

3. INSTITUTIONAL DEVELOPMENT PLAN FOR THE NEXT 4 YEARS

3.1. Scientific SWOT analysis.

NARDI Fundulea is a public research institution, having the mission to improve the living standards of Romanian farmers, by increasing their contribution to European field crop production. To improve its approach to the accomplishment of this mission, NARDI has to consider the strengths, weaknesses, opportunities and threats for its research activities:

Strengths

- NARDI mission implies a wide range of activities, from breeding new cultivars to improving crop management practices, to related fundamental research and to seed production of own cultivars. This has several important advantages, such as:
 - Direct on-farm effects of research results and feed-back from farms to research;
 - Crop management research can be linked from the beginning to the newly created germplasm;
 - A large variation of original germplasm, carrying useful genes, is available for fundamental studies and this ensures a good link between fundamental research and breeding programs.
- Location is representative for a large agricultural area, with significant stresses. This provides a competitive advantages in providing research results for stress environments;
- Traditions in breeding exist and have been passed on for decades;
- Genes for adaptation to stress environments accumulated in the NARDI original germplasm, over many decades;
- Some highly trained staff exists;
- Good reputation nationally and internationally;
- Nationally recognized for providing high quality consultancy at no cost;
- Strong links to local research priorities;
- Existing cooperation with International research centers and partnerships with breeding programs worldwide;
- Existing infrastructure allows some competitive research approaches;
- There are possibilities for increased international visibility:
 - NARDI site in English
 - NARDI publishes an ISI indexed scientific journal in English.

Weaknesses

- Lack of a reliable core financing → Opportunistic research to meet various competition objectives;
- Failure to find sufficient alternative sources of revenue;
- Some research without foreseeable beneficiaries or chances of international competitiveness are still continuing;
- Low ability to continuously adjust research programs to fit farmers needs;
- Infrastructures and labs need extensive maintenance, upgrading and renovating with little funds to do so → infrastructure not sufficient to attain world-class level
- Reduced development of fundamental research
- Insufficient international visibility in fundamental research
- Low competitiveness for European research projects funding
- Insufficient merit-based system of promotion or incentive/reward system for employees;

- Many scientists are resistant to change and fear of competition.

Opportunities

- Growing demand for scientific solutions in farms, especially related to new emerging problems;
- A "farmer first" policy for all NARDI staff can be enforced;
- Good possibilities to strengthen transfer, extension and consultancy services;
- The new law for agricultural research allows some core financing;
- Opportunities for training young researchers abroad exist;
- Increased awareness among scientists on the scoring of journals, citation index and impact factor;
- Good possibilities to expand international partnerships;
- Opportunities to work collaboratively with agricultural universities and other research institutions in research and extension;
- Most competitors try to import scientific solutions less adapted to local stress conditions. Niche targets can be found where local scientific solutions have clear competitive advantages. Predicted climate changes are expected to increase these advantages;
- The World Bank project for restructuring labs premises has started.

Threats

- Apparent conflict with EU “state-aid” regulations;
- Insufficient publicity in areas of NARDI excellence, value and quality;
- Keeping pace with the rapid technological changes regarding infrastructure is more and more expensive;
- Budget limitations because of economic slowdown;
- Recruiting and retaining young people in research is difficult with present salaries;
- Improving retention rates by lowering academic standards which can lead to decreased institutional value, reputation, and negative perception from the community;
- Scientists might become over-proportionally involved in less qualified work because of a shortage of technical personnel;
- Large seasonal weather variations and extreme weather events can delay research results.

3.2. Financial SWOT analysis.

The SWOT analysis of NARDI scientific activities is necessarily linked with the financial SWOT analysis, which has to include both budget financing and financing by own resources. The financial objective of NARDI is to ensure the resources for normal functioning and development of its research projects, using every available source.

Strengths

- The NARDI overall economic activity has been profitable, with profits invested in research and infrastructure.
 - *Budget financing*
 - NARDI has a good record of successful proposals at research projects national competitions.
 - *Own resources*
 - Revenues from seed production are based on competitive breeding research, directed towards adaptation to local conditions;

- Competitive advantages of adapted cultivars;
- Market share leadership in wheat, triticale, alfalfa etc.
- Loyal customers;
- World Known Brand, present on some segments of international market;
- Cost advantage due to the fact that NARDI activity is not directed to obtaining the highest profit

Weaknesses

- *Budget financing*
 - Insufficient participation at national research projects competitions;
 - Low competitiveness for European funds.
- *Own resources*
 - Low market share in maize and sunflower;
 - Limited flexibility as state owned institution;
 - Insufficient communication and marketing activity;
 - No online presence;
 - Occasional failures in providing high quality seed affect NARDI brand credibility;
 - Seed processing capabilities need up-dating;
 - Revenues from seed production are highly dependent on weather conditions and therefore unpredictable.

Opportunities

- *Budget financing*
 - The new law regarding the agricultural research allows some core financing;
 - NARDI's prestige should result in a relatively larger share of agricultural research budget
- *Own resources*
 - Emerging markets and expansion abroad;
 - Niche target markets can be found;
 - Many competitors promote less adapted cultivars, not tested in local conditions. NARDI can take advantage of this competitors' vulnerability;
 - Ultimately it is the client who decides if the end product is useful and meets their needs;
 - Large opportunities of developing online advertising and consultancy; Use of new social media;
 - New partnerships can be developed. Partnering with large seed producing farms;
 - Developing market research programs.

Threats

- *Budget financing*
 - Uncertainties in implementation of the new law regarding agricultural research;
 - Competitions for national research projects have been erratic and much delayed;
 - Research budget limitations related to crisis and small share of the budget for agricultural research;
 - High competition for limited research funds.
 - Difficulties in complying with the regulations regarding co-financing the research projects (In agriculture it is hard to find enterprises willing to co-finance research projects, when application of research results cannot be restricted to the co-financer).
- *Own resources*
 - Highly competitive market;
 - Economic slowdown;



- Rapid technological changes. New technologies for which NARDI is not competitive;
- Changes in market demands;
- Unfair competition from international giants;
- Competitors offer more farmer friendly, flexible programs (e.g. payment at harvest, packages of inputs);
- Extreme weather events.

Based on the SWOT analysis the action plan for NARDI institutional development attempts to maintain and build on the existing strengths, take measures to remedy weaknesses, make most of the opportunities and try to counter the threats. For this purpose:

- NARDI reexamined its strategic scientific objectives and directions. These will be further developed through a Institute wide dialogue on future strategy and tactics for development, based on detailed SWOT analyses for each research team;
- NARDI adopted a human resource strategy, corresponding to the overall strategic scientific objectives and directions
- We intend to use budget crisis as a way to become more innovative, eliminate non-essential research, in order to become more productive at most competitive research domains, making sure that lack of funds does not cause NARDI to give into lowering standards and having less qualified scientists or lower quality research.

3.3. Strategic scientific objectives and directions.

For best serving the farmers community, based on an analysis of the resources available for the development of Romanian agriculture and of the factors that limit their full use, and based on a prognosis of internal and external markets evolution, and taking into consideration the scientific potential available on national and international level, NARDI established the following main strategic directions:

1. to improve farm economic results, by increasing the efficiency of using natural resources and technological inputs, for a sustainable agriculture, in the context of climate changes;
2. to improve quality of field crops production, according to market and consumers' requirements, for better competitiveness on internal and international markets;
3. to develop fundamental research, meant to open new ways of progress in applied research.

The corresponding objectives were established taking into account the SWOT analysis. They maintain and build on the existing strengths (expertise in a wide range of domains, existence of breeding material that accumulated many genes essential for adaptation, international cooperation with leading research institutions, etc.) and try to make best use of identified opportunities (growing demand for scientific solutions in farms, predicted climate changes that will increase the need for local scientific solutions). The objectives are also meant to alleviate some of the presently identified weaknesses, by discontinuing the research projects that lack foreseeable beneficiaries or chances of international competitiveness, and by better adjusting research programs to fit farmers' needs.

The main scientific objectives corresponding to the three strategic directions are presented below:

1. The living standard of Romanian farmers, and their contribution to European field crop production depend on their access to less expensive crop management practices, capable

to increase input use efficiency, and an efficient use of natural resources, for sustainable, performing field crops production.

This implies improving, by genetic and/or crop management ways, the capacity of plants to use available resources and the tolerance to less favorable conditions. For example, water available from rainfall is, in most regions of Romania, far from being sufficient for a full expression of the yielding potential, water availability being one of the main limiting factors affecting Romanian agriculture more than most of EU agriculture. Likewise, large areas with acid or eroded soils, with low Nitrogen or Phosphorus availability, negatively affect Romanian agriculture competitiveness. Without better yields on these areas, Romanian agriculture cannot be competitive on European and global level. At the same time, research has to find ways to reduce production costs, by promoting less expensive and more efficient crop management practices.

Therefore NARDI will continue and intensify research on the following objectives:

- **Improving the germplasm of main crops for drought and extreme temperatures resistance.** This includes research to allow wider use of more tolerant crops (e.g. sorghum), to exploit available genetic variation of main crops, and to widen the genetic variation by using wild relatives and genetic;
- **Adapting crop management practices to predicted climate changes,** for better conservation and more efficient use of water from both rainfall and irrigation;
- **Improving the germplasm of main crops for increased nutrient use efficiency and tolerance to unfavorable soil conditions.** This includes research for increasing genetic variability by using wild relatives and genetic manipulation, as well as research that should allow wider use of crops more tolerant to such conditions (e.g. Triticale).
- **New low cost crop management systems with higher input use efficiency.** A special attention will be given to **conservative agriculture**, including identifying or breeding cultivars adapted to conservative crop management;
- **Improved integrated, environmental friendly crop management practices to prevent and control weed, disease and pest infestation;**
- **Increasing bio-diversity of field crops,** by diversifying crops and cultivars and optimizing crop rotation, according to environmental conditions, farm types and market requirements.

2. The present meaning of quality includes not only the concentration of some components essential for the nutritional or end-use value, but also the appeal to the consumer and mainly the potential effect on consumers' health (lack of toxins and residues, vitamin mineral and anti-oxidants content etc.). In this wide sense, quality has become a main concern and an essential condition for entering the European and, more and more, the internal market. Therefore a special attention will be given to such objectives as:

- **Improving the germplasm of main crops regarding the genetic potential to accumulate essential quality components,** including biologically active and high nutritional components, by exploiting genetic variation available inside cultivated crops and in related wild species;
- **Crop management and plant protection systems to minimize accumulation of toxic or potentially damaging compounds and to favor accumulation of components with favorable effect on human health.** This includes breeding disease and pest resistant cultivars, to reduce the need for chemical control;
- **Crop management practices and cultivars for organic agriculture,** to allow economic results competitive with traditional agriculture.

3. Fundamental research, meant to open new ways of progress in applied research, has lagged behind at NARDI, mainly because low financing caused insufficient infrastructure development and lack of attractivity for young researchers. To have a significant contribution to solving major problems of field crop production, fundamental research at NARDI should focus on the following directions:

- Genetics, molecular genetics, genomics and proteomics, to open new prospects in breeding future cultivars;
- New breeding approaches to shorten the duration of cultivar creation and to accelerate genetic progress;
- Research on physiology of yield and quality formation, to identify new ways of improvement. Development and adaptation of mathematic models for crop growth, yield and quality simulation, and their coupling with tele-detection will be approached;

3.4. The human resource strategy.

In comparison with the present situation, the human resource strategy (synthetically presented in table 3.4.1.) proposes an increase in the number of scientists involved in the strategic research, mainly regarding quality and safety of agricultural products, but also in modeling, applied biotechnologies, and molecular genetics. An increase in the number of scientists is also proposed for researches on organic and conservative agricultural systems and on germplasm improvement of key crops.

Table 3.4.1

Proposed personnel structure and evolution for the period 2011 – 2015

	2011	2012	2013	2014	2015
Total personnel	354	352	349	347	344
Research & Development personnel	252	251	249	247	247
Scientific researcher I	14	15	16	16	17
Scientific researcher II	7	9	11	12	13
Scientific researcher III	14	13	15	16	14
Scientific researcher	6	9	11	13	17
Assistant researcher	18	14	16	14	13
IDT I	8	8	7	7	7
IDT II	-	1	1	1	-
Technicians + Lab. assistants	185	182	172	168	166
Marketing	5	5	5	5	5
Administration	65	64	63	63	61
Economists + Law counselor	21	21	21	21	20
Management (inclusive CA*)	11	11	11	11	11

* NOTE: CA (Administration Council), includes, according to HG 1882/2005 regulations, 4 representatives of NARDI Fundulea, 4 representatives of Ministries (Ministry of Education and Research; Ministry of Public Finances; Ministry of Agriculture and Rural Development; Ministry of Labor, Family and Social Protection) and one representative of the Academy of Agricultural and Forestry Sciences.

The total number of attested research personnel should increase during 2011-2016 by 20, out of which: 3 Scientific Researchers I, 6 SR II and 11 SR, so that in 2015, the research personnel structure will be more balanced, reaching: 28% SR I, 28% SR II, 21% SR II and 23% SR III.

The increase in the number of highly qualified researchers will be accompanied by a reduction of auxiliary technical personnel, by 39 positions, out of which 33 in the first three years. This reduction of technical personnel should however be balanced with a significant improvement in mechanization and automation of field and lab activities, to avoid the threat that scientists might become over-proportionally involved in less qualified work.

The total number of employees will gradually decrease (by 15 in the first year and by 2-5 in the following years), so that by 2015 the reduction will reach 25 de positions.

To reach the proposed personnel structure, along with the attestation of existing personnel, an important activity of recruiting and specialization of young people, to the level required by the integration in the European Research Area, is planned

The human resource strategy includes:

- evaluating the activity and confirmation of the existing research personnel;
- improving the merit-based system of promotion and the incentive/reward system for employees;

- a common program with the University for Agricultural Sciences and Veterinary medicine București and other agricultural universities, for carrying out PhD research at NARDI, in order to improve the formation and increase the efficiency of selecting future researchers;

- a common program with the University for Agricultural Sciences and Veterinary medicine București and other agricultural universities, for specializing a number of students from the last years of study, or MSc students, for the research activity;

- organizing specialization courses for young researchers, at the Institute or at other research and education institutions;

- taking advantage of all opportunities for specialization at advanced research and education institutions abroad, in modern research domains.

These measures should contribute to reducing the existing gaps between generations in research potential.

3.5. Mechanisms for stimulating the appearance of new research directions.

One of the identified weaknesses of NARDI scientific activity is a relatively low ability to continuously adjust research programs to fit farmers' needs and certain inertia in approaching new research projects. This is partially due to the existing financing system, which favours project offers that fit into a rather conservative pattern, not related to specific emerging problems encountered by the farmers.

To remedy this weakness, and taking into account the opportunity offered by the growing demand for scientific solutions in farms, especially related to new emerging problems, a program shall be put in place, in cooperation with the extension institutions and farmers' representatives, to explore new research directions and objectives. To finance projects approaching these new research directions and objectives NARDI will explore attracting non-public funds and/or will use own resources.

3.6. Infrastructure: investment plan and strategy.

The need of developing the infrastructure was estimated based on the existent infrastructure and on evaluating the requirements for a modern approach of own research priorities. The investments necessary for developing the infrastructure, corresponding to NARDI priorities, are presented in table 3.6.1.

Table 3.6.1

Requirements for infrastructure improvement

Nr.	
1	Supplementing and modernizing controlled climate facilities
2	Equipments for experimental fields and for on-farm research
3	Laboratory equipment: - for quality and safety of field crops production; - for plant biotechnology and physiology research; - for cytogenetics research; - for soil fertility research; - for mycology and toxicology research; - general use equipment
4	Informatics
5	Library
6	Modernizing research buildings

Controlled climate facilities are essential for accelerating genetic progress through extra-generations, as well as for advancing research on modeling, stress response, biotechnology etc. A new greenhouse was recently purchased and is functional. However, further efforts are considered necessary for extending and improving controlled climate facilities.

Using the opportunities offered by the national program “Capacities” a significant investment was made in equipments for the Molecular genetics lab. To increase the contribution of this lab to the germplasm improvement program, and to keep pace with the technological advances in the field, further investments in equipment for molecular analyses are considered necessary.

NARDI Fundulea owns a set of adequate experimental field equipment, which has been recently partially updated. However, it is necessary to further supplement this equipment, especially in view of developing on-farm research.

A considerable investment is necessary for up-dating and supplementing laboratory equipment. A priority is the equipment for quality and safety research, cytogenetics, biotechnology, soil fertility, plant protection etc.

Up-dating and supplementing is also necessary for IT, including new computers and software, as well as modernizing the network. The library needs funds for acquisition of new publications and for modernization.

NARDI has at its disposal sufficient labs spaces. The restructuring and modernization of these premises, to adapt them to new functional requirements, are planned using funds from a World Bank project.

3.7. Technology transfer and the attraction of non-public funds.

The main ways for the transfer of NARDI research results to farms have long been:

- Producing and promoting seed of new NARDI bred cultivars;
- Recommending best crop management practices, through leaflets, articles in agricultural extension publications, courses, interventions at radio or TV etc.
- Organizing field days for wheat and barley, sunflower and soybeans, as well as for maize, where new cultivars and crop management demonstrations are presented;
- Providing seed of main NARDI cultivars for on-farm demonstration plots;
- Providing consultancy, assistance and collaborative support.

Despite the proved efficiency of these approaches, there are still large segments of the farmers’ community that are not sufficiently informed about NARDI offer of scientific

results. This applies especially to a large number of “new farmers”, with very little agricultural education.

There is still insufficient publicity in areas of NARDI excellence, value and quality, leaving place for scientifically incorrect publicity from some competitors.

Despite the high costs involved, the technology transfer activity has to be improved by:

- increased presence on mass-media;
- better publicity to increase participation at field days;
- better promotion of NARDI cultivars;
- use of the large opportunities to develop online advertising and consultancy as well as to use of new social media.

NARDI has not been very efficient so far in attracting non-public funds. This can be partially explained by the fact that the large number of small farmers lack financial resources, and by the reluctance of large farmers to invest in obtaining research results that cannot be for their exclusive use, and will be anyway available to every farmer. Further efforts are necessary to identify reliable, interested, partners and to form private-public partnerships, capable to attract more funds to research activities.

3.8. Strategic partnerships and visibility: events, communications, collaborations

NARDI shall work to develop strategic partnerships with:

- Agricultural universities;
- Public and private extension services;
- Other public and private research institutions;
- Large seed-producing farms;
- International research organizations;
- Private companies involved in agricultural research.

The functional integration Research-Education-Extension will receive increased attention. In this triangle, NARDI plays the role of:

- Main generator of information for the education and extension systems;
- Partner with the universities research in obtaining new information;
- Employer of specialists formed by the education system;
- Beneficiary of information gathered by the extension systems about the current problems of agricultural production and about the expectations and effects of applying research results.

To improve the efficiency of this integration, NARDI will work towards:

- Developing the cooperation with the research activity carried on in the agricultural universities, and especially in the University for Agricultural Sciences and Veterinary medicine București, by the formation of a consortium between NARDI and Agronomy and Biotechnology Faculties, in view of coordinating the research activities and inserting students in research activities. Cooperation with other agricultural research institutes will also be developed;

- Establishing a common program with the University for Agricultural Sciences and Veterinary medicine București and other agricultural universities, for specialization in research activity of a number of students from the last years of study and of MSc students;

- Establishing a common program with the agricultural universities, for carrying out PhD research at NARDI, in order to improve the scientific formation and increase the efficiency of selecting future researchers;

- A larger involvement of NARDI scientists in the formation of extension specialists.

Strategic partnerships with large seed-producing farms will also be developed in order to accelerate adoption of the genetic progress provided by newest NARDI cultivars. These partnerships have become essential with the drastic reduction of the area available for seed production at NARDI and at agricultural research stations.

International research organizations, such as the International Center for Maize and Wheat Improvement (CIMMYT), have been traditional partners for NARDI, providing very valuable germplasm, testing data and information. Expanding international partnerships will continue to be a high priority in NARDI's institutional development plan.

NARDI visibility has to be improved both nationally (as presented in the 3.7 chapter) and internationally. For this purpose NARDI will work on:

- continuously improving the content of NARDI Website, both in Romanian and English;
- increasing quality of NARDI's scientific journal published in English, while maintaining its "open journal" status;
- maintaining and improving relevant participation to international scientific congresses, conferences and symposia, especially for young scientists;
- extending and improving the cooperation with important research institutions from abroad.