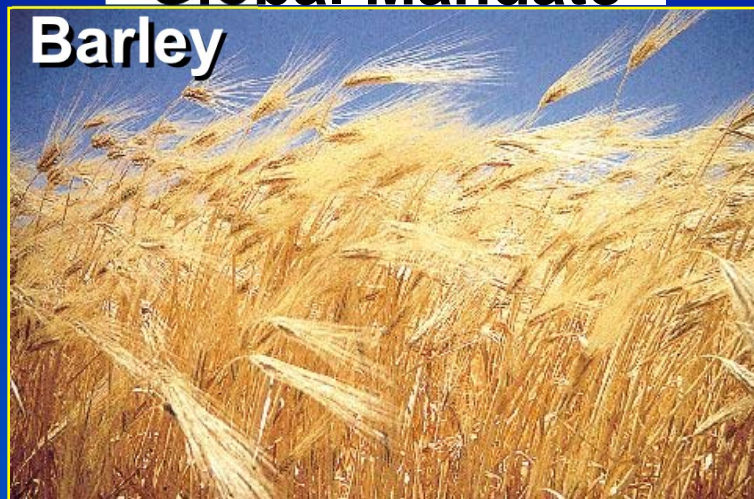
Improved livelihoods of the resource-poor in dry areas



Technical Mandate: Cereal Improvement

Global Mandate

Barley



Regional Mandate

Bread Wheat



Durum Wheat



Technical Mandate (cont'd): Food Legume Improvement

Global Mandate



Lentil



Faba bean



Kabuli Chickpea



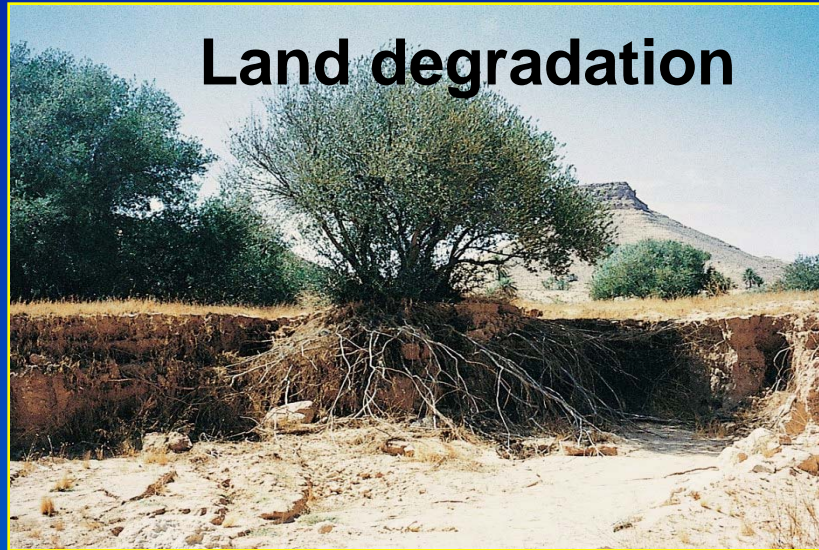
Grass pea

Technical Mandate (cont'd): Natural Resource Management in Non-Tropical Dry Areas

Water use efficiency



Land degradation



Range improvement

Small ruminant nutrition

Forage Legumes



ICARDA's Major Research Programs

**Biodiversity and
Integrated Gene
Management**

**Integrated
Water and
Land
Management**

**Diversification
and Sustainable
Intensification
of Production
Systems**

**Social,
Economic and
Policy Research**



Helping farmers to cope with climate change

Adaptation - Mitigation - Resilience

- Enhance crop adaptation through tolerance to drought, extreme temperatures & salinity
- Improve resilience of farming systems
- Risk management & adaptive capacity of rural communities
- Enabling policies

Research Outputs & Technologies towards food security & better livelihoods

Improved Varieties



ICARDA Gene Bank: germplasm collected (Apr 2009)

Crop	Number of Accessions	
	2007- 2009	1977-2009
Barley	489	24,823
Wheat	658	33,639
Wild cereals	38	7,300
Forage legumes	0	28,330
Food legumes	292	32,456
Wild food legumes	0	851
Forage and range	0	5,666
Total	1,477	133,065

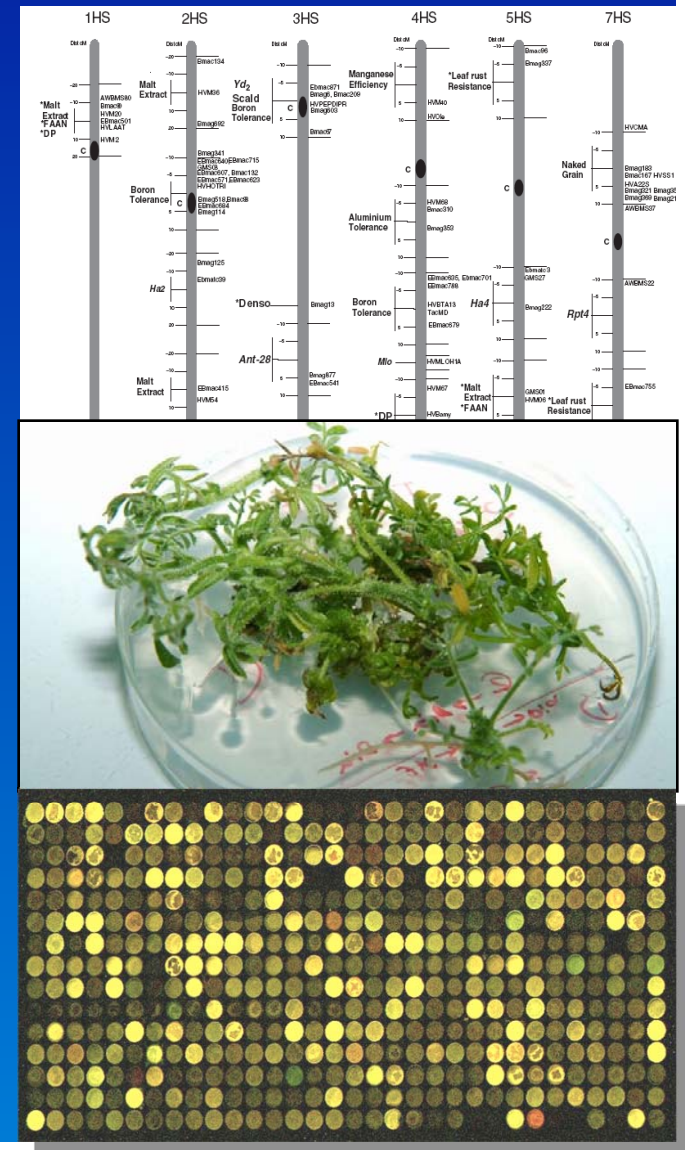


Conventional Plant Breeding



Biotechnology Tools

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



Crop Improvement: Varieties Released using ICARDA Germplasm Worldwide, 1977 to 2008

Crop	1977 - 2008		Last 2 years
	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	24
Total	901		37



NET ESTIMATED BENEFIT = about US \$850 m / year

Heat-Tolerant Wheat in Sudan



Resistance/Tolerance to Hessian Fly in Morocco



Hessian Fly Resistant



Black Stem Rust (Ug99) Resistant Wheat Lines Released in Ethiopia

1) Bakalcha

(Gedifla/Gerrou1: ICD 91-0980-AB-5AP-0TR-2AP-0TR)

2) Malefia (Ug99 Resis)

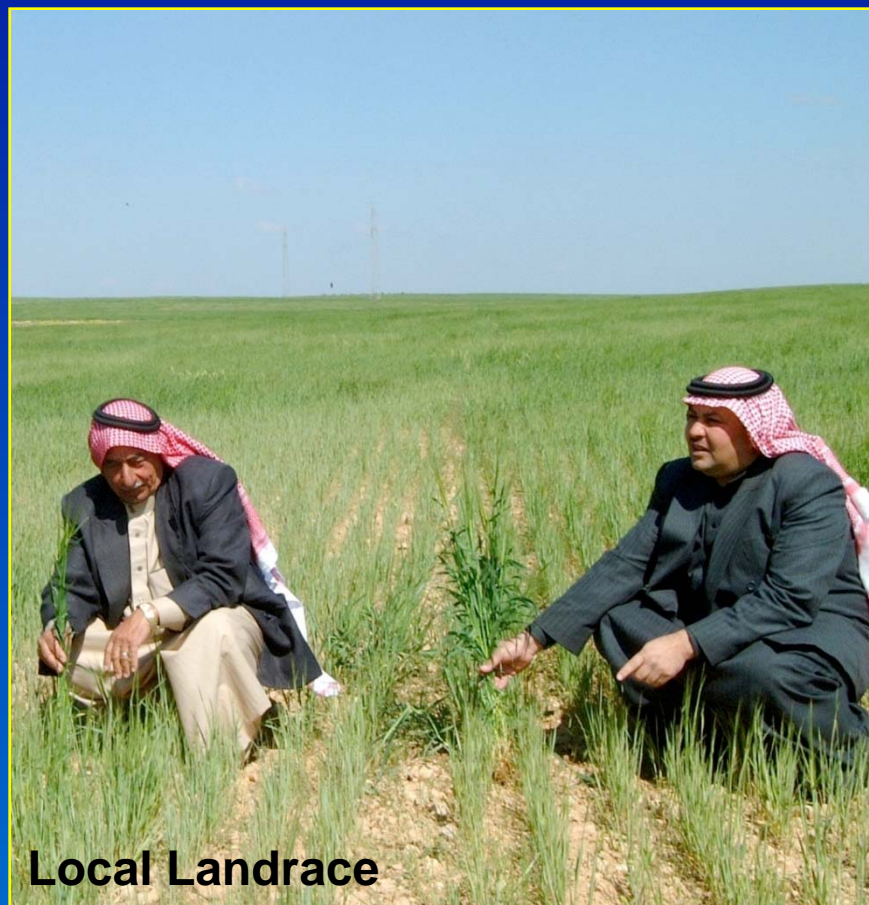
(Aghrass= ICD 92-MABL-0237-5TR-OAP-4AP-OTR).



Nachit 2008

On-going Seed multiplications of resistant varieties in Egypt, Pakistan Afghanistan

Barley for Excessive Drought in Syria



Local Landrace

“Zahra” versus local landrace (139 mm rainfall)

Chickpea Winter Sowing



Informal Seed Sector: Village-Based Seed Enterprises (VBSE)



VBSE: Afghanistan (17), Egypt (2), Eritrea (1), Pakistan (4)

IPM of Sunn Pest in Wheat



Wheat infested by Sunn pest

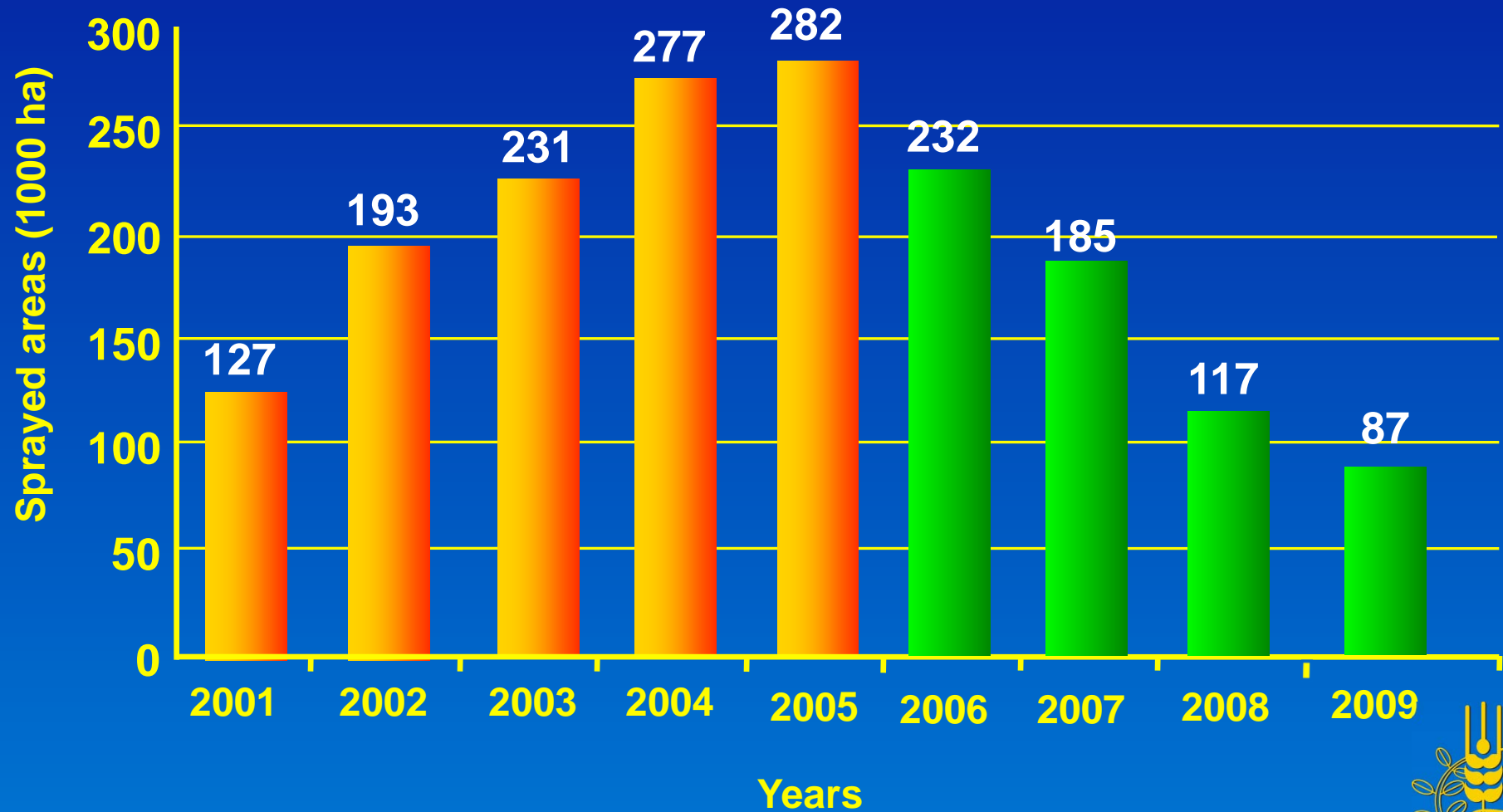


Predators of Sunn pest eggs



Sunn pest killed by Fungi isolate

Evolution of Sprayed Areas against Sunn Pest in Syria

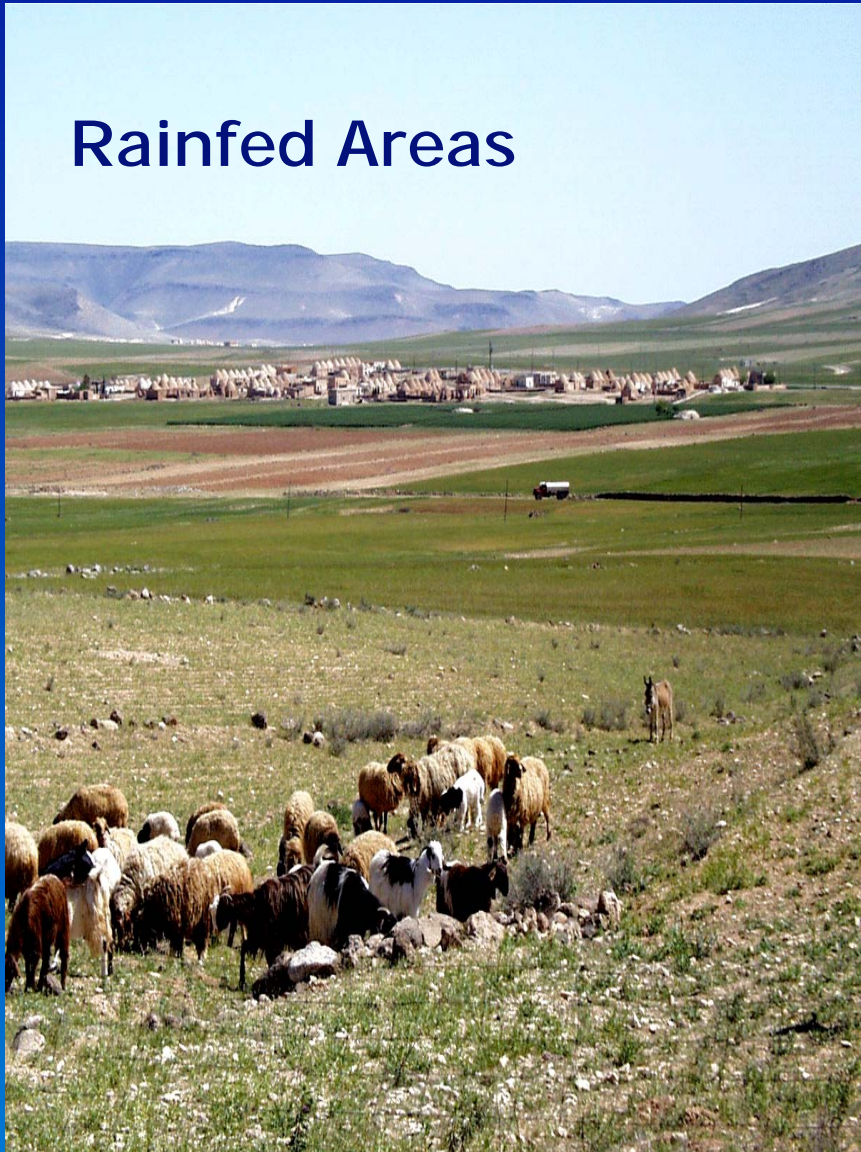


Benchmark Sites for Integrated Water Management



Implementation in Three Agro-Ecologies

Rainfed Areas



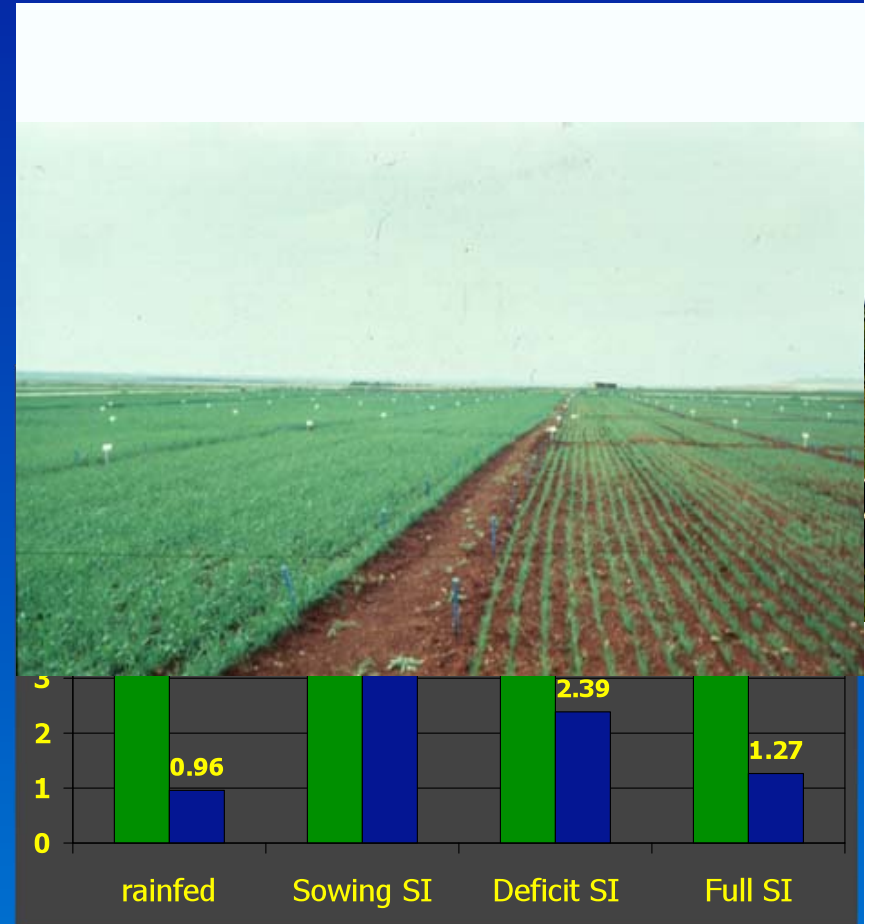
Irrigated Areas



Marginal Lands

Rainfed Agro-Ecosystems

- Supplemental Irrigation
- Early sowing
- Deficit irrigation



Irrigated Agro-Ecosystem

- Increasing water productivity/income
- Management of saline water and soils
- Policies and institutions
- Modifying cropping patterns

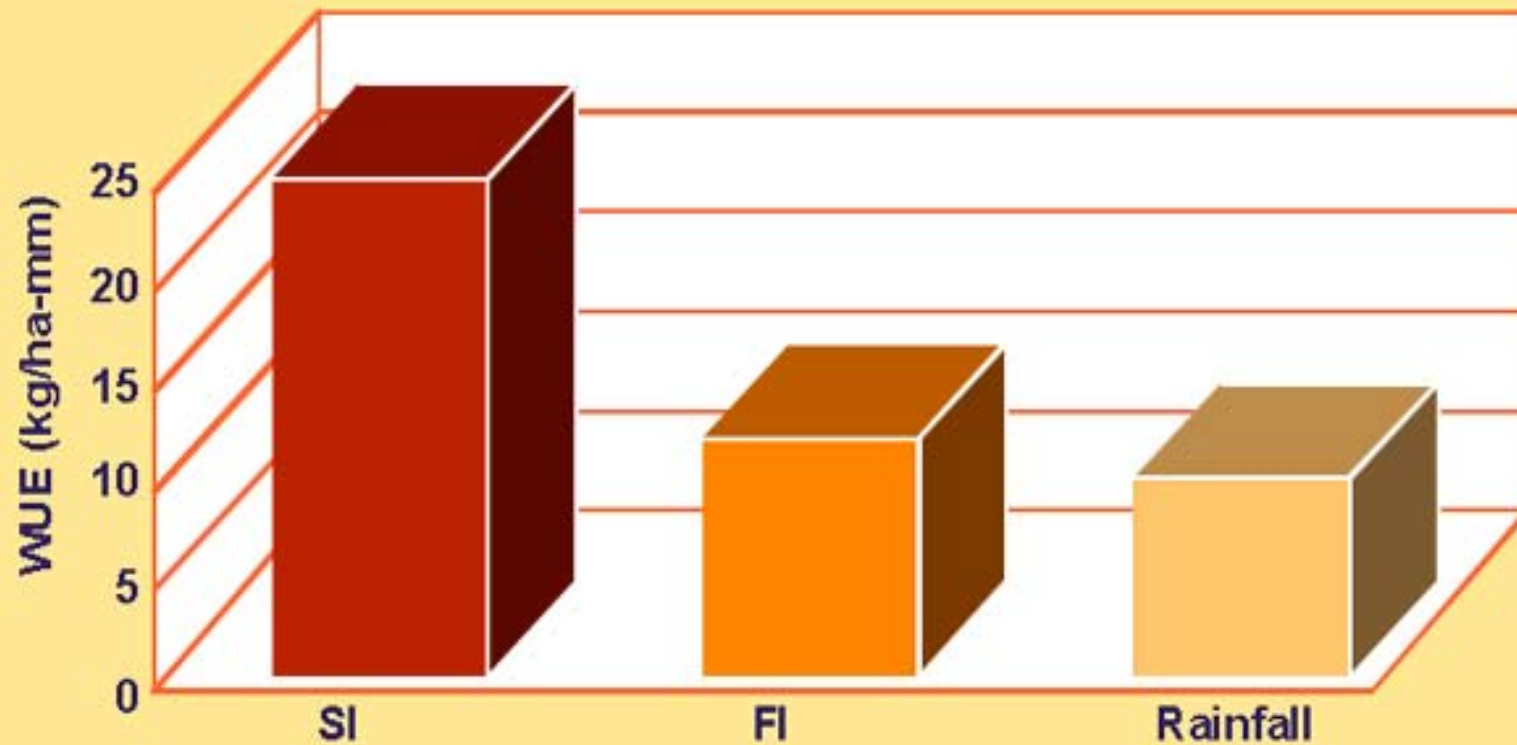


Marginal Land (Badia) Agro-Ecosystem

- Water harvesting technologies
- Micro-catchments mechanized contour using laser
- Effective water harvesting
- Grazing management
- 40-50% increase in rainwater production



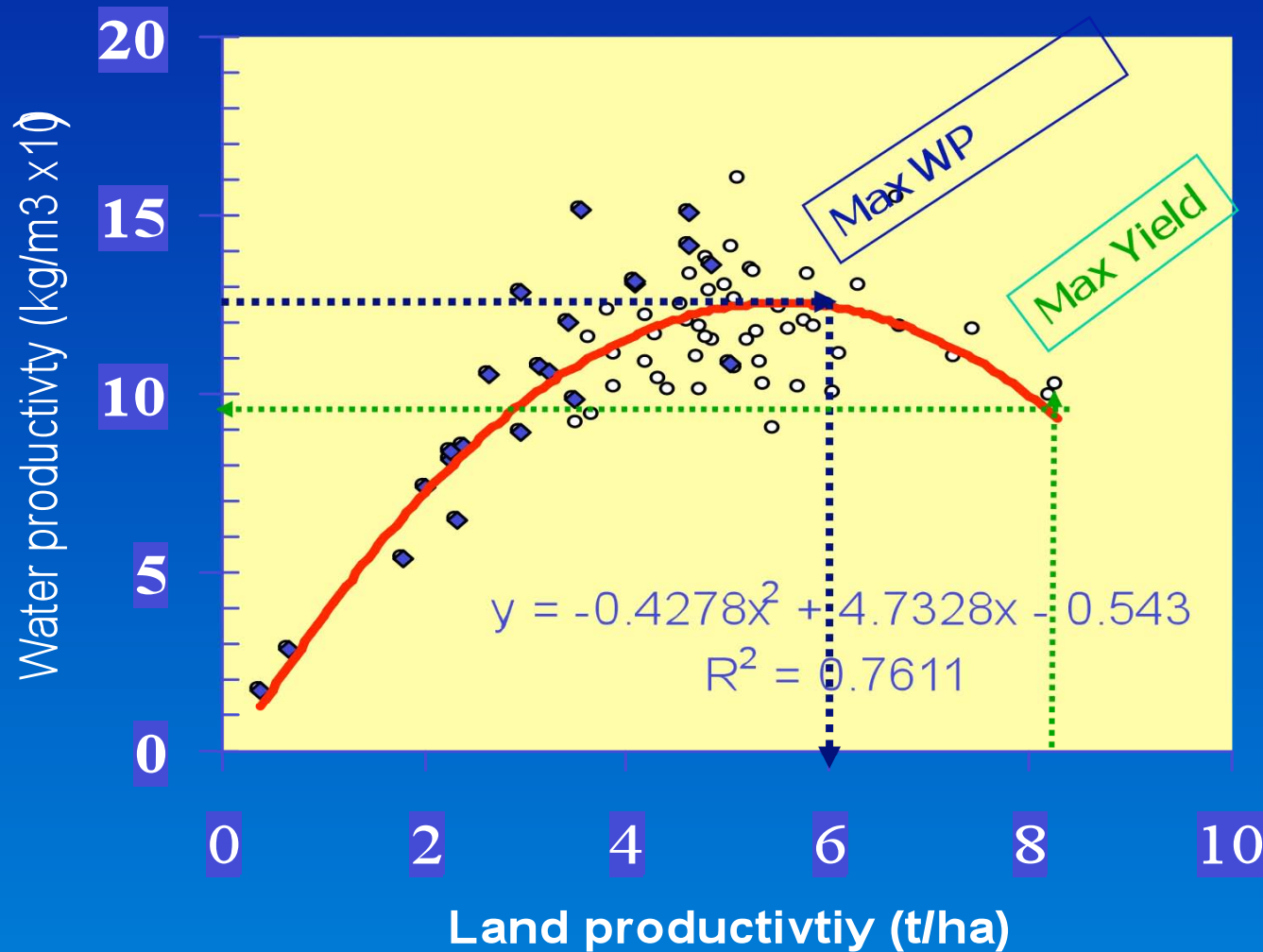
Potential of WUE: Supplemental Irrigation (SI), Rainfed and Fully Irrigated (FI) Areas



WUE: Water Use Efficiency

Tradeoffs between Water & Land Productivity - Deficit Irrigation

Water productivity can be Increased Substantially
Water, not Land, is the Limiting Resource



Risk Management with Climate Change:

Diversification of Production Systems with High Value Crops

- Dryland Fruit Trees
- Protected Agriculture
- Herbal, Medicinal and Aromatic Plants



Research Outputs & Technologies towards food security & better livelihoods

Geographic Information System (GIS)

- Land use mapping to promote diversification of production systems
- Maps for potential areas for water harvesting
- Maps for potential areas for de-rocking

Conservation Agriculture: Approach to Cope with Climate Change



Benefits of ZT

- 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 seeders - price
≈ \$1400

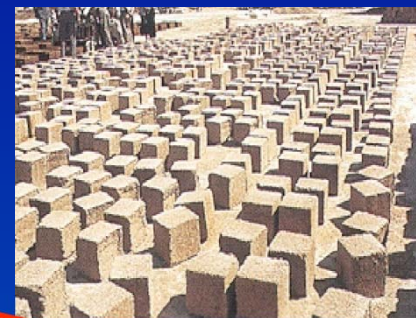


Ecosystem Resilience: Integrated Crop/Rangeland/Livestock Production Systems



On-farm Feed Production

Successful Technologies



By-products Feed Blocks



Barley Production



Flock management



Cactus & Fodder Shrubs



Value Added Activities



Natural Pastures Enhancement & Rangeland Management



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Approaches & Mechanisms for Technology Transfer:

- **Researcher-Extension Agent-Farmer Traditional Approach**
- **Integrated Research Sites as Platforms for Technology Transfer and development**
- **Community Approach**
- **Participatory Approach**
- **Poverty Mapping & Livelihoods Analysis**
- **Value Chain**
- **Adoption and Impact Assessment**

Not mutually exclusive ..



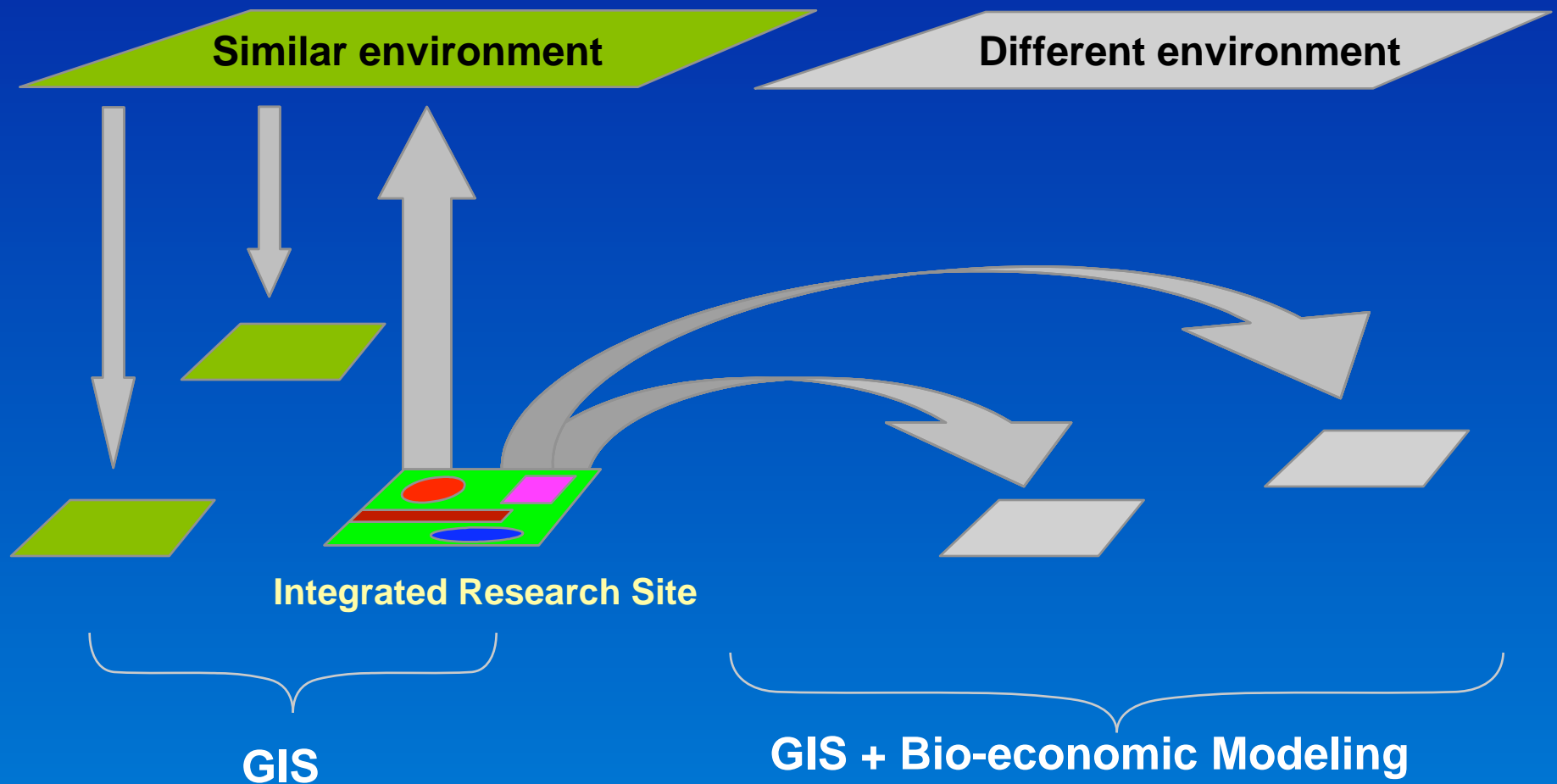
Enhanced knowledge & information: **field days**



Linking Research with Development

Up-scaling and Extrapolation

Transfer and Adaptation



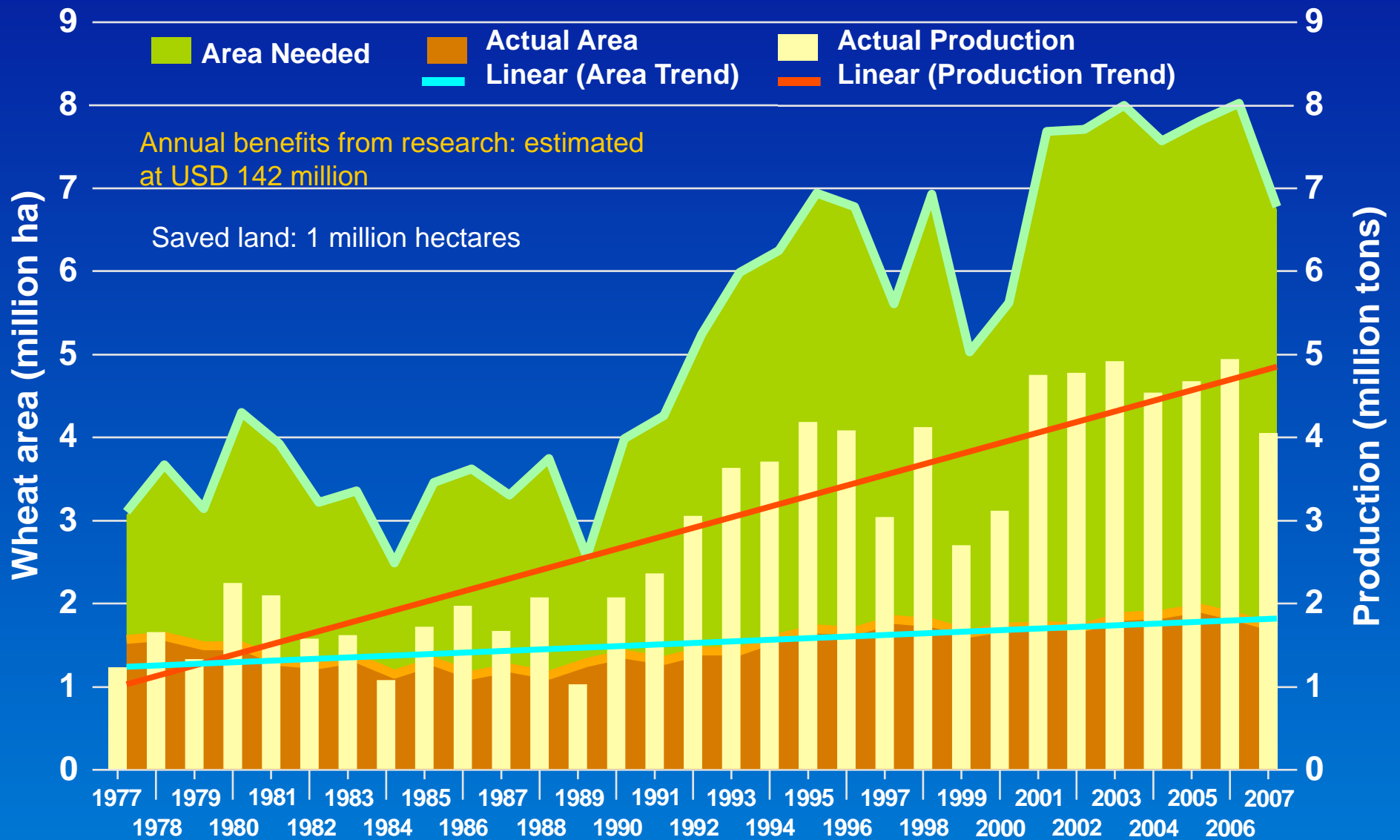
Participatory in Crop Improvement



Farmers score barley lines according to their selection criteria in a participatory barley breeding project of ICARDA in Eritrea

Impact of wheat research in Syria

Area Saved and Production Reached



Impact of Improved Technologies on Profitability (Net Return \$/ha)

Technology	Country	Adopters	Non-adopters	Increase
Wheat	Egypt	1,191	830	43%
	Sudan	510	134	281%
	Yemen	677	318	113%
Faba bean	Egypt	962	820	17%
	Ethiopia	164	108	52%
	Sudan	369	293	26%
Chickpea	Ethiopia	551	201	174%
Lentil	Ethiopia	781	451	73%



THANK YOU