

# An Introduction to ICARDA

A Presentation at Centers Week 1991, Washington, D.C.

by  
Nasrat Fadda  
Director General



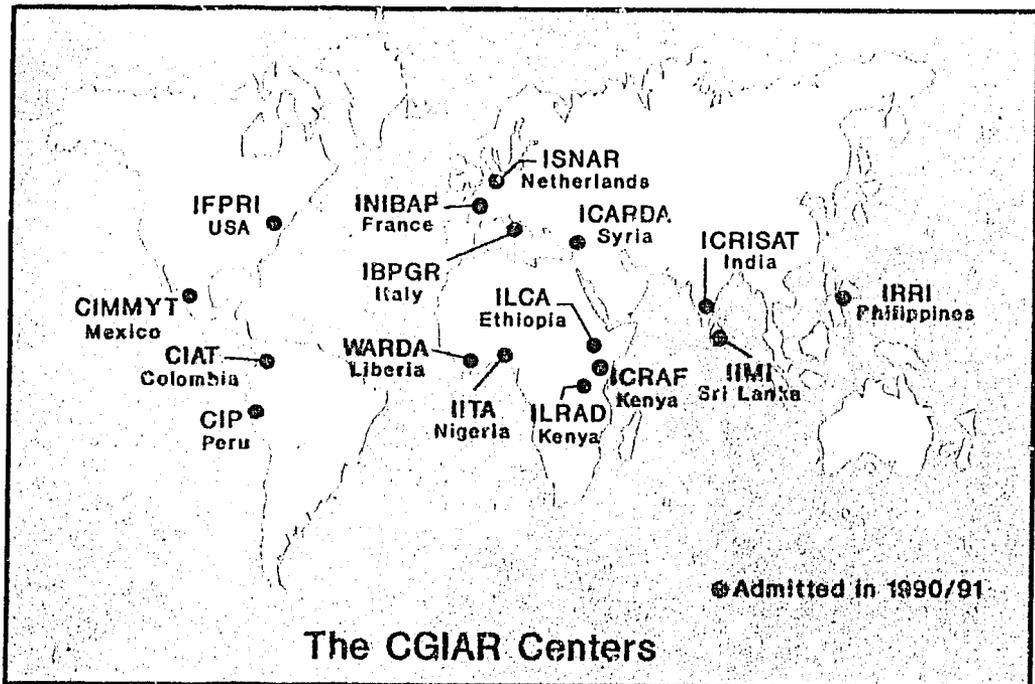
International Center for Agricultural Research in the Dry Areas  
Aleppo, Syria

# The CGIAR

ICARDA is one of 16 international centers supported by the Consultative Group on International Agricultural Research (CGIAR). Established in 1971, the CGIAR is an international group of representatives of donor agencies, eminent agricultural scientists, and institutional administrators from developed and developing countries who guide and support its work.

Cosponsored by the World Bank, the Food and Agriculture Organization of the United Nations (FAO),

developing countries in ways that enhance nutrition and well-being, especially of low-income people." The mission implies a focus on: international research that complements and supports national research efforts; complementary activities aimed at strengthening national research capacities such as specialized training and information services, but excluding other development or technical assistance activities; satisfying human needs from agriculture, forestry and fisheries,



and the United Nations Development Programme (UNDP), the CGIAR operates without a formal character, relying on a consensus deriving from a sense of common purpose.

The CGIAR has the following mission: "Through international research and related activities, and in partnership with national research systems, to contribute to sustainable improvements in the productivity of agriculture, forestry, and fisheries in

without degrading environment or the natural resources on which they depend; the large numbers of poor people; and the importance of technological change in generating new income streams for the poor.

The CGIAR is serviced by an executive secretariat, provided by the World Bank and located in Washington. A Technical Advisory Committee (TAC), with its headquarters at FAO in Rome, guides the research programs and priorities of the Group.

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**Cover:** Labor is often the greatest resource of the farm family. In recent years, the West Asia and North Africa region has been experiencing major changes in the relative availability and cost of land, labor, and capital. These changes have important implications for the design of new agricultural technology. ICARDA's research must ensure that improved technology is technically, economically, and socially suitable to farmer conditions.

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# **An Introduction to ICARDA**

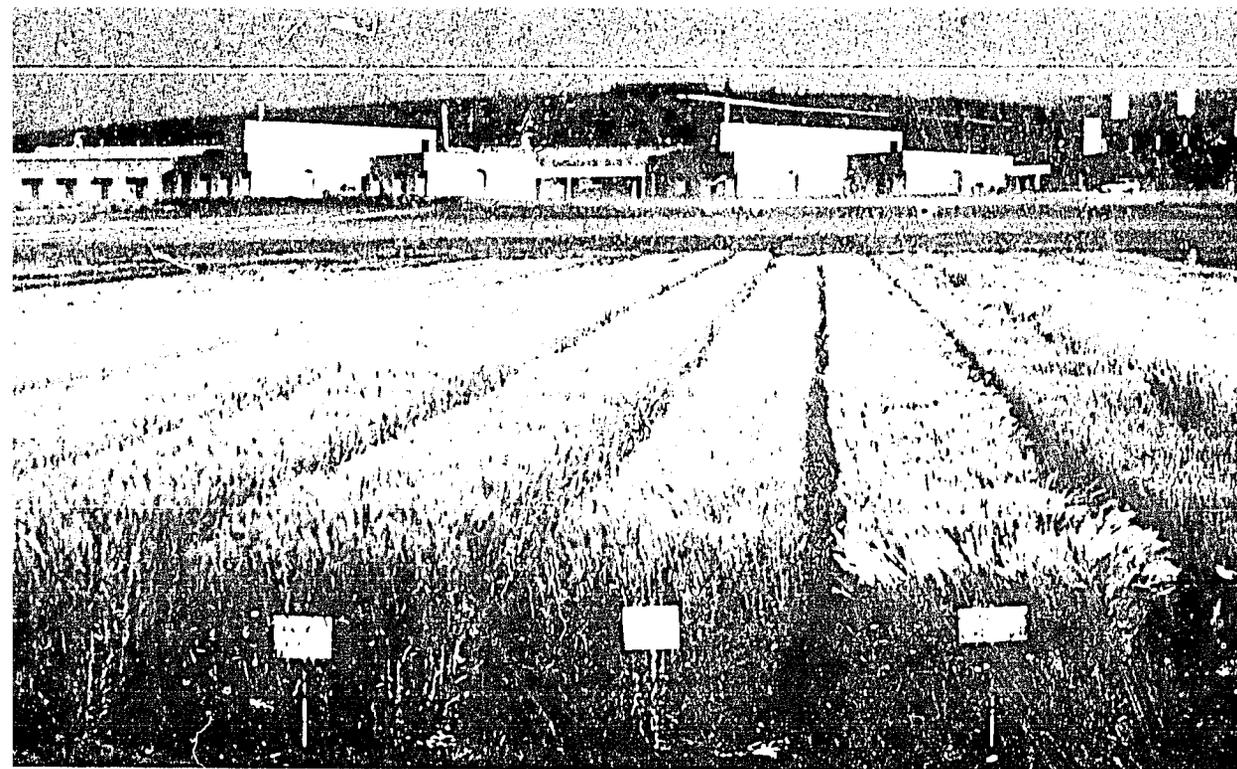
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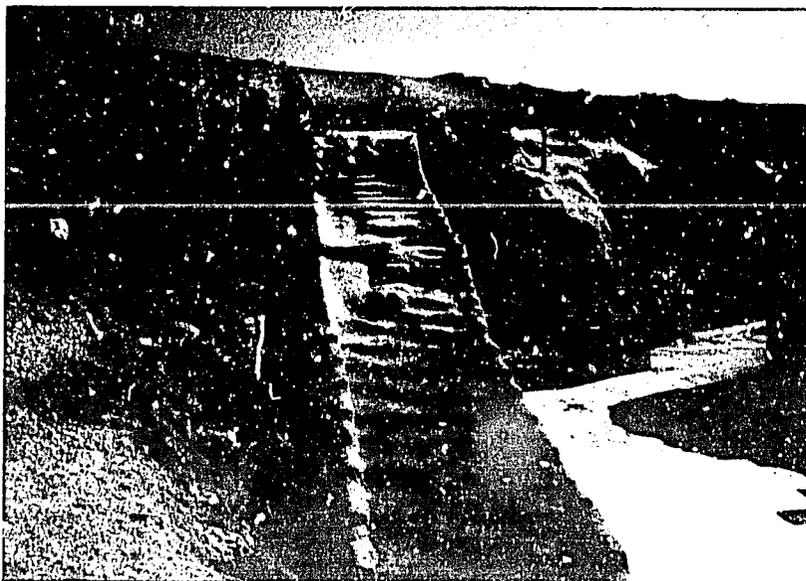
# An Introduction to ICARDA

1. Established in 1975, the International Center for Agricultural Research in the Dry Areas (ICARDA) started its operations in 1977. At its inception, it was conceived as a multi-center entity, with its principal station in Lebanon and two other stations: one in Syria to serve the lowland agriculture, the other in Iran to serve the highland agriculture.

Events in Lebanon and Iran shortly after the establishment of ICARDA were, however, not conducive to the development of the Center's stations there. As a result, the station in Syria was developed into the principal and, so far, only station run by the Center. It is located at Tel Hadya, near Aleppo, where the Syrian government has

generously provided a 948-ha site suitable for lowland agricultural research, and from where the range of agro-ecological zones served by the Center, except the highlands, is within easy reach. Shortage of funds has precluded the establishment of a new station for the highland zone. In 1991, the Iranian Government expressed a renewed interest in highland work and signed an agreement to fully finance an Iran/ICARDA project at Maragheh, near Tabriz. The project is expected to come into operation in 1992.

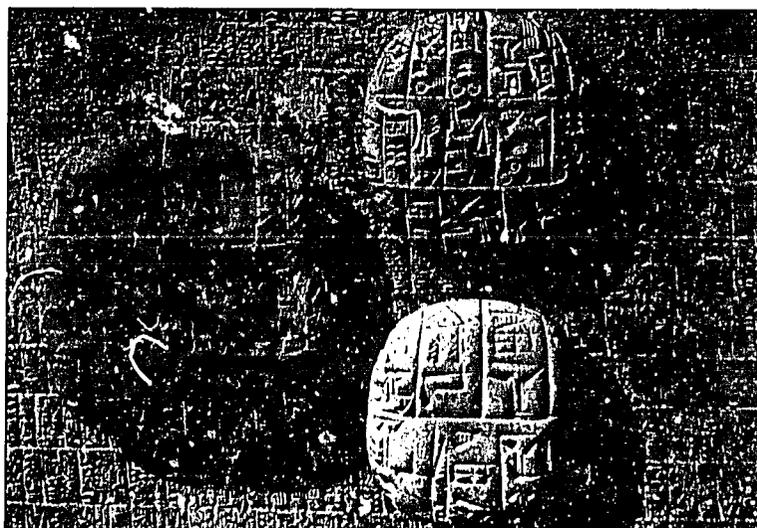




Ruins of the Ebla empire, only a few kilometers south of ICARDA, testify to a culturally sophisticated civilization actively engaged in agriculture and trade during the period around 2,400 B.C.

2. ICARDA is located in an area which was the birthplace of some of the world's greatest civilizations. The empires of Ebla, Assyria, Sumeria, Babylonia and the Hittites held sway over this region of critical economic and strategic importance. Although there were many factors that contributed to the emergence of civilization in the area, there is little doubt that agriculture played a central role and encouraged the growth of long-distance trade. Of a more lasting impact was the development of a numerical system and an alphabet.
3. An excellent example of the ancient glory of these civilizations can be found at Ebla, only a few kilometers south of ICARDA's Tel Hadya Station. In 1975, Italian archaeologists excavating at Ebla found a vault containing 16,500 cuneiform tablets dating from around 2,400 B.C., the largest and oldest single collection of such tablets ever found. It is significant that many of these tablets are contracts dealing with the sale and purchase of agricultural land and products.

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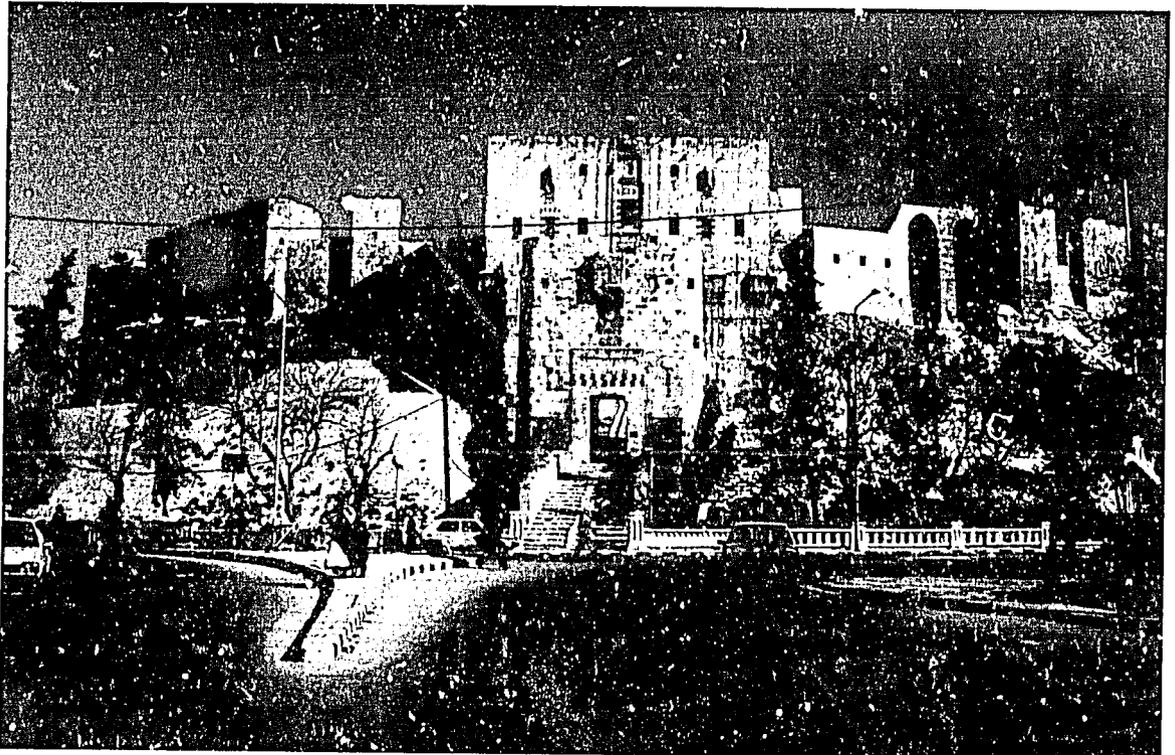




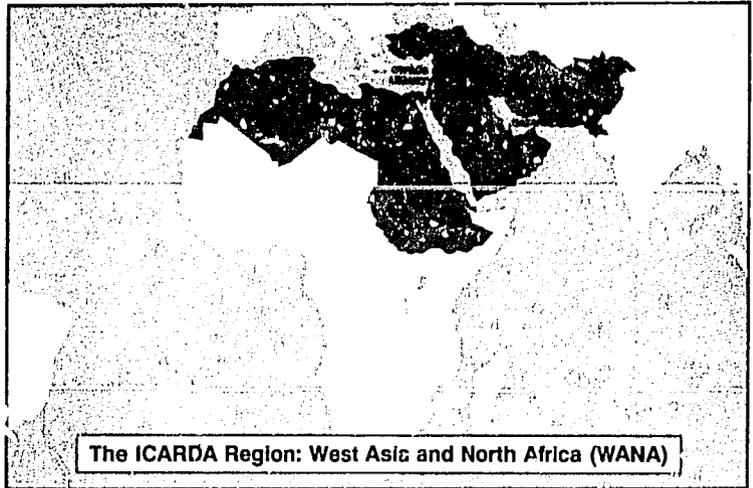
Ruins of the Basilica of St Simeon

4. The spectacular ruins of the Basilica of St Simeon, 60 kilometers northwest of Aleppo, provide further proof of the historical and commercial importance of the region. Built by the Byzantines in the 5th Century A.D., the Basilica of St Simeon was one settlement in an area dotted with villages and towns where people lived by agriculture and trade. Today the area around St Simeon stands as a stark reminder of the devastation that can be wreaked by soil erosion.
5. Dominated by its ancient Citadel, Aleppo is one of the oldest continuously inhabited cities. In the years following the spread of the Islamic empire, Aleppo became an important center of industry, commerce and learning. By the 15th Century A.D. it ranked as one of the most flourishing and productive cities in the Levant, profiting from a booming trade in agricultural and industrial goods throughout the Mediterranean.
6. Both old and new exist side by side in Syria-- Aleppo is no exception. Within the last 20 years the country has undergone a process of rapid and unprecedented economic and social development, of which the people of Syria are deservedly proud.

The Citadel of Aleppo

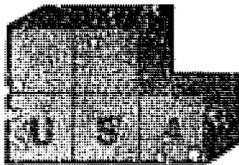


7. While, ICARDA has a world mandate for certain commodities, it has many features of an eco-regional center, in that it serves primarily the region of West Asia and North Africa (WANA). This covers some 23 countries stretching between the Atlantic and the Indian Ocean, with a total area of about 17 million km<sup>2</sup>, 80% greater than the USA, and ranging from less than 600 km<sup>2</sup> for Bahrain to about 2.5 million km<sup>2</sup> for the Sudan.

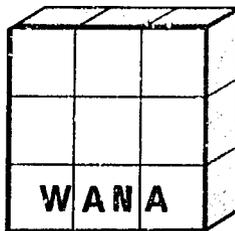


ICARDA's regional mandate covers some 23 countries in West Asia and North Africa.

### LAND AREA



9.4 million km<sup>2</sup>



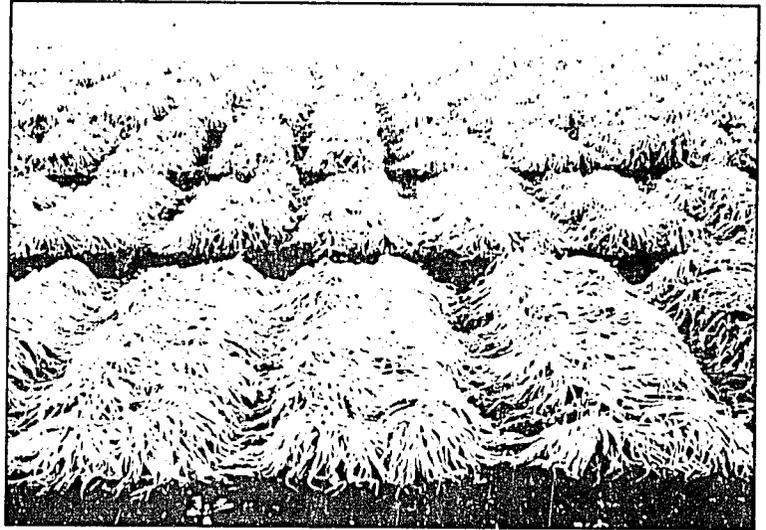
17 million km<sup>2</sup>

8. There are also large disparities in the populations of the WANA countries, currently ranging from just about 0.3 million for Qatar to over 100 million for Pakistan. Overall, populations of the region are growing rapidly--from 416 million in 1985 to a projected 622 million in the year 2000 and 1.5 billion in 2050. The prospect of a three-fold increase in a mere 40 years has serious implications for the region's food requirements and the ability of its agriculture to satisfy them.

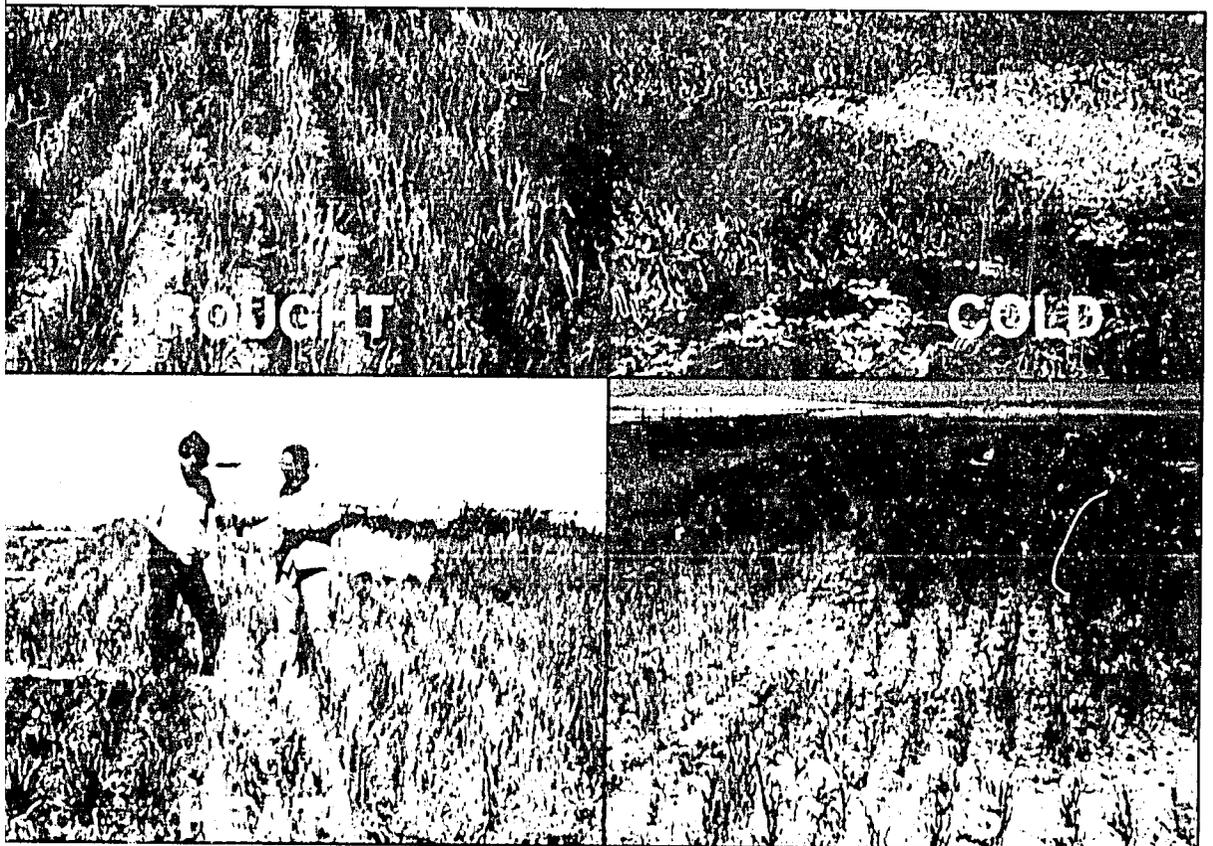
### Human Population and Growth Projections (million)

Country	1985	2000	Country	1985	2000
<u>Low income</u>			<u>Middle income</u>		
Afghanistan	17	-	Algeria	22	34
Ethiopia	42	65	Cyprus	0.7	-
Pakistan	96	146	Egypt	49	67
Sudan	22	34	Iran	45	69
<u>High income</u>			Iraq	16	27
Bahrain	0.4	-	Jordan	4	6
Kuwait	2	3	Lebanon	3	-
Libya	4	7	Morocco	22	31
Qatar	0.3	-	Oman	1	2
Saudi Arabia	12	20	Syria	11	17
UAE	1	2+	Turkey	50	67
			Tunisia	7	10
			Yemen	10	15

9. The climate of WANA is mostly Mediterranean, characterized by cool to cold winters and hot to extremely hot dry summers. Winters are milder in the coastal areas of the Atlantic and Mediterranean than in inland Asia. The severest winters occur in the highlands and at northern latitudes where frosts can cause serious damage to crops, especially some legumes. In spring, there is a sharp rise in temperatures and crops may experience, at the same location, first cold then heat stress.

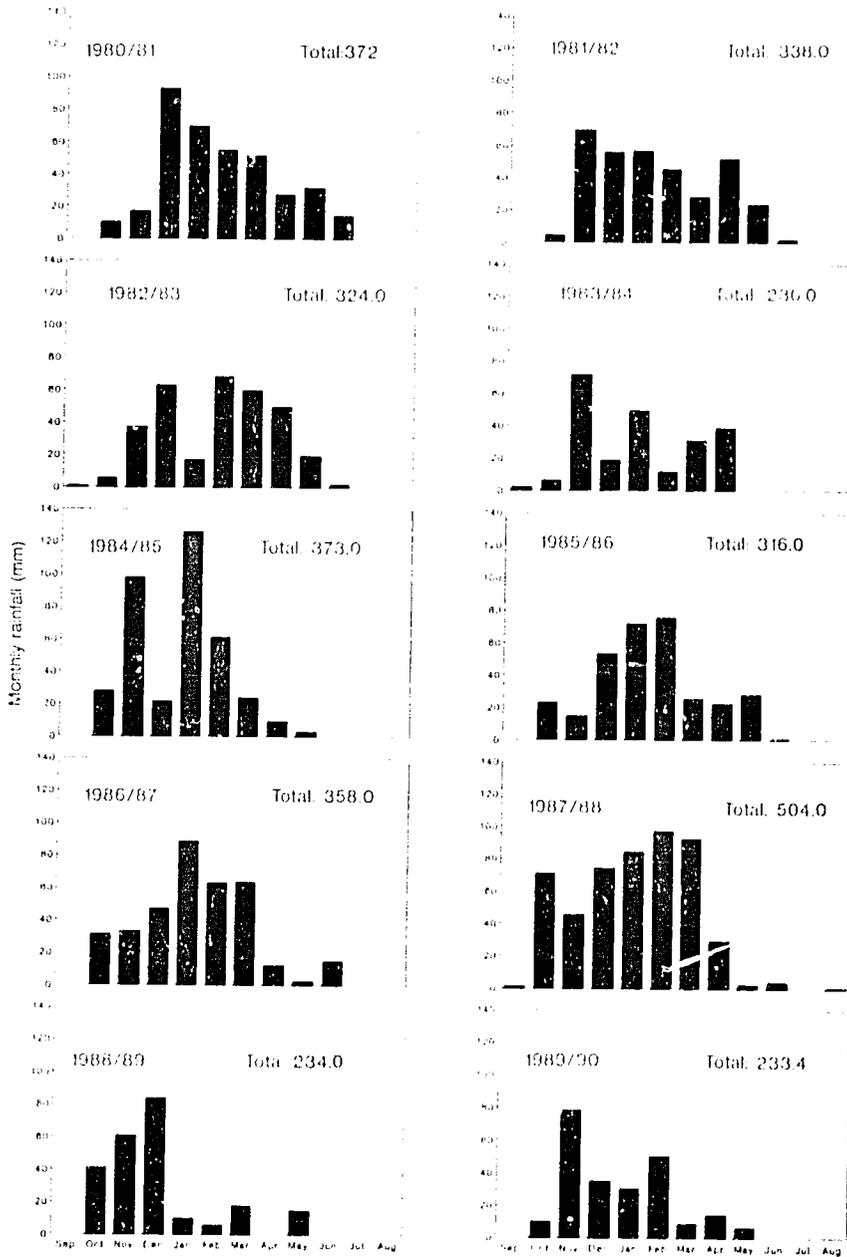


Abiotic stresses in the ICARDA region: above, frost; below (clockwise), drought, cold, salinity, and heat.



10. Rainfall in all countries of WANA is highly erratic in both time and space. It ranges from under 50 to over 1200 mm annually--the highest amounts occurring in coastal and highland areas. This variability in amount and seasonal duration is

reflected in the length of the growing season which ranges from 0 to 200 days depending on incidence of precipitation as well as soil depth. The substantial between-year variations increase the risks to crop production.

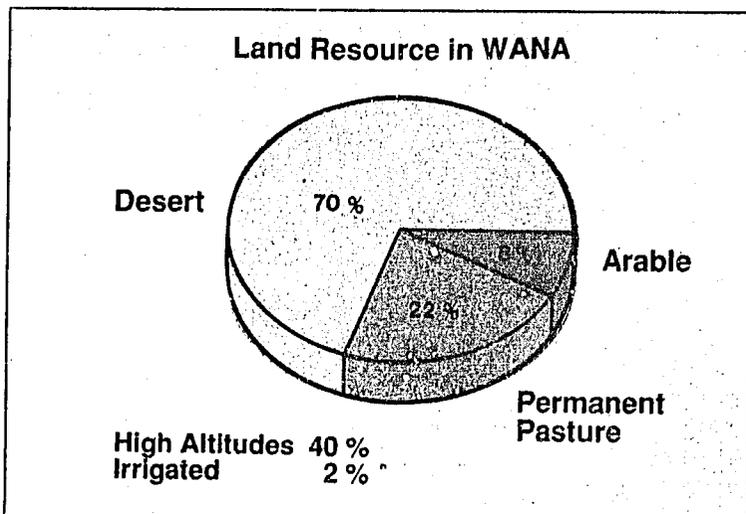


The rainfall pattern at Tel Hadva, Syria, 1981/82-1989/90.

11. The region's soils are generally calcareous and low in phosphorus, nitrogen and organic matter. In many areas, shallow soil limits the amount of available water, thus shortening the effective growing season. Capping or crusting after rain leads to serious problems of run-off and poor seedling emergence. Soil erosion caused by run-off is often serious and so is erosion caused by wind during the long, dry summers.



Poor structural stability of silty soils with a low organic matter content can lead to surface crusting, rainfall runoff, and restricted seedling emergence. Such soils are widespread in West Asia and North Africa.

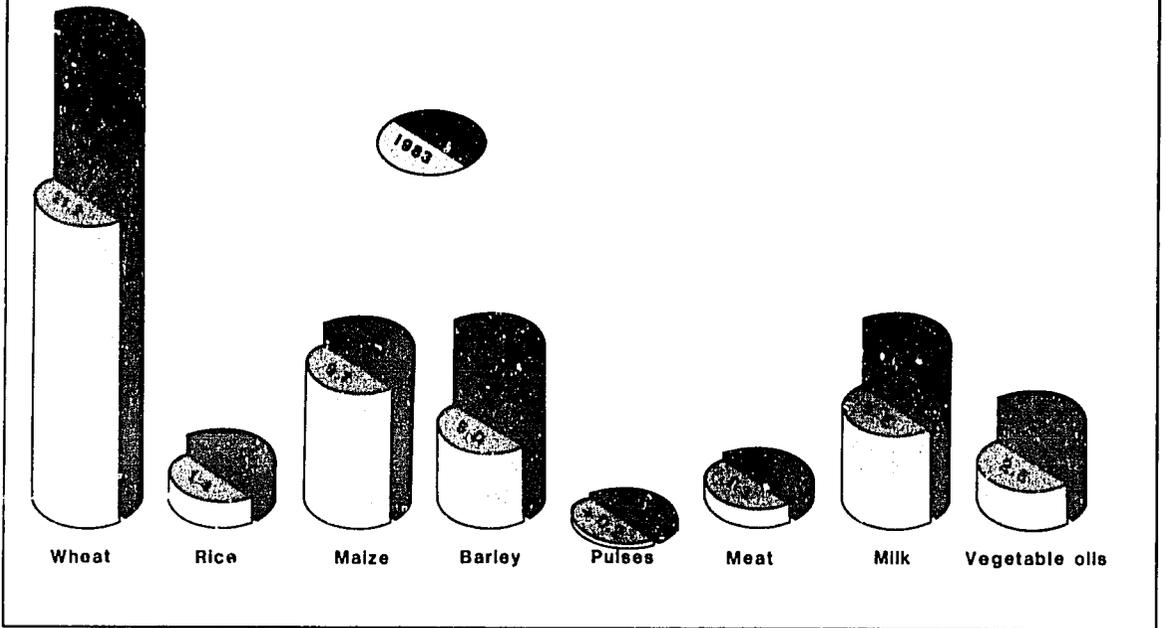


Marginal grazing areas with shallow, rocky, and steeply sloping soils make important contributions to the annual livestock feeding cycle throughout the farming systems of West Asia and North Africa.

12. Only 8% of the region's 1.7 billion ha area is thought to be arable, and another 22% is steppe. The area under perennial crops and forests is small, leaving the bulk of the remaining 70% as deserts or semi-deserts. Much of the land has steep slopes and/or shallow, rocky or saline soils that are unsuitable for cultivation without extensive and expensive reclamation work. The land resource is both slender and fragile and the conservation and maintenance of its productivity must be a crucial concern.



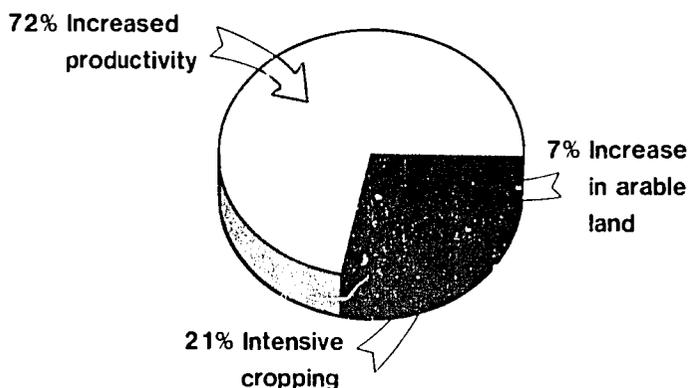
**Projected food deficits in the WANA region  
(million metric tons)**



13. A net exporter of food less than 40 years ago, the WANA region has become the largest food importing region in the developing world due to a rapidly growing population and, in some instances, rising income, at a time of sluggish growth in its agricultural production. Agricultural imports now account for 25% of the region's total import bill and more than 40% of food imports by all developing countries. If current trends continue, the region will, by the year 2000, be importing about 34 million tonnes of wheat, 11 million of barley, 9 million of vegetable oils, and 7.8 million of sugar. Large amounts of meat, about 1.5 million tonnes, and of milk, 11.4 million, will also be needed. In monetary terms, there will be a six-fold increase in the cost of the region's food imports.

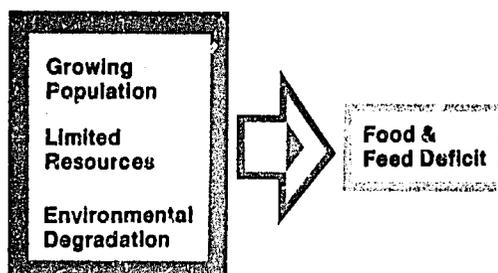
14. There can be little increase in the area of arable land in the WANA region. FAO (Food and Agriculture Organization of the United Nations) estimates that only 7% of the achievable increase in food production can come from this source. Another 21% is thought possible from more intensive cropping, particularly through the replacement of fallows by feed legumes and multiple cropping, leaving 72% to be achieved by increasing productivity. Such increases must be sustained at over 5% a year to meet the projected food and feed gap.

## SOURCES OF INCREASES IN FOOD PRODUCTION



15. This level of increase has not been attained in modern agricultural history. ICARDA has concluded that food sufficiency, stated as a policy objective in many countries of its region, will prove impossible within this century and well beyond it for all but a handful of food producers. Nevertheless, self-reliance in food can be enhanced through a combination of new technology, better farm practices, more favorable government policies and a more rational land-use pattern. To offer this service effectively is the main challenge that ICARDA is called upon to meet.

## THE CHALLENGE



## MEETING THE CHALLENGE

- Sustainable Increases per Unit Area through New Technology and Better Farming Practices
- More Rational Use of Land, Water and Other Resources
- Preservation of the Environment
- More Favourable Government Policies

16. It is with this background that ICARDA's Charter entrusts it with "promoting improved and more productive agriculture in developing countries having a dry sub-tropical or temperate climate, through research and training activities conducted primarily in the countries of the Near East and North Africa and the Mediterranean region, in order to raise the standard of living and promote the social, economic and nutritional well being of developing countries." Within this broad mandate, ICARDA

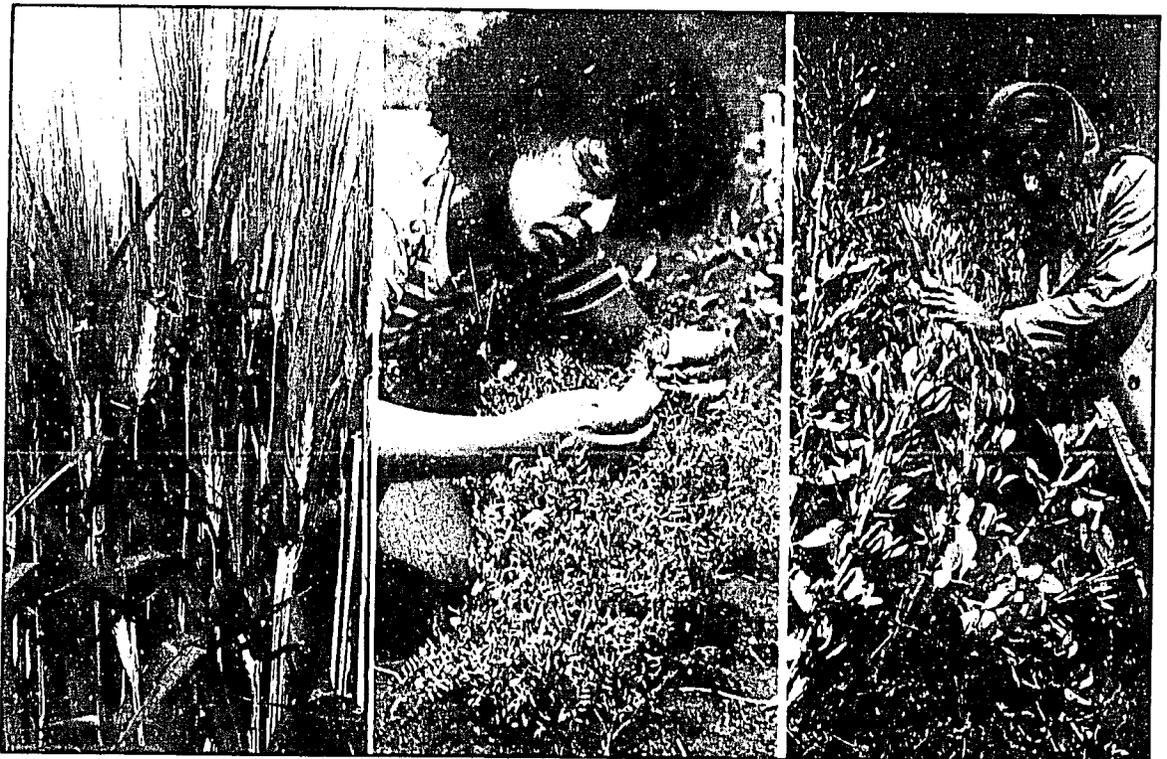
has a world responsibility for the improvement of barley, lentil and faba bean, and a regional responsibility jointly with CIMMYT (Centro Internacional de Mejoramiento de Maiz y Trigo) for the improvement of wheat and with ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) for chickpea. ICARDA has interpreted its mandate in the context of the physical and social environments of its region and the challenges they pose.

17. ICARDA's mission is implicit in its mandate. The Center exists to meet the challenge posed by harsh, stressful and

## ICARDA'S MISSION

- **Sustainable increased productivity in harsh environments with low winter rainfall**
  - through research, training, and dissemination of information
  - in collaboration with NARSs.
- **Arrest degradation of the environment**

ICARDA has a world responsibility for the improvement of barley, lentil, and faba bean (left to right).





In West Asia and North Africa, ICARDA is responsible for the improvement of durum wheat, bread wheat, and kabuli chickpea (left to right).

highly variable environments in which the productivity of rainfed agricultural systems must be increased to higher sustainable levels; in which soil degradation must be arrested; and in which the quality of the environment is ensured. The Center meets this challenge through research, training and the dissemination of information in a mature partnership with national agricultural research and development systems.

18. ICARDA has identified its ultimate beneficiaries as the producers and consumers of food, and its clients as the national agricultural research systems (NARSs). Other stakeholders are sister international agricultural research centers (IARCs) within and outside the CG system, the CGIAR with its TAC (Technical Advisory Committee) and Secretariat, and the donor community at large. ICARDA acknowledges their legitimate claims and, through properly targeted research and training and efficient use of resources, it aims at serving them well.

#### STAKEHOLDERS IN ICARDA

##### *Beneficiaries*

-- Producers and Consumers of Food

##### *Clients*

-- Governments and National Agricultural Research Systems

##### *Other Stakeholders*

-- Regional and International Organisations

-- Donors

-- ICARDA's Sponsors: FAO, UNDP and World Bank

19. To serve its mission and mandate adequately, ICARDA has developed an organizational structure designed to reflect its research and research support needs. The structure is considered balanced and responsive to the needs of the Center's research which is currently organized around three multidisciplinary commodity programs: cereals, legumes, and pasture, forage and livestock; and a farm resource management program which integrates the results of the commodity work and addresses issues of wider concern including the socio-economic aspects of farming, agro-ecological characterization and the sustainability of the resource base. The structure is complemented by a few support services. Inter-disciplinary linkages are maintained through joint planning, the provision of

joint research services and the placing of disciplinary scientists-- pathologists, entomologists, biotechnologists, etc.--in shared laboratories.

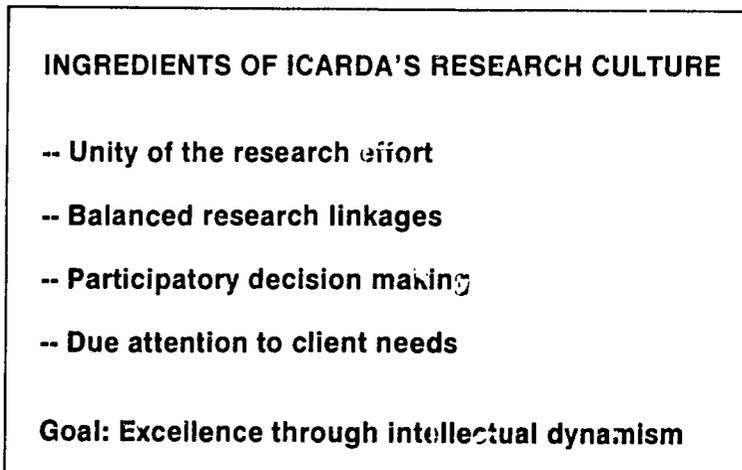
20. ICARDA's organizational and managerial structure aims at balancing the claims of freedom in research pursuits and discipline and accountability in financial and administrative matters; at nurturing an environment in which its scientists will feel free to work and innovate; at installing a participatory approach that will circumvent possible dichotomies in research and developmental claims; at maintaining intellectual vigor through a dynamic approach to staff development, and at ensuring that the legitimate claims of its partners in research and development are well served.

## **Organisation and Management**

**ICARDA's managerial culture aims at**

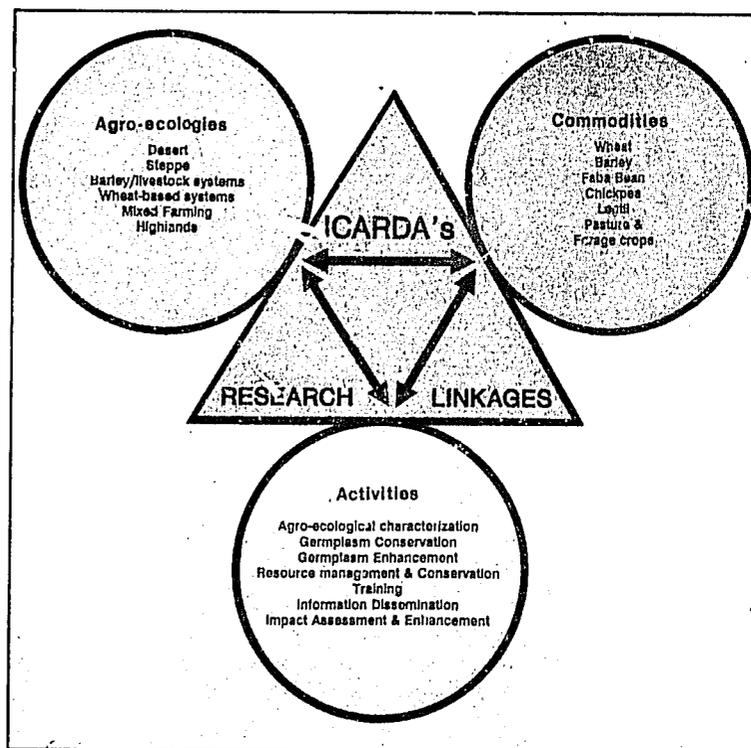
- balancing freedom in research pursuits and discipline in financial and administrative matters**
- nurturing an environment in which scientists feel free to work and innovate**
- installing a participatory approach**
- maintaining intellectual vigor through a dynamic approach to staff development**
- ensuring that the research and development interests of its partners are well served.**

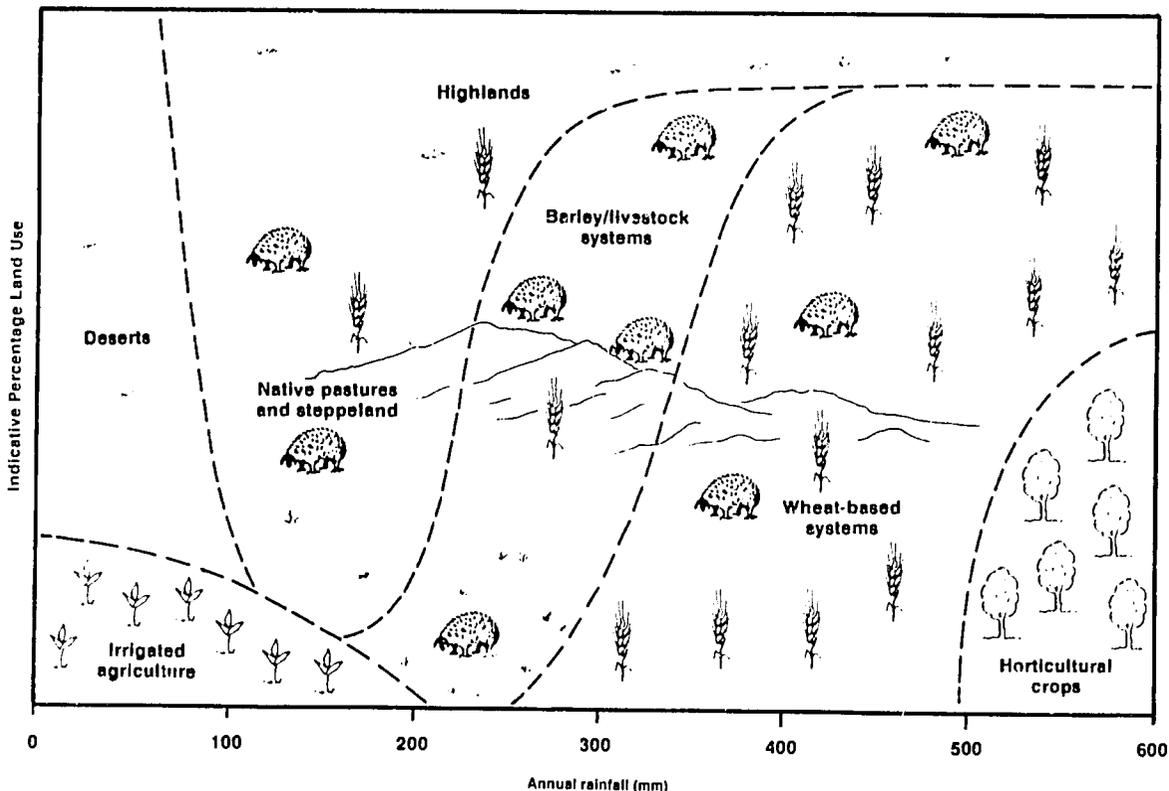
21. The main ingredients of ICARDA's research management are: unity of the research effort; balanced research linkages; participatory decision-making; and due attention to client needs. The unity of the research effort is ensured by bringing together the headquarters and outreach activities under the Deputy Director General (Research). While much of the research would continue through multidisciplinary programs, other linkages are being established which make a fuller use of the matrix/project-based approaches. These also have the merit of exposing scientists to the full range and rigor of research decision-making, resource allocation and resource-use accountability



The three thrusts of ICARDA's research (agro-ecological, commodity, and activity) are interlinked.

22. ICARDA's research has evolved in the context of a three-dimensional structure intended to bring out the inter-linkages between the various facets of its work. There is, first, the agro-ecological dimension which defines the broad setting in which the Center's work is being conducted; then there is the commodity thrust which responds to the requirements of enhancing the germplasm and improving the management of the mandated commodities; and, finally, the activity level which introduces a matrix/project-based approach that cuts across the boundaries between the other aspects of the Center's research.



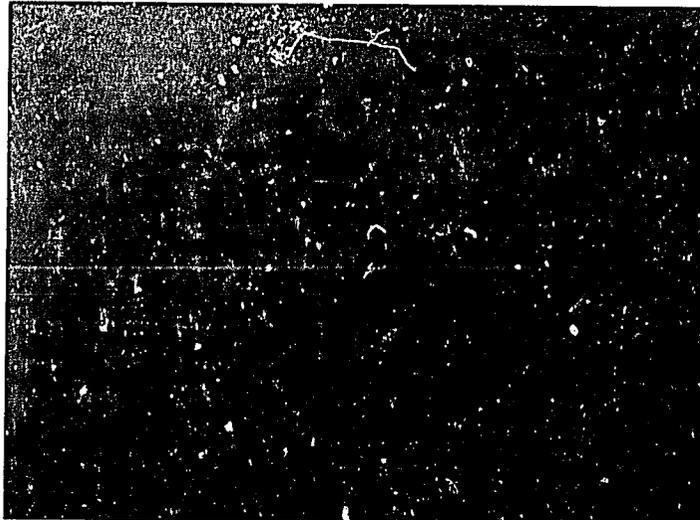


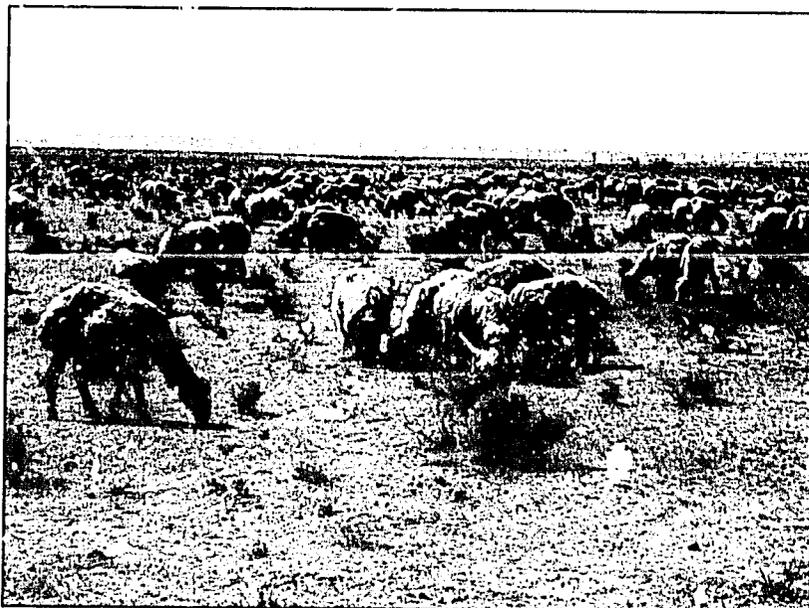
Diagrammatic representation of the major agro-ecological zones in West Asia and North Africa. The zones are primarily based on different rainfall bands but constitute a continuum with a large number of overlapping agro-ecologies.

Deserts account for about 70% of the land area in West Asia and North Africa.

23. The prevailing ecologies of ICARDA's region are primarily associated with rainfall bands and constitute a continuum that, for simplicity, has been reduced to five major zones: deserts; steppes and native pastures; barley/livestock; wheat-based farming; and highland zones.

24. Much of the WANA area, about 70%, is true deserts, including the Sahara of North Africa, the Empty Quarter of Arabia and large parts of the Iran-Pakistan region. Here, only irrigated agriculture and nomadic grazing are possible, and these are excluded from ICARDA's mandate. Apart from spin-off benefits from the Center's work, this region has received little attention and there are no plans for ICARDA's direct involvement in it in the future.





Pasture and steppe zone: In the very dry areas, native steppeland has become severely degraded due to overgrazing.

25. Where annual rainfall is below 200 mm, steppeland occupies most of the land surface. It is too dry to cultivate, although at the wetter margin of the steppe there is an increasing tendency to sow barley. Originally a shrub steppe or even woodland, steppeland is now characterized by ephemeral vegetation of very low productivity. Even where rainfall exceeds 250 mm, it is native pasture that occupies pockets of land which are too steep and/or stony or where the soil is too shallow to grow crops, and where all but a few perennial

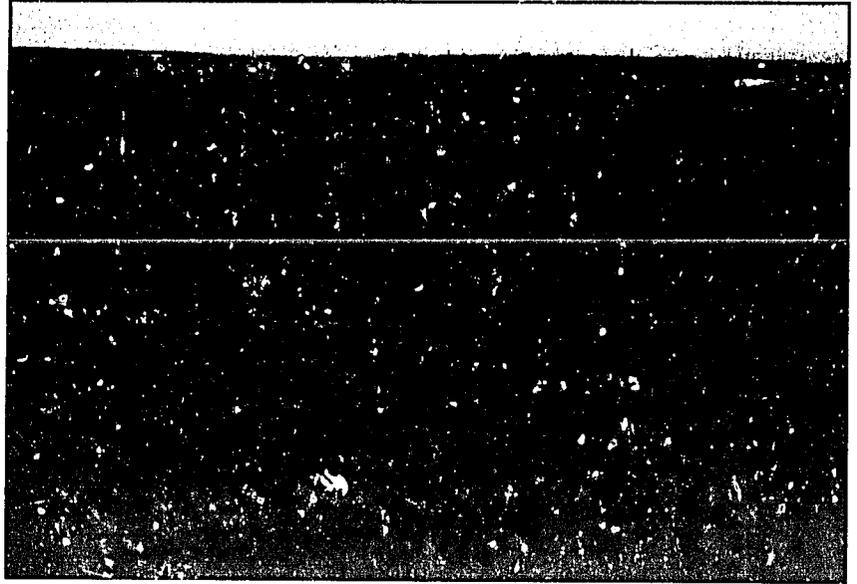
plants have long since disappeared mainly due to overgrazing.

26. In areas adjacent to the dry steppe with an annual rainfall of between 200 and 350 mm, livestock production, principally sheep and goats, is the dominant enterprise, and farmers derive the bulk of their income from the sale of dairy products--meat and wool. Barley is the most common crop, although wheat is important in some areas. The potential of barley/livestock system is low and variable.

Barley/livestock zone



Wheat-based farming zone



27. In areas with a rainfall of between 350 and 600 mm, wheat is the favored crop. Above 450 mm, bread wheat predominates while, elsewhere, durum wheat is more common. The wheat/fallow rotation is widespread, but rotations of wheat with food legumes and summer crops such as melon are also common.

28. In the WANA region, 40% of the agricultural land,

contributing about 30% of production, consists mostly of plateaux at altitudes of over 1000 m above sea level. These are subject to extremes of winter cold and summer heat, and have a snow cover for up to 4 months of the year. Annual rainfall ranges from 200 to 600 mm, but in most areas is below 450 mm. The soils are degraded, being low in organic matter, with a high pH, and poor moisture-holding capacity. Soil erosion is common.

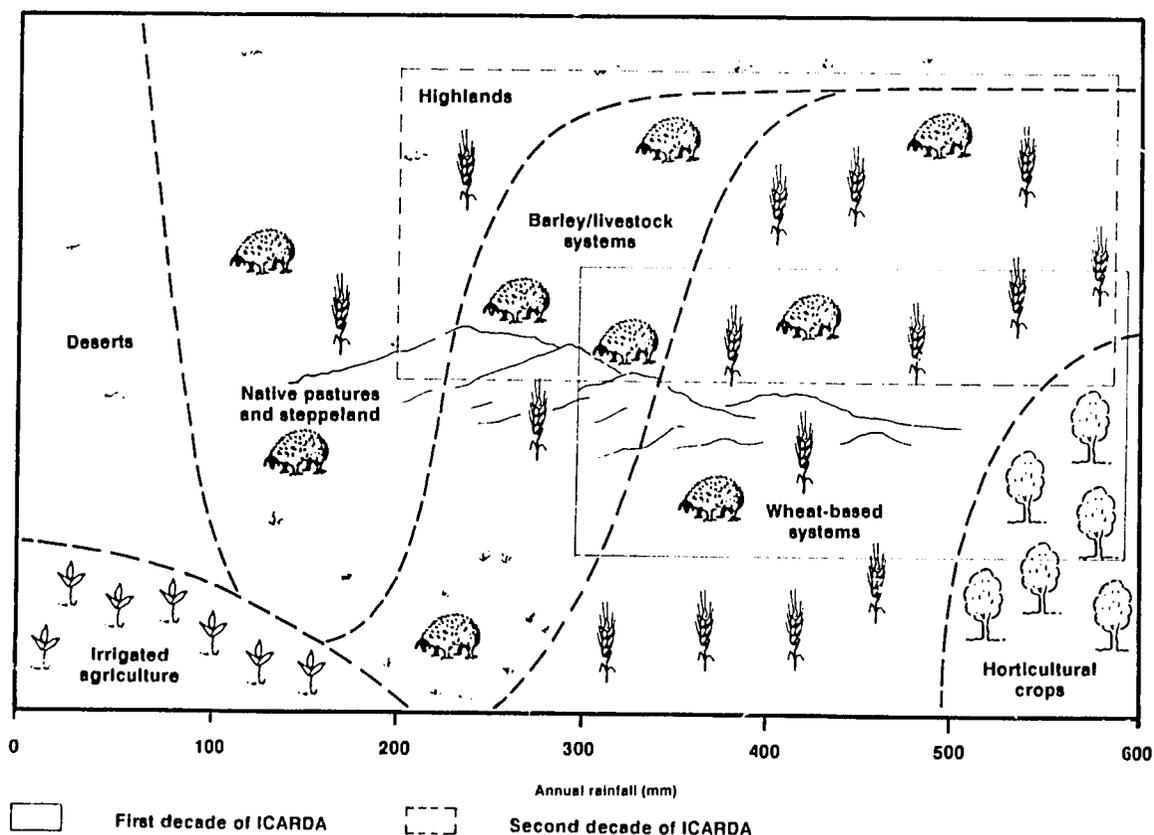


Over 30% of the total arable land in West Asia and North Africa is in mountainous areas. ICARDA is paying greater attention to these areas.

29. ICARDA has not worked in the driest areas where only irrigated agriculture--excluded from its mandate--is possible, and has in its first decade given attention to the high-rainfall high-potential zone which has been well served by research conducted elsewhere and where the national agricultural research systems have developed adequate capabilities and made significant advances. The Center has opted to concentrate on the more challenging, but still rewarding, intermediate ecologies with a rainfall of between 300 and 450 mm. These include the wetter end of the Barley/Livestock Zone and the Wheat-Based Farming Zone.
30. ICARDA recognizes that major contributions to WANA's food supplies would continue to come from its higher rainfall lowlands. These receive an important share of the Center's work and will do so in the future. While the drier areas, because of

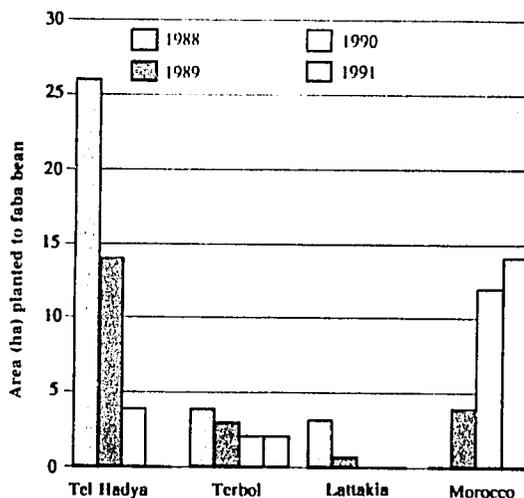
their low potential, and the highlands, because of their remoteness and poor infrastructure, are less promising, these two agro-ecologies are so extensive in the region that small increases in their productivity would have a substantial impact on total production. Further, these areas are exploited by the smaller and poorer farmers who are an important target group of ICARDA's work. Without over-involvement, ICARDA is now giving these two zones greater attention.

31. In view of the correspondence between agro-ecologies and the crop/livestock they produce, ICARDA's work has resolved itself in research aimed at the genetic improvement and better management of the mandated commodities for each zone, and developing cropping and livestock systems appropriate to them. A common theme throughout this work has been the maintenance of the resource base and the sustainability of production.



During its second decade, ICARDA is directing more of its research to the commodity groups and the farming systems associated with them in the drier areas and highlands.

32. The Center, naturally, gives appropriate attention to those crops covered by its mandate - wheat, barley, chickpea, lentil, faba bean and pasture and forage crops. Work on these is justified by projected increased demand for them, by their importance as components of the farming systems, or by their potential for adaptation to drier areas.
33. Nevertheless, ICARDA is shifting the emphasis it attaches to these commodities. The main impact has been on food legumes for which future supply and demand are expected to be in reasonable balance. In particular, work on faba bean, which performs well only in areas where rainfall is over 400 mm and which is not crucial in the drier areas, is being phased down at ICARDA to the level of maintaining the Center's germplasm collection and providing technical backstopping. The main work is being transferred to Morocco, the major dryland faba bean producer in the region. Every effort is being made to ensure that important gains so far realized by ICARDA are not jeopardized.
34. Lentil is a vital component in rotations that sustain cereal crop yields in WANA's drier areas, and is potentially a key element in crop-livestock interactions which are to be a major thrust of ICARDA's future work. Chickpea plays a comparable role in the intermediate rainfall zones. ICARDA concentrates on the kabuli chickpea, and



Shift in faba bean research from ICARDA's core program to the national program of Morocco.

has no plans to conduct research on the desi types which fall within ICRISAT's mandate. A study on the 'Role of Legumes in Farming Systems', conducted jointly by the International Food Policy Research Institute (IFPRI) and ICARDA, supported ICARDA's approach to these crops.



Lentil is an important component in the farming systems in West Asia and North Africa. ICARDA has made considerable progress in developing a mechanized lentil harvesting technology.



Chickpea is one of the most important food legume crops in West Asia and North Africa. Winter sowing of this crop has produced dramatic increases in yield. ICARDA has developed several new varieties for winter sowing that are high yielding as well as resistant to cold and diseases.

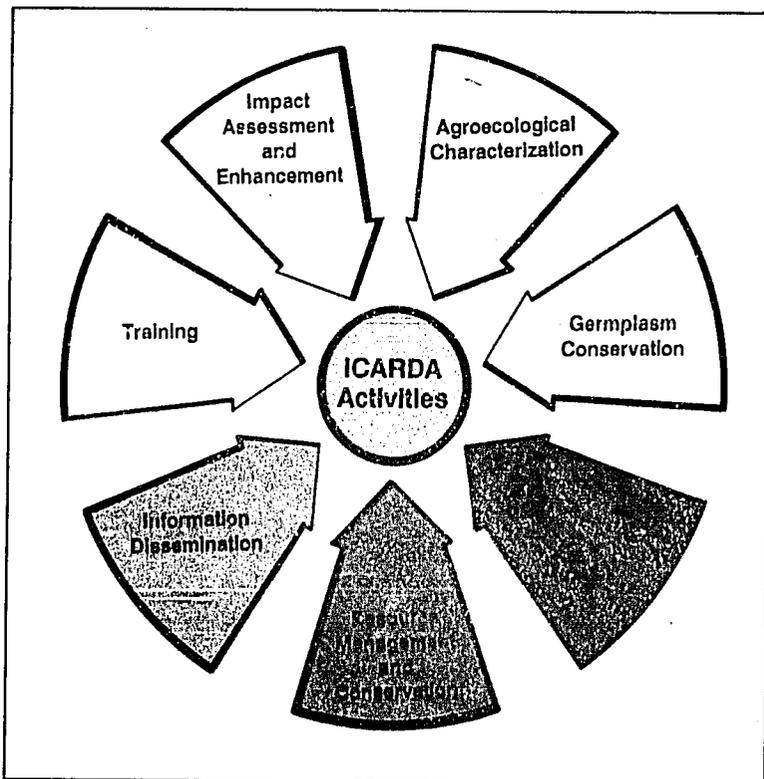
35. The rising demand for livestock products, and the crucial place of animals in the farming systems of WANA, indicate the need to expand the Center's work on sheep and extend it to goats. Both species thrive in the drier areas, where they are the primary source of income for producers. Because of the extent and complexity of livestock research, ICARDA's work is being restricted to a few areas which offer promise of a maximum impact. It concentrates on meat and milk with a focus on improved animal nutrition and management. No animal breeding work or the preservation of genetic diversity is being undertaken, but breed characterization is. The objective of this work is the identification and utilization of those sheep and goat genotypes which are more responsive to improved management and are, thus, more productive and profitable.

On-farm trials of ley farming with medics at the village of Tah, 60 km south of Aleppo, are attracting increased farmer attention.

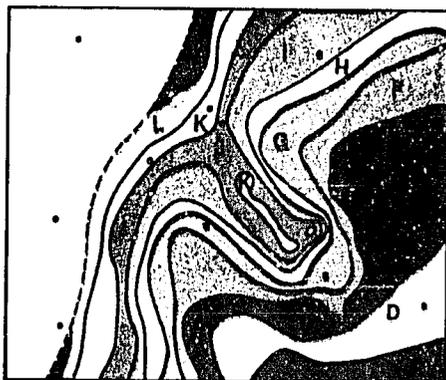


36. ICARDA has identified seven integrative activities central to its future program. These are: agro-ecological characterization; germplasm conservation, germplasm enhancement; farm resource management, training and networking; information dissemination; and impact assessment and enhancement.

37. ICARDA is giving high priority to the characterization and monitoring of its agro-ecologies with the objective of improving the efficiency, relevance and targeting of research. Techniques which characterize agro-ecological variability, in both time and space, and predict how such variability will interact with, and modify the impact of new technology are used in an integrated package. Key components of this package include the spatial and



Map produced by spatial weather generator

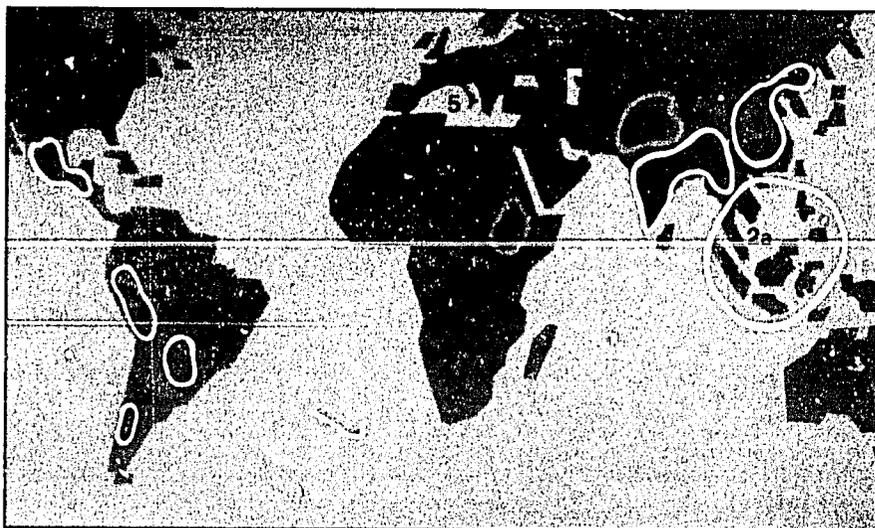


C=150-200 kg/ha    D=200-250 kg/ha    E=250-300 kg/ha  
 F=300-350 kg/ha    G=350-400 kg/ha    H=400-450 kg/ha  
 I=450-500 kg/ha    J=500-550 kg/ha    K=550-600 kg/ha  
 L=600-650 kg/ha    M=650-700 kg/ha

Yield increase of barley in a barley-barley rotation from 60 kg N/ha and 30 kg P/ha expected in four out of five years.

temporal generation of climatic data sets; weather-driven crop growth models which incorporate soil, crop genotype and management factors; and whole-farm models of choice which provide an economic evaluation of integrated resource management at the farm level.

38. ICARDA, located in a region which includes the centers of origin and diversity of its mandated crops, accepts a special responsibility to collect, conserve and evaluate those genetic resources which have great regional and global significance for further germplasm improvement and related research.



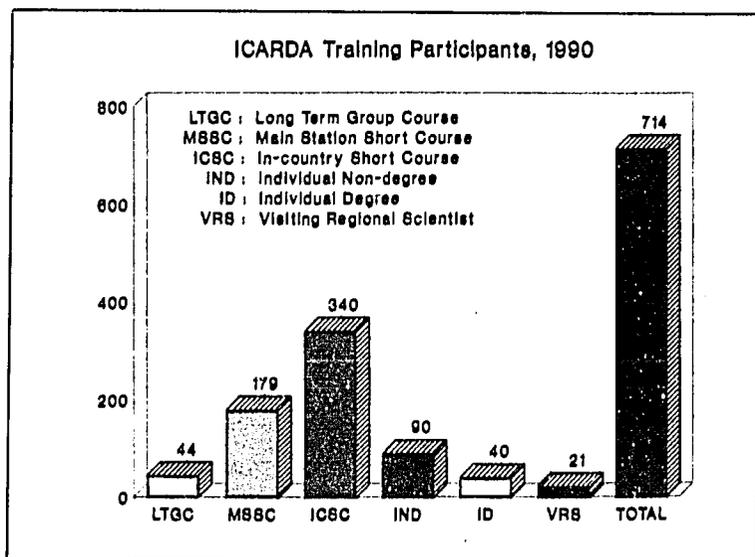
The Vavilov centers of genetic origin and diversity.

39. In germplasm enhancement, the goal is to develop material that will improve the yield and yield stability of barley, wheat, lentil, chickpea and pasture/forage legumes for the WANA region and for testing elsewhere in the world. Special effort is being exerted to extend gains already made in optimal environments to drier areas. The guiding principles in the acceptability of the new material are better performance, adaptability and, above all, stability. Much of the work on germplasm enhancement is conducted in close collaboration with CIMMYT (wheat) and ICRISAT (chickpea).

40. ICARDA is seeking to improve and integrate the management of soil, water, nutrients, plants and animals in ways that optimize sustainable outputs. Initially, the work focuses on the most vulnerable barley-livestock and highland mixed-farming systems. The range of the work covers the testing of new varieties to define conditions vital for their environmental and economic

success; agronomic studies to improve farming practices; studies on soil, water and nutrient management that would maintain yield and protect natural resources; the determination of stable crop-livestock farming systems; and livestock management research directed to optimizing the efficiency of feed resource use.

41. As part of its efforts to enhance the generation, adaptation and adoption of improved agricultural technologies, ICARDA's work in training and networking aims at strengthening the capacities of NARSs. In the context of large differences in requirements and a rapidly changing scene, the training



Human resource development in national programs by providing training opportunities to young researchers is an important and integral component of ICARDA's overall program.



43. ICARDA has taken, and will continue to take, concrete steps to gauge the economic and environmental impact of introduced technology and, where possible, to enhance benefits by promoting further adaptation of such technologies to farmers' needs, and seeking appropriate changes in government policies. ICARDA

recognizes the special advantage of NARSs in this area and is involving them fully in the process, providing them with the required study tools. Special attention is being paid to the impact on sustainability, environmental quality, family welfare and family income, particularly in the fragile dryland environments.



In its second decade, ICARDA is paying greater attention to monitoring the adoption of new technologies and assessing their impact.



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44. In the short time since it was established, ICARDA has made notable advances in the research and training activities covered by its mandate. Located, as indicated earlier, in an area considered as center of origin and diversity of many crops, it has launched a major effort to collect, and characterize the land races and wild relatives of the major crops in the region. Its collection now numbers over 90,000. ICARDA has implemented a breeding strategy that specifically caters for the environments of WANA and recognizes the importance of developing material resistant or tolerant to the commonly encountered stresses of the region. Germplasm enhancement work has been extremely productive. Some 140 releases, mainly of cereals and food legumes derived from ICARDA's material, have been made in

<b>Germplasm Accessions at ICARDA, 1990</b>	
<b>Cereals</b>	
Barley	18671
Durum wheat	18033
Bread wheat	6711
Wild species	4495
<b>Food Legumes</b>	
Chickpea	8164
Lentil	6850
Faba bean	3528
Wild species	553
<b>Forages</b>	
Medics	4939
<i>Vicia spp.</i>	4267
<i>Lathyrus spp.</i>	1315
Other species	13368
<b>Total</b>	<b>90894</b>

<b>Cereal Varieties Released by National Programs (1980-1990).</b>		
<b>Crop</b>	<b>Number of Varieties Released</b>	<b>Countries</b>
Barley	48	Algeria, Australia, Brazil, Chile, China, Cyprus, Ecuador, Ethiopia, Iran, Jordan, Mexico, Morocco, Nepal, Pakistan, Peru, Portugal, Qatar, S. Arabia, Spain, Syria, Thailand, Tunisia, Vietnam, Yemen.
Durum Wheat	43	Algeria, Cyprus, Egypt, Greece, Jordan, Lebanon, Libya, Morocco, Pakistan, Portugal, Saudi Arabia, Syria, Tunisia, Turkey.
Bread Wheat	59	Algeria, Egypt, Ethiopia, Greece, Iran, Jordan, Libya, Morocco, Oman, Pakistan, Portugal, Qatar, Sudan, Syria, Tanzania, Tunisia, Turkey, Yemen.

countries extending from Latin America to China. These developments have gone hand in hand with the strengthening of national research capabilities through collaborative work in networks, programs and special projects; the training of over 2000 technicians and scientists so far; the opportunities offered to participate in workshops and seminars; and the provision of information. The payoffs are beginning to show in changing government attitudes and policies, as illustrated by the increasing number of varietal releases, the adoption, in Syria, of a new fertilizer policy and the interest shown in the Center's ley-farming work.

45. In these advances, ICARDA believes that it has laid a sound foundation on which to construct and conduct its future work. The Center recognizes, however, that new concepts and visions are changing; the context within which it operates. We are watching closely the work of TAC particularly on the reappraisal of global and regional priorities and the emerging distinction between global and regional centers. These will undoubtedly have a strong bearing on our future orientation and mode of operation. To highlight one or two points, ICARDA, as has been seen, has based its work on agro-ecologies, primarily within a regional context. This approach will be further developed with a possibility that the Center could restructure its research programs around the major environments prevailing in its region. Thus, in place of a cereal, food legume and other programs, we might have programs for the pasture-steppe zone, the wheat-based systems, mixed farming systems and the highlands. A corollary of this approach is that the Center's mandate might have

Legume Varieties Released by National Programs (1980-1990).		
Crop	Number of Varieties Released	Countries
Kabuli Chickpea	31	Algeria, Cyprus, France, Italy, Jordan, Lebanon, Morocco, Oman, Portugal, Spain, Sudan, Syria, Tunisia, Turkey.
Lentil	20	Algeria, Australia, Canada, Chile, Ecuador, Ethiopia, Jordan, Lebanon, Morocco, Nepal, Pakistan, Syria, Tunisia, Turkey.
Faba Bean	2	Iran, Portugal.
Dry Peas	1	Sudan
<i>Vicia sativa</i>	1	Morocco

to be widened to include other elements needed for the comprehensive study of each zone, such as other crops grown in the crop rotations of WANA, and other practices, such as irrigation/supplemental irrigation in the drier zones. Most of the additional work would be in the agronomic domain, while other needs of the expanded program, e.g. germplasm enhancement of non-mandated crops, will continue to rely on the work of sister international centers.

ICARDA, like other IARCs is acutely aware of the variety of legitimate claims of its various stakeholders. Fortunately, we live and work in a region that is, against all appearances, not without some expertise in the art of compromise. In a true levantine spirit and practice we have, so far, managed to keep the pulls which we are subjected and the burden we bear in reasonable balance.