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Regionalisation of the National Agricultural Research System in Turkey

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Abstract. The institutionalisation of agricultural research in Turkey started during the first few years of the foundation of Republic in the early 1920s. The first institutions were established in central locations of the country such as Ankara, Istanbul and Eski¸ehir. However, during the development of the NARS, many research institutions have been created to cover all aspects of agricultural research in different regions. The diversity of climate, soil type, natural plant cover and socio-economic characteristics of farmers naturally resulted in the regionalisation of agricultural research.

The NARS of Turkey is composed of institutions governed by different organisations. Currently 52 Ministry of Agriculture research institutes, 12 General Directorate of Rural Services research institutes and 22 Faculties of Agriculture are scattered around the country. Other individual governmental institutions such as the Scientific and Technical Research Organisation of Turkey (STRO-TUBITAK), the Association of Atomic Energy and Nuclear Research Centre (AAENRC) are involved in agricultural research. Apart from the state institutions, a few non-governmental organisations, which are mostly subsidiaries of international seed and agrochemical companies, carry out varietal adaptation studies and agrochemical tests.

Considering the magnitude of agricultural production and number of holdings, the distribution of research institutes over the 9 agro-ecological regions can be considered as fair. The spreading of resources around the country has enabled the regions, in spite of certain disparities, to receive a fair amount of agricultural research resulting in many positive effects in agricultural development. However, the regionalisation process has also had some negative effects such as the fragmentation of resources and decreased efficiency of overall co-ordination of the research system. New policies have been introduced since 1996 to eliminate the negative effects of this process.

Key words. Agriculture – Research – Regionalisation – Decentralisation – Priority.

Résumé. *L'institutionalisation de la recherche agricole en Turquie débute les toutes premières anées de la fondation de la République, au début des années 1920. Les premières institutions furent établies dans des sites centraux du pays, comme Ankara, Istanbul et Eskichir. Pourtant, pendant le développement du SNAR, de nombreuses institutions ont été créées pour couvrir tous les aspects de la recherche agricole dans les différentes régions. La diversité du climat, le type de sols, la couverture végétale naturelle et les caractéristiques socio-économiques des agriculteurs ont entraîné la régionalisation de la recherche agronomique.*

Le SNAR en Turquie comprend des institutions dirigées par différentes organisations. Actuellement, 52 instituts de recherche du Ministère de l'Agriculture, 12 instituts de recherche des Services Ruraux de la Direction Générale et 22 facultés d'agriculture sont dispersés dasn tout le pays. D'autres institutions gouvernementales spécifiques comme l'organisation de la Recherche technique et Scientifique Turque (STRO-TUBITAK), l'Association de l'Energie Atomique et le Centre de Recherche Nucléaire (AAENRC) sont impliquées dans la recherche agronomique. A côté des institutions d'Etat, plusieurs organisations non-gouvernementales – principalement des filiales de compagnies internationales de semences et d'agrochimie – effectuent des études d'adaptation variétale et des tests agrochimiques.

Etant donné l'ampleur de la production agricole et le nombre des entreprises, la répartition des instituts de recherche sur les 9 régions agro-économiques peut être considérée comme assez bonne. La répartition des ressources dans le pays a permis aux régions, malgré certaines disparités, de recevoir de nombreuses actions de recherche agronomique entraînant des effets positifs importants pour le développement agricole. Cependant, le processus de régionalisation a eu également quelques effets négatifs, comme la fragmentation des ressources et l'efficacité décroissante de la coordination du système de recherche. De nouvelles politiques ont été introduites depuis 1996 pour supprimer les effets négatifs de ce processus.

Mots-clés. *Agriculture – Recherche – Régionalisation – Décentralisation – Priorité.*

I – Introduction

Turkey has a total land area of 76.9 million hectares comprising the peninsula of Asia Minor (Anatolia) and eastern Thrace in south-eastern Europe. The country boasts fertile coastal regions as well as high mountainous plateaux. Numerous mountain ranges generally run parallel to the northern and southern

coasts, surrounding the central and east Anatolian plateau that rises from an elevations of 500 m in the west to over 2000 m in the east.

Turkey has 16 main soil groups. The largest are Calcareous Brown and Reddish Brown, located in the Central Plateau. About 80% of the soils suffer from moderate to severe erosion. In terms of plant nutrient contents, Turkey's soils are generally deficient in nitrogen and phosphorous but rich in potassium.

There are two distinct agro-climatic zones in the country. The Central Anatolian Plateau includes transitional zones and coastal areas. The former have long, cold winters and dry summers with annual rainfall of 250-450 mm. The latter have warmer winters and higher annual rainfall of 600-1000 mm. Diverse geo-climatic characteristics have enabled the development of a wide range of farming systems throughout the country under both rainfed and irrigated conditions.

Turkey is divided into 9 different agricultural regions with regard to the characteristics of climate, soil, natural plant cover, type of predominant land use, marketing and socio-economic characteristics. The regions can be further divided into 27 separate climatic sub-regions according to rainfall, temperature and relative humidity (Myzrak, 1988).

II – Historical Background and Development of the NARS

Historically, the National Agricultural Research System (NARS) of Turkey has developed along several distinct lines starting almost with the foundation of the Republic. The main goal of research efforts was to achieve self-sufficiency in food production during the early stages of establishment of the Republic. In the 1920s and the early 1930s, a few individual agricultural research (AR) stations and institutes were established in central locations of the country in various disciplines such as veterinary science, agronomy, horticulture and plant protection. These were followed by the establishment of soil and water research institutes (RIs) in the 1960s and fisheries RIs in late 1980s. During the development process, the numbers of RIs increased significantly and they became major component of the NARS.

In parallel, some higher education institutions in agricultural science were set up from the 1930s onwards and these later were developed into faculties of Agriculture, Veterinary and Aquaculture. The founding of new faculties of agriculture has been completed within the last decade. After the 1950s, a few separate single-commodity RIs were also established by other ministries in addition to those of the Ministry of Agriculture (MOA). Until recently, the MOA RIs reported to different disciplinary and commodity departments. Since the reorganisation of the MOA in 1991, all RIs have been administered by the General Directorate of Agriculture (GDAR). As the most recent development, an Agricultural Economics Research Institute (AERI) was established under the Council of Research, Planning and Coordination (CRPC) of the MOA in 1996 with responsibilities in the study of the role of agricultural policies in agricultural development and the economy. In the same year, the Agricultural Hydrology Research Institute was founded within GDRS.

During the development of the NARS, the varied climate, soil type, natural plant cover and socio-economic characteristics of the regions naturally resulted in the regionalisation of agricultural research (Anon., 1969).

III – NARS Structure and Its Regional Setting

The Turkish NARS is made up of research organisations of decreasing degree of size and importance as follows: 1) General Directorate of Agricultural Research (GDAR) of MOA, 2) General Directorate of Rural Services (GDRS), which is governed by one of the State Ministries, 3) the Universities, 4) several State Enterprises under different ministries, and 5) non-governmental organisations (NGOs).

Most of the agricultural research is performed by the MOA GDAR institutions (Annex 1). The GDAR has 51 research institutes spread through 9 Agricultural Regions. These institutes mainly carry out strategic, applied and adaptive research on field and horticultural crops, plant protection, agricultural economics, livestock, aquaculture, animal health, food and feed technology, genetic resources and production tech-

nology. Four of these RIs function as central RIs in field crops, horticulture, animal husbandry and animal diseases. Central RIs carry out mainly strategic and applied research in their fields. They also have national responsibilities for co-ordinating and guiding the research efforts of the regional research institutes in different parts of the country.

Eight regional research institutes are located in the Aegean, Black Sea, Mediterranean, «ukurova, Central Anatolia, South-eastern Anatolia, East Anatolia and Thrace regions. They perform applied and adaptive research on the improvement of agricultural commodities and agricultural productivity in their mandate regions. The remaining 39 specialised research institutes are responsible for conducting research in specific agricultural commodities. These institutes are established in appropriate locations such as for cotton, figs, olives, poultry and aquaculture in the Aegean region, for hazelnut, honeybee and aquaculture in the Black Sea region, for silkworm and viticulture in the Mediterranean, for wheat, water buffalo and livestock in Central Anatolia, for fruits in the east and for pistachio nut in South-East Anatolia.

Considering the magnitude of agricultural production and number of holdings, the distribution of RIs by region can be considered to be fair. Of the 9 agro-ecological regions, the Aegean region and Central North possess the largest number of institutes with 11 and 9 respectively. These are followed by Marmara-Thrace, South-East, Mediterranean, Black Sea, Central South and Eastern Anatolia with 7, 7, 5, 4, 4 and 3 RIs respectively. The fewest Institutes (2) are found in Central East but this region is also served by the institutes located in other parts of Central Anatolia.

The GDRS research institutes form the second most important component of the NARS. Currently, 12 research institutes are well distributed around the country (Annex 1). They conduct research on hydrology, soil and water conservation, irrigation and drainage, soil productivity, plant nutrition and mechanisation.

Several governmental organisations other than the GDAR and GDRS are involved in AR. The Atomic Energy and Nuclear Research Association of Turkey focuses on the use of nuclear techniques in plant nutrition and breeding, soil fertility, food storage and animal health. A number of state enterprises reporting to different ministries also carry out research on related commodities such as sugar beet, tea, tobacco and opium.

Faculties of agriculture (22), veterinary science (11) and forestry (12) are located in various parts of the country. They conduct a considerable amount of research in various fields in addition to teaching activities. Most research consists of student theses and/or work supported by the Scientific and Technical Research Association of Turkey (STRO-TUBITAK).

Apart from the governmental institutions, several non-governmental organisations, most of which are subsidiaries of international seed companies, carry out adaptation studies on imported plant varieties including vegetables, maize, sunflower, soybean, millet and safflower. Similarly, some agrochemical companies are involved in agrochemical evaluation activities. In addition, a few private companies and non-governmental organisations support a number of research projects such as the improvement of malting barley, chickpea, lentil and durum wheat. International institutions such as ICARDA and CIMMYT make a substantial contribution to the efforts of the NARS through collaborative research initiatives.

IV – Comparison of Human Resources and Research Funds in Relation to Land Resources and Households

The scientific human resources of the research institutes of NARS total 1360 persons, most of whom work for GDAR (1060) followed by GDRS (160) and others (130) (Table 1). Approximately 40% of the scientists hold an MSc. or a PhD and the rest are graduates. The technical support staff resources of these organisations are 550, 100 and 50 (700 in total) and there are 3000, 1334 and 266 (4590 in total) unskilled workers respectively. Faculties of agriculture, veterinary science and fisheries employ a total of 2858 teaching staff, of whom 1500 are academic staff and the rest research assistants. The most recent estimations suggest that total annual NARS research expenditure, including faculties, is between 80 and 90 million $US. In 1995, the figure was 56.7 million $US for GDAR and 9.3 million $US for GDRS.

Table 1. Human Resources of the Major Components of NARS as of 1996 *1

Organisation	Research Scientists	Support staff	Labor
General Directorate of Agricultural Research **(GDAR)**	1 060 *2	550	3 000
General Directorate of Rural Services **(GDRS)**	160 *2	100	1 334
Other Governmental Resarch Organizations	130 *2	50	266
Faculties of Agriculture, Veterinary & Fisheries	2 858 *3		
Total	4 208	700 *4	4 590 *4

*1: As of 1996; *2 Approximately 40 % hold a postgraduate degree; *3 1500 are academics and 1308 are research assistants;
*4: Excluding those in faculties

The GDAR, which is the largest component of the NARS, has established its RIs all around the country. The disparity between regions does not appear to be significant in terms of the number of institutes. However, there is a strong imbalance between the regions in terms of allocation of human resources and research funds in relation to land resources and holdings. In this respect, the 9 agricultural regions may be placed in two categories: developed and underdeveloped regions. This categorisation seems to be partly the reflection of the general pattern of economic development of the regions. In general, the developed regions (Central North, Aegean, Marmara-Thrace and Mediterranean) are in western and southern parts of the country while the underdeveloped regions (North East, Southeast, Black Sea, Central East and Central South) are located in eastern and northern parts.

In the developed regions category, the percentage (of national total) of scientists within the regions varies from 2.5 to 28.4 % and that of research fund allocation (RFA) through the nation-wide Agricultural Research Project (TARP) from 0.7 to 29.7 % in 1996 (Table 2). In the regions of this category, the share of research investment (scientists and funds) is higher than that of agricultural production capacity (arable land and households). In contrast to developed regions, the share of agricultural research investment is significantly lower than that of agricultural production capacity in underdeveloped regions. The imbalance is the greatest in South East Anatolia, which has a share of 3.8 to 5.0 % research scientists and RFA, against 21.3 to 8.9 % share of arable land resources and house holdings, respectively. However, the case of this region is unique. The well-known Southeast Anatolian Project (GAP), the most costly development project since the foundation of the republic, covers social, economic and agricultural aspects of development in the region. Through this, irrigation facilities for 1.7 million ha are expected to be created in the area. Within the framework of this initiative, the project implementing body, the GAP Development Management Office, run by a State Ministry, has been performing a multidisciplinary specific research programme, including agriculture, with «ukurova and Harran Universities. Thus, the region may be considered as sufficiently developed with regard to research capacity. However, current research establishments are must be further developed as part of the permanent research system of the region, constituting strong linkage with extension units and farmers for sustainable improvement of research effectiveness.

Table 2. The distribution of arable land, agricultural holdings and GDAR's research funds and researchers by agricultural regions

		Share of regions (%) in national total			
Agric. Region No.	**Region**	**Arable land**	**Agricultural holdings**	**Research budget ***	**Total research scientists**
1	Central North	14.8	11.9	19.3	28.4
2	Aegean	13.5	19.6	29.7	23.9
3	Marmara-Trace	8.6	8.0	13.3	11.5
4	Mediterranean	10.4	11.7	20.1	16.8
5	North East	3.9	5.8	3.6	3.9
6	South East	21.3	8.9	5.0	3.8
7	Black Sea	7.4	15.8	5.3	5.4
8	Central East	7.1	7.9	0.7	2.5
9	Central South	12.8	10.2	2.7	4.0
National Total		**18.246.028 ha**	**4.046.973**	**56.696.000 $US**	**1060**

* Provided through the TARP

The GDRS, the second largest contributor to the NARS, seems to be better-endowed in terms of distribution of research resources in the regions in comparison with GDAR Institutions. The human resources and research funds are distributed fairly among the regions, with the exception of Central Anatolia which receives considerably more resources. This is because Ankara accommodates, in addition to the standard GDRS institute, the Soil and Fertiliser Research Institute, which acts as a central institute serving the whole country.

The distribution of higher education institution resources in the regions is not well balanced. The developed faculties are basically located in the regions of Aegean, Central Anatolia, Mediterranean and to some extent in Eastern Anatolia. These receive a larger share of research/teaching personnel and budgets. Faculties in other parts of the country have been established relatively recently and are yet to develop both in terms of research budget, infrastructure and research/teaching personnel.

V – The Positive and Negative Effects Observed in the Regionalisation Process

In recent years, a gradual shift from government-oriented centralised agricultural research towards a decentralised approach has been observed. The regionalisation process has accompanied the development of the NARS. The objective of this approach has been to convey the agricultural research capacity to all parts of the country to meet the research requirements of all farmers and commodities. So far, this process has been continuing successfully to a great extent, with both positive and negative impacts on agricultural development.

The regionalisation process in agricultural research has had positive influences such as 1) efficient development and implementation of location-specific research, 2) direct and stronger interaction with farmers and research clients (bottom-up research approach), 3) prevention of imbalances in research resource allocation among the regions and 4) increased influence of agricultural research on the development of related agricultural industries and markets. However, together with positive outcomes, the regionalisation process has also caused some negative effects on agricultural development. Some of these are 1) the fragmentation of human, financial and infrastructural resources, 2) the duplication of research in some fields, 3) less efficient overall coordination of the research system and 4) relatively weaker integration and interaction among researchers and institutions.

It is envisaged for the future that the regionalisation process should continue to serve the development of the NARS provided that its negative effects are eliminated and the central authorities strengthened in order to ensure stronger coordination and control of the research systems. For this, new measures were taken in 1996 through the establishment of Research Master Plans (RMP) by the GDAR and GDRS.

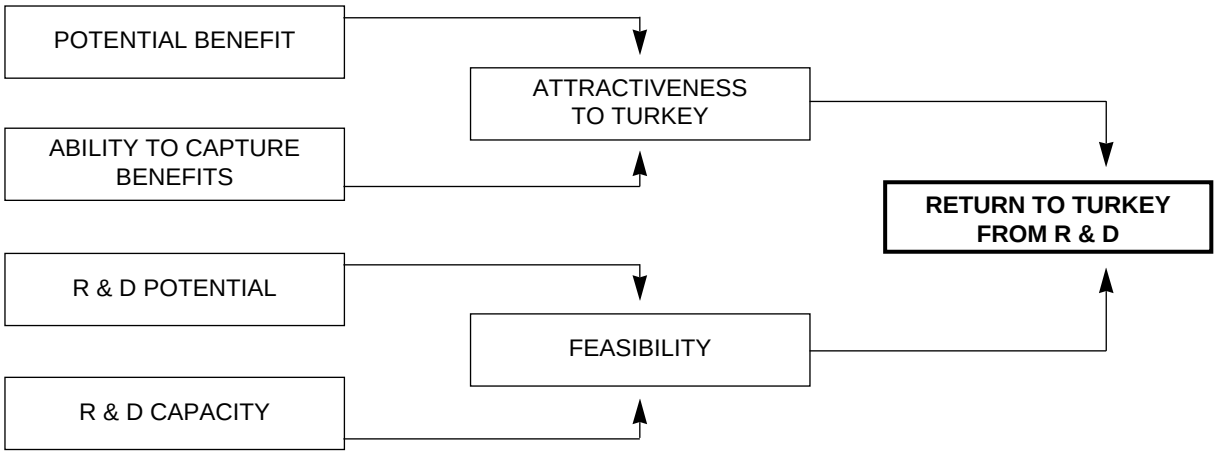
VI – Methodology and Criteria for Establishment of Priority Research Areas and Programmes

As the major player in agricultural research in Turkey, the GDAR of MOA determines major Research Priority Areas (RPA) in field crops, animal husbandry and diseases, aquaculture, and food and feed research. The first step of the procedure is the evaluation, assessment and review of on-going research activities, research resources and research requirements of agricultural production systems and development objectives. Selected RPAs are ranked by using priority-setting criteria based on potential benefit, ability to capture benefit, research capacity and research potential (Figure 1). In a similar manner, the priority of individual research programmes is determined within each RPA. The representatives of producers, processing industries, universities and other related organisations are actively involved in the priority-setting process.

Research projects proposed to the GDAR for funding are assessed by the Research Advisory Committees (RAC). The major criteria used for the assessment of projects are as follows: Relevance (degree to which it supports GDAR's research priorities, i.e. RPAs and Research Programmes), scientific excellence (literature reviews, objectives, design, analytical techniques, etc.), technology transfer potential, capacity, originality, collaboration, equipment requirements, training needs and cost effectiveness.

Proposals which meet the required criteria are funded by the GDAR (currently from TARP resources) following the signing of a contract between the project leader and GDAR. The project leader submits biannual reports, summarising project activities for monitoring and evaluation.

Figure 1. Research assessment framework illustrating the criteria which contribute to attractiveness and feasibility and, in turn, their contribution to the return to Turkey from R&D



VII – Current Major Research Programmes

The ministries involved in different aspects of agricultural research, establish their own priority research areas and programmes. Most agricultural research activities are carried out by the GDAR of MOA, followed by GDRS and Universities. The Ministries of Forestry and Environment also implement some projects associated with agricultural development but on a limited scale. Recently, the Ministry of Agriculture (GDAR), the GDRS and Ministry of Forestry have developed research master plans in order to improve their research capacities, each establishing well-defined research priority areas (RPAs) and within them research programmes (RP), through priority setting procedures.

Currently the GDAR of MOA have identified 17 RPAs (Table 3). Of the 17 RPAs, 6 are high priority (cereals, oilseeds and legumes, industrial crops, fruits, vegetables, ornamentals and livestock), 6 are medium priority (nuts, processed crop products, sheep and goat, forage crops and feeds, aquaculture and conservation of natural resources) and 5 are low RPAs (veterinary and agrochemical, poultry, apiculture, sericulture and processed animal products). Some of the current major high priority programmes identified under RPAs are improvement of yield, quality production of durum wheat, bread wheat, sunflower, chickpea and lentils, cotton, potatoes, medicinal crops, forage crops, bees and silkworm. Table potatoes, vegetables (aubergine type), root and tuber vegetables, pistachio nut, stone fruits, citrus and viticulture research are also high priority programmes. High priority programmes also cover integrated pest management of cotton, potatoes, vegetables and flowers-ornamentals, vineyards and orchards together with disease diagnosis and management of aquaculture, bees and livestock. Other additional high priority RPs are the efficient use of commercial fertilisers in crop production; animal vaccines, feeds and feeding systems for livestock and sheep, enhancement of reproduction of livestock, sheep and goats, economic performance of poultry, animal product diversity, the development of inventories, and conservation of aquaculture resources and plant genetic diversity. These research programmes total 84 together with medium and low priority programmes.

Table 3. Current allocation of resources to RPAs compared with the priority rating for the same RPAs

RPA	Current %	Priority*
Cereals	21.0	H ▼
Oil seed & food legumes	7.0	H ▲
Industrial crops	11.0	H ▼
Nuts	2.0	M ▲
Fruits	21.0	H ▼
Vegetables (Ornamentals)	15.0	H ▼
Processed food crops	<1.0	M ▲
Pharmaceuticals & Ag. Chemicals	6.0	L ▼
Dairy and beef	5.0	H ▲
Sheep	2.5	M ▲
Feeds and beef	1.5	M ▲
Poultry and fish	4.0	M ○
Other (apiculture & silk)	0.5	L ▲
Processed animal products	<1.0	L ▲
Natural resource base	<1.0	M ▲

* H= Highest priority (strong emphasis); M= Medium priority (selective emphasis); and L= Low priority (limited support). Fish would rate higher than poultry and apiculture higher than silk, if the combined RPAs (Poultry & Fish and Apiculture & Silk) were separated into separate RPAs.

▲ Increased future emphasis ▼ Little change in emphasis ○ Decreased future emphasis

The GDRS has determined 4 RPAs, namely management of catchments,, water, soil and investment, each consisting of 6 high or low priority RPs. The high priority RPs of the GDRS have been identified as water storage, impact of land use on catchment water regimes, protection of soil and water resources, conservation of moisture in fields, improvement of rangeland, optimisation of irrigation scheme operations, techniques for improving water use efficiency, optimisation of drainage systems in irrigation, fertility of Turkish soils, soil sustainability, profitability of agricultural investment projects, investments in land consolidation, investments in research, economic issues in agricultural developments, and financial models for rural communities.

Similarly, the Ministry of Forestry has identified 7 output-based research programmes. These are the protection, improvement and expansion of natural forests, fast growing plantations, major and minor forest products, forest industries, policy-related research, erosion control, improvement of rangeland and development of agro-forestry and sylvo-pastoral systems, the latter being awarded the highest priority and the strongest association with agricultural development.

Research priorities and programmes of the Universities are set up individually, according to their regional characteristics. However, the Agriculture and Forestry section of Scientific and Technical Research Organisation of Turkey (STRO-TUBITAK), provides research funds based on already established priority areas such as agronomy, crop protection, livestock and horticulture.

VIII – Research And Extension Linkage

The linkage between research and extension was not sufficiently effective in the past. It has been significantly improved recently, especially through the implementation of Agricultural Extension and Applied Research Projects (TYUAP). Existing linkages between research & extension services are as follows:

- Short & long term in-service training provided by researchers to extension staff,
- Periodic meetings for information exchange,
- Surveys for identification of opportunities, problems and their solutions,
- Employment of research and extension co-ordinators facilitating linkages with research institutes,
- Demonstrations and on-farm research trials,
- Implementations of extension programmes and distribution of printed materials to extension agents and farmers.

Through these links, all applicable research results are transferred from research to extension sites and the problems identified by extension agents are conveyed to researchers. Proposed extension programmes are reviewed at periodic meetings and the problems identified are included in research programmes following an evaluation process.

IX – Research Impact and Efficiency

The research service expanded from 1950s to the early 1980s, resulting in improved sources of operating funds, field and laboratory equipment. The technology developed during this period had a significant impact on development and the productivity of agricultural sector in many fields. Applied, rather than strategic, types of research were dominant and technical improvements were based on the needs of farming communities. The technical achievements were widely adopted by the producers of cereals, food legumes, certain fruit and horticultural crops and by processing industries of industrial crops such as cotton and tobacco.

According to Myzrak (1995), some examples of the adoption and impact of research technologies developed during this period are as follows:

❏ During the 20-year period from 1971 to 1990, the average yield of wheat, the most important widely cultivated crop in Turkey, increased from 1.5 t/ha to 2.1 t/ha with little or no increase in the area devoted to production. This represents a yield increase of 1.7% per year, which is similar to increases achieved in Europe and the USA. However, this has been achieved in Turkey under drier, harsher environmental conditions. Research contributed significantly to this increase by providing producers with higher yielding varieties and improved cropping practices.

❏ A threefold increase in the production of lentils and chickpea during the period 1980 to 1991 was the consequence of a research programme initiated in the 1970s to introduce pulses in the fallow phase of the fallow-cereal cropping system. As a result, Turkey has become one of the world's largest exporters of food legumes. Farmers adopting this system significantly increased their incomes and the cereal-legume production system is widely used today.

❏ The Turkish dried apricot industry now earns over $US80 million annually (1993) from exports. This success is a direct result of the development by researchers in partnership with the industry of a number of highly suitable apricot varieties and successful techniques for drying the fruit.

❏ There has been a fourfold increase in per-tree yield and an improvement in the quality of oranges grown in the southern Mediterranean region since the beginning of research in this area in the 1950s. The yield and quality increases have stimulated the development of domestic and export markets for citrus products.

❏ Research on hive design and selection of more productive bee populations has doubled hive yields, making the bee keeping significantly more profitable. Producers have responded rapidly to the opportunities created by research, resulting in higher national output.

❏ Significant advances have been made in animal health through the control of major endemic diseases. Most of the vaccines and other diagnostic kits and drugs to manage these diseases are now manufactured in Turkey as a result of research carried out in the national animal health laboratories.

Other examples of achievements could also be found, but it is impossible to quantify the contribution of all research activities to the related sectors since other factors also contribute to the adoption and impact of new technology. However, there are clear indications that the achievements of Turkey's research services have been important catalysts for developments in many agricultural industries.

X – Sector Development Objectives, Principles And Policies

The Turkish economy has become more market-oriented since the 1980s as a result of liberalisation and privatisation programmes. This has substantially affected agricultural sector and national research agenda. As a result, quality and production cost have became very important criteria for agricultural export products.

The objectives of agricultural development plans are set by government policies and executed through the five-year development plans prepared by the state planning organisation. The objectives have changed little over the last few decades and recent plans are based on social and research aspects of development (Anon., 1995a).

Current development objectives of the agricultural development programmes are 1) ensuring the sustainability of adequate levels of nutrition for the growing population, 2) increasing production and yields, 3) reducing the vulnerability of production to adverse biological and non-biological factors, 4) increasing levels of national self-sufficiency in agricultural products, 5) increasing agricultural income and improving income stability for farming communities, 6) increasing exports of agricultural products, and 7) improving the quality of rural life.

To achieve these objectives, Turkish Government has set up a science and technology improvement project. The main aim of this project is that of achieving an information society. Supporting the scientific and technological efforts has been determined as the basic principle for attaining this goal. Enhancing the diffusion of application of improved technology and attracting the contribution of public and private sectors in all areas of research together with the most productive use of information in decision-making periods is the focal point. The key elements of the current development plans are as follows:

❏ Technological infrastructure will be improved to raise the level of scientific and technological research, influencing economic and social development. The share of the R&D budget will be raised to 1.5% of GNP by the early 2000s and the number of researchers will be raised to 15 per 10,000 workers.

❏ Human power is the most valuable resource for Turkey and this will be the primary resource for any initiative. Experienced human resources will play a key role in the improvement of scientific and technological capacity. Heavy emphasis will therefore be laid on education and training.

❏ The private sector will be encouraged to increase R&D investments. Appropriate amounts of financial resources will be directed to science, technology, education, training and R&D areas on the grounds of social, economic and long-term national interests.

The science and development policy of the 7th 5-year development plan is equally applicable to the agricultural research system. In addition, unique features of the agricultural sector such as the economic, social, cultural and strategic characteristics of the regions will also be taken into account. Agricultural research will therefore provide one of the major inputs for the regional agricultural development programmes. All regional characteristics will be considered in these programmes and research systems will orient themselves according to priority-setting procedures.

In order to ensure harmony with the government's general development plans, the GDAR has initiated—through the establishment of RMP—a new research policy for the improvement of the agricultural research system (Anon., 1995b). The main features of the new policies are:

❏ Allocation of resources to priority research programmes,
❏ Involvement of all agencies concerned and clients in priority-setting processes,
❏ Output-oriented research programmes,
❏ Promotion of collaborative research among the research organisations including national, international, private and governmental institutions,
❏ Improvement of research knowledge, information and communication systems,
❏ Improvement of research and management information systems,
❏ Improvement of human resources,
❏ Improve the impact and relevance of the research service.

XI – Consequences of Development of More Powerful Communication and Documentation Exchange Technologies

Improvement of the means of communication within the GDAR headquarters and with the agricultural research institutes is one of the major components of the new research policy. Within this framework:

- ❏ Central Library Service has been established at GDAR headquarters in Ankara,
- ❏ GDAR has developed 3 basic types of scientific literature (selected text, reviews and scientific journals) and an on-line database to provide access to research literature collections held in other libraries in Turkey and abroad,
- ❏ GDAR has established a computerised local area network (LAN) to assist in improving communications, project management, word processing and other software applications, including on-line access to research information,
- ❏ GDAR is also considering linking (LAN) to a wider area network (WAN) to extend the communication network to important research institutes throughout Turkey.

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Appendix 1

The research institutes of GDAR and GDRS (with *) in 9 agricultural regions of Turkey

I. CENTRAL-NORTH ANATOLIA

PLANT PROTECTION RESEARCH INSTITUTE - ANKARA
ANIMAL HUSBANDRY RESEARCH INSTITUTE - Lalahan/ANKARA
POULTRY RESEARCH INSTITUTE - ANKARA
SOIL AND FERTILISER RESEARCH INSTITUTE - ANKARA *
ANIMAL HUSBANDRY RESEARCH INSTITUTE - Yerköy/YOZGAT
ANIMAL DISEASE RESEARCH INSTITUTE - Etlik/ANKARA
FOOT and MOUTH DISEASE INSTITUTE - ANKARA
TRANSITIONAL ZONE AGRICULTURAL RESEARCH INSTITUTE - ESKISEHIR
ANKARA RURAL SERVICES RESEARCH INSTITUTE - ANKARA *
ESKISEHIR RURAL SERVICES RESEARCH INSTITUTE - ESKYPEHYR *
CENTRAL RESEARCH INSTITUTE FOR FIELD CROPS - Lodumlu/ANKARA
AGRICULTURAL ECONOMICS RESEARCH INSTITUTE (under the CRPC of MOA) - ANKARA

II.AEGAN SEA REGION

AEGEAN AGRICULTURAL RESEARCH INSTITUTE - Menemen/IZMIR
COTTON RESEARCH INSTITUTE - Nazilli/AYDIN
OLIVE RESEARCH INSTITUTE - Bornova/IZMIR
VITICULTURE RESEARCH INSTITUTE - MANISA
FIG RESEARCH INSTITUTE - Erbeyli/AYDIN
PLANT PROTECTION RESEARCH INSTITUTE - Bornova/IZMIR
ANIMAL DISEASE RESEARCH INSTITUTE - Bornova/IZMYR

SHEEP RESEARCH INSTITUTE - Bandyrma/BALIKESIR
FISHERIES RESEARCH INSTITUTE - Bodrum/MUGLA
FISHERIES RESEARCH INSTITUTE - Egyrdyr/ISPARTA
POULTRY DISEASE RESEARCH and VACCINE PRODUCTION INSTITUTE - MANYSA
MENEMEN RURAL SERVICES RESEARCH INSTITUTE - Menemen/IZMYR*
AGRICULTURAL HYDROLOGY RESEARCH INSTITUTE - IZMYR *

III.MARMARA REGION

ATATÜRK HORTICULTURAL RESEARCH INSTITUTE - Yalova/ISTANBUL
ANIMAL HEALTH RESEARCH INSTITUTE - Pendik/ISTANBUL
TRACE AGRICULTURAL RESEARCH INSTITUTE - EDYRNE
VITICULTURE RESEARCH INSTITUTE - TEKYRDAD
FOOD TECHNOLOGY RESEARCH INSTITUTE - BURSA
LEATHER RESEARCH INSTITUTE - Kartal/ISTANBUL
CORN RESEARCH INSTITUTE - SAKARYA
KIRKLARELY RURAL SERVICES RESEARCH INSTITUTE - KIRKLARELI *
SERICULTURE RESEARCH INSTITUTE - BURSA

IV.MEDITERRANEAN REGION

MEDITERRANEAN AGRICULTURAL RESEARCH INSTITUTE - Aksu/ANTALYA
ÇUKUROVA AGRICULTURAL RESEARCH INSTITUTE - ADANA
HORTICULTURAL RESEARCH INSTITUTE - Erdemli/YÇEL
CITRUS AND GREENHOUSE RESEARCH INSTITUTE - ANTALYA
PLANT PROTECTION RESEARCH INSTITUTE - ADANA
ANIMAL DISEASE RESEARCH INSTITUTE - ADANA
PISTACHIO NUT RESEARCH INSTITUTE - GAZYANTEP
TARSUS RURAL SERVICES RESEARCH INSTITUTE - Tarsus/YÇEL *

V.NORTRHEAST ANATOLIA

EASTERN ANATOLIA AGRICULTURAL RESEARCH INSTITUTE - ERZURUM
HORTICULTURAL RESEARCH INSTITUTE - ERZYNCAN
ANIMAL DISEASE RESEARCH INSTITUTE - ERZURUM
ERZURUM RURAL SERVICES RESEARCH INSTITUTE - ERZURUM *

VI.SOUTHEAST ANATOLIA

SOUTH-EASTERN ANATOLIA AGRICULTURAL RESEARCH INSTITUTE - DYYARBAKIR
PLANT PROTECTION RESEARCH INSTITUTE - DYYARBAKIR
AGRICULTURAL RESEARCH INSTITUTE - Akçakale/PHURFA
PHANLIURFA RURAL SERVICES RESEARCH INSTITUTE - PHANLIURFA *

VII.BLACK SEA REGION

BLACKSEA AGRICULTURAL RESEARCH INSTITUTE - SAMSUN
HAZELNUT RESEARCH INSTITUTE - GYRESUN
BEE RESEARCH INSTITUTE - ORDU
FISHERIES RESEARCH INSTITUTE - TRABZON
ANIMAL DISEASE RESEARCH INSTITUTE - SAMSUN
SAMSUN RURAL SERVICES RESEARCH INSTITUTE - SAMSUN *

VIII.CENTRAL-EAST ANATOLIA

FRUIT RESEARCH INSTITUTE - MALATYA
ANIMAL DISEASE RESEARCH INSTITUTE - ELAZID
TOKAT RURAL SERVICES RESEARCH INSTITUTE - TOKAT *

IX.CENTRAL SOUTH ANATOLIA

ANIMAL HUSBANDRY RESEARCH INSTITUTE - KONYA
BAHRY DADDAPH INTERNATIONAL WINTER CEREALS RESEARCH CENTER - KONYA
BUFFALO RESEARCH INSTITUTE - AFYON
ANIMAL DISEASE RESEARCH INSTITUTE - KONYA
KONYA RURAL SERVICES RESEARCH INSTITUTE - KONYA *

Figure 2. Grouping of attractiveness versus feasibility for all AROs to give return to Turkey from R&D. Priority groups High, Medium and Low are indicated