

3. PLAN OF INSTITUTIONAL DEVELOPMENT OF NATIONAL INSTITUTE OF RESEARCH-DEVELOPMENT FOR MACHINES AND INSTALLATIONS DESIGNED TO AGRICULTURE AND FOOD INDUSTRY - INMA (2012 – 2015)

3.1. SCIENTIFIC SWOT ANALYSIS

The strategic position of the institute, using the managing SWOT technique is the following:

1. STRENGTHS

- a) Institute owns a modern, competitive and multifunctional research infrastructure with multiple users, which allows to:
 - test and evaluate the technical and functional performances of equipment appropriate to different domains (agriculture, food industry, industrial constructions, electro-technique, rolling stock, defense equipment, etc);
 - optimize the technical and architectural solutions necessary to build the equipment and installations;
 - ensure the monitorization and traceability of processes;
 - ensure the obtaining of rapid and secure results through simulated, accelerated or virtual methods;
- b) High-qualified pluridisciplinary human resources with abilities and competences already confirmed;
- c) Institute is the main provider of technical and scientific specialty expertise in Romania in the field of agricultural engineering; specialty data bases;
- d) Powerful relational system developed (communication – information – collaboration) within the research community and academic environment ;
- e) Competitive results of research activity, among which a part has been already implemented in economic environment and has a good visibility;
- f) Research career high attractiveness level for young specialists and performant researchers;
- g) Institute scientifically substantiates and develops innovative technologies, products and services which are able to be directly applied to economic environment;
- h) Continuity of research-development and innovation activities within the same headquarters since 1927 (since the establishment) and up today.

2. WEAKNESSES

- a) Reduced level of entrepreneurship culture;

- b) Low connection with business environment for rapid technology transfer to economy;
- c) Reduced promotion of patents of EPO or TRIADICE type;
- d) Poor access to fundings promoted by EU (FP7; EUREKA; COST; etc);
- e) Publications of the institute have poorly penetrated the international market.

3. OPPORTUNENESS

- a) Existence of a legal framework, implemented by EU related to:
 - Life, health and environment (air, water, soil) protection through Regulations, Directives, Harmonized Norms, Norms);
 - Increasing the soil output when its natural features are preserved;
- b) Necessity of adapting the mechanizing technologies of agricultural works to climate changes with severe consequences on soil: soil erosion, drought, desertification;
- c) Increasing the quantity of natural food necessary at global level;
- d) Increasing the non-pollutant energy quantity obtained from renewable sources-biomass;
- e) Orienting and boosting the technical/technological progress by forming and promoting clusters and enhancing consume sector;
- f) A new EU industrial policy – 2020 adapted to globalization era – INDUSTRIAL INNOVATION and innovation request and its quality increasing;
- g) Rural development has created the premises of increasing the level of mechanizing technologies and automating the processes;
- h) Developing new interest domains, such as: energies obtained from renewable sources, biotechnologies, organic and ecological farming;
- i) Current policy of optimizing the structure of energetic base and technical equipment for different agricultural enterprises;
- j) Necessity of life-long training of adults in rural environment, in order to acquire relevant skills and new technical competences.

4. THREATS

- a) Severely reducing the financial resources assigned to RDI¹ activities, relevant to respective field;
- b) Partially applying the RDI policies promoted by EU;
- c) Accelerated rhythm of technological changes leads to obsolete equipment;
- d) Big salary differences between the institute researchers and those belonging to EU member states, in the relevant domain;

¹ RDI= research, development and innovation

- e) Increasing the amount of products, technologies and appropriate services of internal and external (EU) market, which are not always genuine and high quality products.

3.2. STRATEGIC SCIENTIFIC OBJECTIVES AND DIRECTIONS

3.2.1. SCIENTIFIC OBJECTIVES OF NATIONAL INSTITUTE OF RESEARCH-DEVELOPMENT FOR MACHINES AND INSTALLATIONS DESIGNED TO AGRICULTURE AND FOOD INDUSTRY - INMA

The institute main objectives for the next period 2012 – 2015 are the following:

1. Mechanizing technologies and technical equipment adapted to climate changes for:
 - Protecting the agricultural lands;
 - Preventing and fighting against the drought and desertification phenomena;
2. Mechanizing technologies and technical equipment aimed to enhance the agricultural fields output and processes designed to preserve structural quality, eliminating soil erosion and degradation;
3. Substantiating and achieving new smart technical equipment, appropriate to concept of PRECISION AGRICULTURE for:
 - applying natural fertilizers related to local necessities of agricultural fields (soil type, grain structure, GPS);
 - locally destroying the weeds on ecological field exploitations;
4. Substantiating and achieving new mechanizing integrated technologies suitable to new energy crops (poplar, willow, cinara pedunculum)
5. Modernization and energetic optimization of technical equipments used in vegetable production, horticulture, aquaculture and fisheries:
 - with increased reliability;
 - with installed optimized power and minimum power consumption;
 - driven by means of renewable energy sources;
 - remote operating interface on basis of foreseen maps;
 - multifunctional equipment achieving more than one operation at a single passing;
6. New mechanizing and automating technologies of processing the vegetable and horticultural products;
7. New technologies of setting up, maintaining, harvesting and capitalizing the biomass;
8. Researching and energetically optimizing the primary agricultural products processing (transport, handling, conditioning, storage);
9. Substantiating, creating and extending expert techniques and systems for scientific management of small and medium-sized agricultural enterprises.
 - assessing the bonity of agricultural lands;

- optimum structure of technical equipment + energetic sources + human resources;
 - foreseen maintenance system;
10. Conceiving and achieving new active parts for different working regimes and pedoclimatic conditions;
 11. Increasing the institute visibility within the scientific community, in economic and business environment through high quality and efficient results implemented.

3.2.2. ACTING DIRECTIONS

1. Ensuring the financial resources for an optimum development of the relevant activities;
2. Improving the personnel technical-scientific expertise by domains and research teams expertise as well;
3. Creating partnerships with key authorities (ministries, agencies, local authorities) and direct beneficiaries (farmers, associations, trade-unions, employers unions);
4. Boosting the technology transfer and extending the good practices to specific fields, by ensuring consultancy, technical assistance, results dissemination, assessing and certifying the conformity of performances of technologies and technical equipment manufactured/ implemented /commercialized, EPO patents;
5. Supporting the life-long training of beneficiaries' human resources for improving and creating of new professional competences appropriate to new mechanizing techniques and technologies transferred/ implemented to economic environment/ agricultural enterprises;
6. Participating with specific project proposals in competitions of local, national, European or international research programmes;
7. Ensuring an environment appropriate to developing the research activities, partnership, dissemination and technology transfer of knowledge, manufacturing technical projects, technical plans, etc.

3.3. HUMAN RESOURCE STRATEGY

The targets and acting directions of the institute related to human resources field are the following:

3.3.1. GOALS

1. Reducing the research staff average age from 45 years at the present moment, to 40 years in 2016;
2. Increasing the researchers professional competences by assimilating new state-of-the art techniques and methods on realistic grounds;
3. Increasing the researchers mobility and responsibility (3 out of 5);
4. Attracting/ employing/ collaborating with Diaspora researchers, who have a high expertise level obtained in different foreign universities, research institutes. (At least 5 persons attracted from USA and Canada);

5. Increasing the share of PhD engineers and PhD students up to 60 % out of the whole of researchers;
6. Enhancing intellectual property obtaining and legitimacy related to patents, articles, medals, diplomas quoted and recognized by scientific research community;
7. Orienting and supporting the most valuable researchers in order to create spin-off enterprises. The goal aimed is that up to 2014, at least 5 spin-off enterprises should be established;
8. Forming pluridisciplinary research teams comprising researchers of different specializations, technological development engineers, experts in testing the performances of models, products, technologies achieved and, at the same time, intellectual property specialists;

3.3.2. ACTING DIRECTIONS

1. Employing and supporting the graduates to become scientific researchers by specific tutorial, assessment, monitoring and professional promotion only on basis of results recognized by research teams of the institute and scientific community. Yearly are employed at least 12 graduates;
2. Creating a solid and responsible environment to develop the activities of research, training, perfecting and evaluating the results and competences;
3. Identifying, supporting, facilitating and stimulating the professional hobby of researchers related to technical and technological pluridisciplinary processes (acting in maximum interest area, organizing work-shops focused on precise issues, professional/pecuniary motivation);
4. Periodically monitoring the evolution, results and performances of each researcher/researching team (half-yearly, yearly);

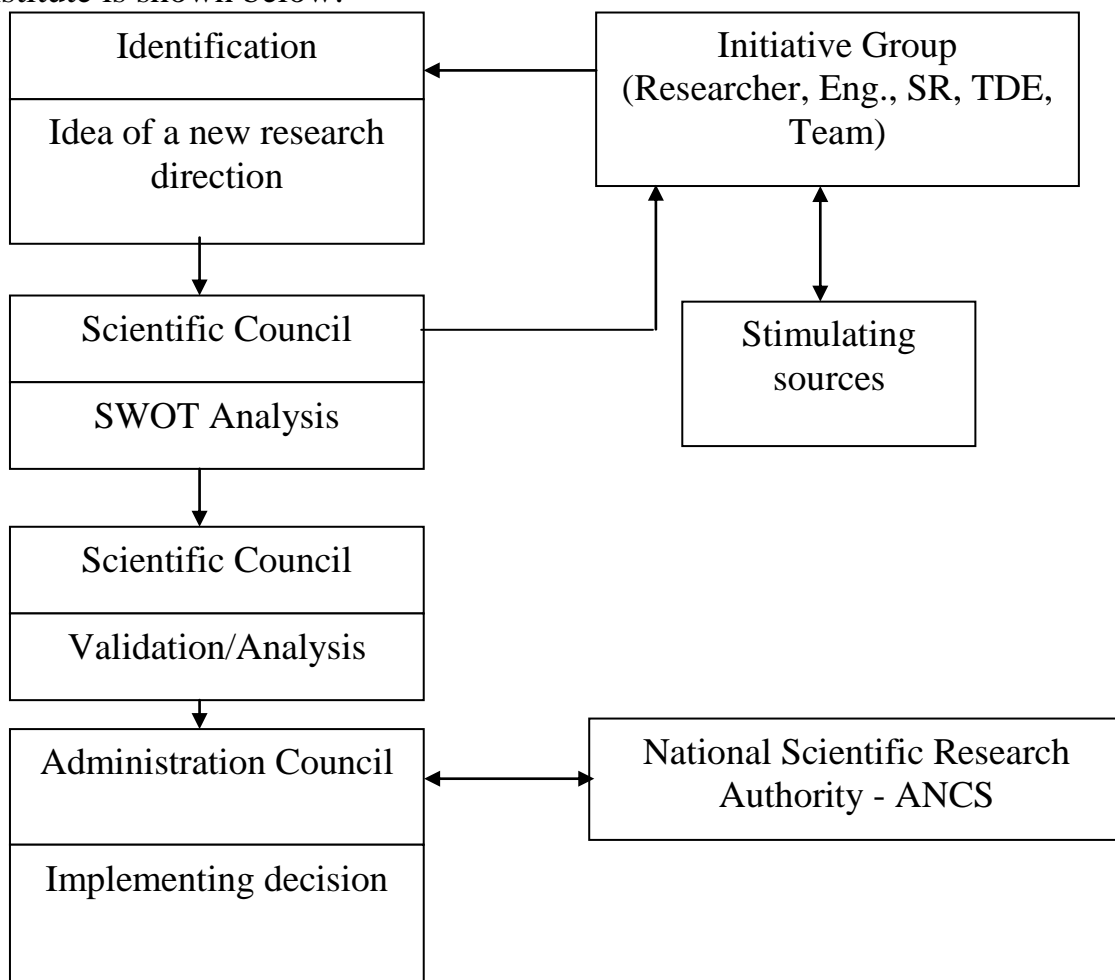
3.4. MECHANISM FOR STIMULATING THE APPEARANCE OF NEW RESEARCH DIRECTIONS

Within the institute developing strategy, the mechanism aimed at finding new research directions has started from the concrete analysis of market demands (economic background, business environment, authorities requests, etc), and optimized the production, the chain of organization and distribution at the relevant level of enterprises which absorb the research results.

- Sources of enhancing the emergence of new research directions developed within the institute are as it follows:
 - a) Evolution of legislative background of the relevant field at national, European or international level (regulations, norms, directives, standards); e.g. Directive of machines, noise, low voltage, irrigation water, fertilizers and phytosanitary treatments for plants, etc);

- b) results/conclusions /decisions /requests established together with PROFESSIONAL ORGANISMS IN THE FIELD (PACTMAR, APIMAR, FNPAR) or with ACADEMIC ORGANIZATIONS (ASAS), FACULTIES IN THE FIELD (UPB, USAMV);
- c) researches and initiatives of researchers and technological development engineers in the institute, as a result of new emerging technologies;
- d) ideas, trends, viable practices, demonstrated and substantiated in workshops, symposia or conferences, which are recognized by the research community in the field of technologies and technical equipment designed to agriculture and food industry;
- e) particular requests of certain users categories (farmers involved in vegetal crops, livestock, horticulture, rural development, medicinal plants, technical plants, etc);
- f) practices and demands of specific markets at national, EU or international level;

- Logical scheme of mechanism generating a new research direction within the institute is shown below:



3.5. SWOT FINANCIAL ANALYSIS

Financial analysis of the institute during 2007 – 2011 is shown by a series of indicators, which are found in annual financial standings, as an image of economic and financial management, human resources management, as well as management of research, development and innovation aimed to implementing the specific strategy.

1. STRENGTHS

- a) Realistic financial policy aimed to draw up the Income and Expenditure Budget BVC based on real values of agreements;
- b) Achieving the level of financial indicators proposed (productivity, rate of profit) according to commitments assumed;
- c) Efficient use and economic-financial management of institute patrimony;
- d) Efficient financial informatics system appropriate to research activities specific to institute;
- e) Diversifying the financial sources and continuously monitoring of financial elements appropriate to each project type;
- f) Promoting all the forms of economic-financial relations allowed by laws in force in order to facilitate the technology transfer to absorbing entities.

2. WEAKNESSES

- a) Reduced financing level of research activities;
- b) Economic agents poor possibilities of participating in projects, as a result of financial situations limiting the results implementation;
- c) Reduced capitalization level of intellectual property patrimony existing within the institute;
- d) Difficult specific laws related to projects multiannual funding.

3. OPORTUNENESS

- a) European policy context most favorable to research;
- b) Developing the infrastructure by using national and international sources;
- c) Increasing the access to funding and logistics support of economic agents, which achieve technologies, products or innovative services;
- d) Increasing the innovation request on global (internal EU, international) market.

4. THREATS

- a) Diminishing the funds designed to research-development-innovation activities;
- b) Specific legislation difficult to enforce;
- c) Intensifying competition on knowledge market, achieved by research centers with outstanding financial potential;
- d) Lack of motivation of researchers.

3.6. INFRASTRUCTURE: INVESTMENT PLAN AND STRATEGY

The goal of research infrastructure development during 2012 – 2015 is the institute to become a CENTRE OF COMPETENCE IN RESEARCH AND SUBSTANTIATION OF TECHNOLOGIES OF MECHANIZING THE AGRICULTURAL PROCESSES SUITABLE TO CLIMATE CHANGES.

Based on Cost – Benefit analysis, the institute Scientific Council has established the following conditions:

- New investments should be integrated according to existing endowment and infrastructure;
- Investment quality level should reach state-of-the art investments, by using financial sources attracted;
- Utilization of capacity of conception of institute researchers in order to assimilate, optimize and implement the components specific to each investment.

Investment Plan 2012 – 2015

Den. No.	Year	Objective	Investment denomination	Tangible assets	Intangible assets	Estimated value RON/ EURO
1.	2012	Optimization of active / passive parts of technical equipment	Mobile installation for substantiating and assessing the profile and architecture of active/passive parts designed to soil works	*	*	700.000 / 175.000
2.	2012	Bonity / Quality of agricultural lands	Mobile installation for assessing the agricultural lands bonity (upgrade)	-	*	500.000 / 125.000
3.	2013	Setting up the energetic balance of agricultural processes mechanizing technologies	Mobile installation for assessing the energetic balance of agricultural processes mechanizing technologies (upgrade)	*	*	900.000 / 225.000
4.	2013	Evaluating the safety level of mobile technical equipment	Installation for assessing the traffic safety level of agricultural equipment on	*	*	1.200.000 / 300.000

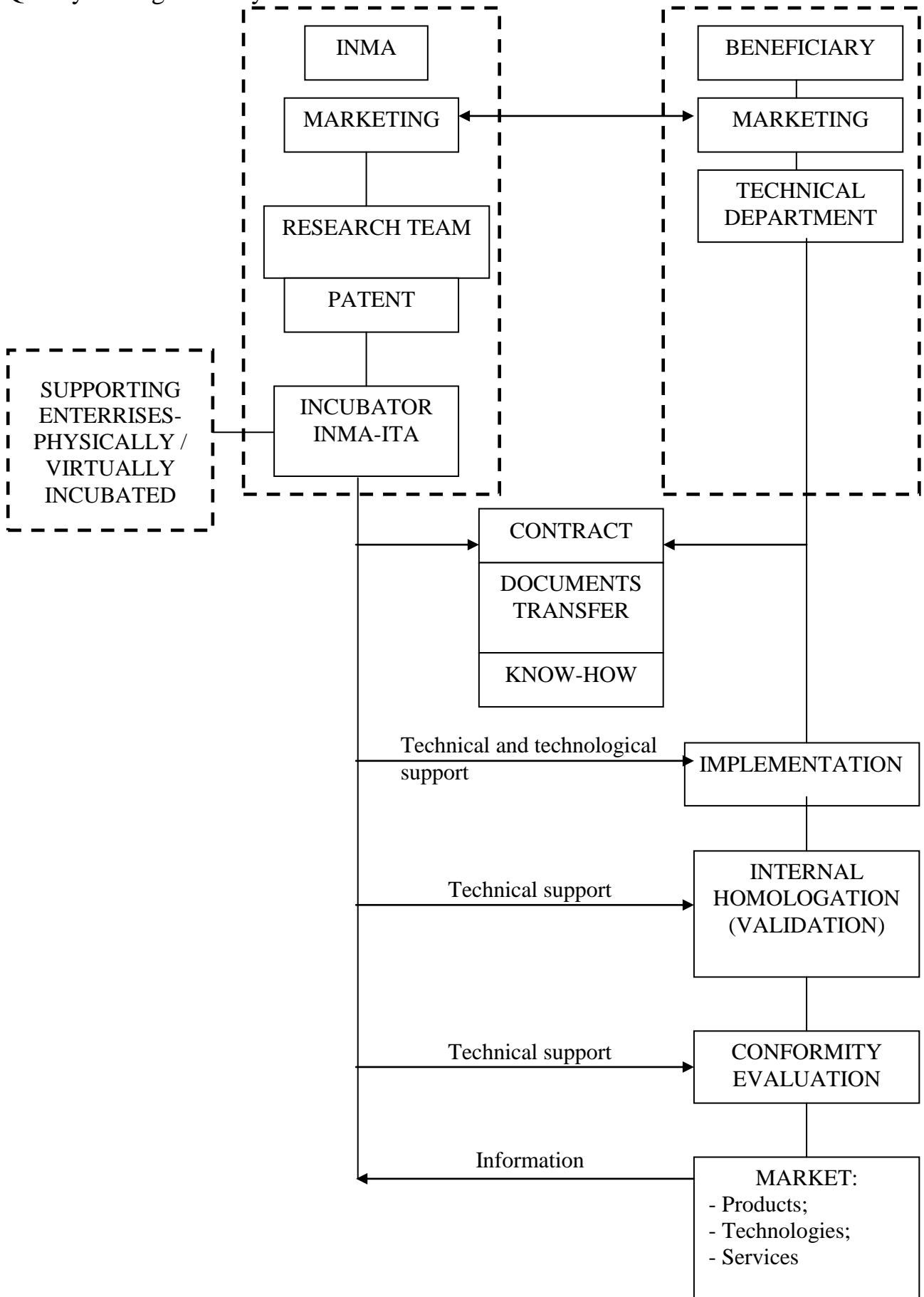
Den. No.	Year	Objective	Investment denomination	Tangible assets	Intangible assets	Estimated value RON/ EURO
			public roads (upgrade)			
5.	2014	Span of life of technical equipment used in agriculture	Testing installation in simulated and accelerated regime – Hydropulse type(upgrade)	-	*	700.000 / 175.000
6.	2014	Determining the agricultural aggregates stability during the slope works	Mobile installation for assessing the agricultural aggregates stability	*	*	1.000.000 / 250.000
7.	2015	Achieving functional and experimental models	Technical equipment appropriate to agricultural engineering manufacturing	*	*	2.000.000 / 500.000
8.	2015	Scientific substantiation, technical solutions and punctual measurements	Equipment appropriate to design and measurements	*	*	1.000.000 / 250.000

3.7. TECHNOLOGY TRANSFER AND ATTRACTION OF NON-PUBLIC FUNDS

Taking into account the fact that technology transfer represents the process by which knowledge, mechanizing technologies and technical equipment substantiated and achieved within the institute are transferred to relevant industry or farmers, in the context of latest years positive experiences, the institute aims at intensifying these activities.

The entire success of a technology transfer depends on the type of technology transferred (researching team), receiver (beneficiary) and market position after implementing in production. The decisive factor of this relational system is given by the knowledge level of beneficiary's personnel and his technical endowment. Therefore, the institute has been focused on facilitating the technology transfer by ensuring the technical assistance of implementation and supporting the beneficiary employers in order to improve their professional competences during the technical documents , procedures and methodologies implementation.

The logical scheme of technology transfer applicable to institute according to Quality Management System is shown below:



ACTIONS AIMED ATTRACTING NON-PUBLIC FUNDS

The institute strategy of attracting NON-PUBLIC FUNDS is focused on the following actions:

- Achieving agreements with representative organisms (EMPLOYERS ASSOCIATION OF AGRICULTURAL TRACTORS AND MACHINES IN ROMANIA – APIMAR; NATIONAL FEDERATION OF ROMANIAN MANUFACTURERS – FNPAR, etc);
- Creating the partnerships of participation in project calls with the direct beneficiary (during the project running is also achieved the know-how transfer);
- Creating an increased visibility of own research results through dissemination and promotion performed by marketing department and business incubator;
- Creating a data base for monitoring the actions and information related to transfer evolution, including the post selling, in order to boost quality and increase beneficiary trust;
- Organizing and participating in brokerage actions;
- Intensively participating in national technological platforms, which founding member is „MANUFUTURE” and „FOOD FOR LIVE”;
- Supporting the substantiation of economic activities of SMEs in the field in order to extend their activity outside the European Union.

3.8. STRATEGIC PARTNERSHIPS AND VISIBILITY: EVENTS, COMMUNICATIONS, COLLABORATIONS

According to long-term developing strategy of the institute, achieving strategic partnerships and improving the visibility of research-development and innovation activity results represents forefront elements of the institute future.

Therefore, during 2012 – 2015, the institute Scientific Council aims to strengthen and extend the agreements concluded with the principal traditional actors, and also with others, such as:

At internal level, with:

- Institutes and research centers of Academy of Agricultural and Forestry Science – ASAS; Universities of Agricultural and Forestry Science in Bucharest, Iași, Cluj and Timișoara, in order to harmonize different crops biological elements to most efficient mechanizing technologies;
- National Research and Development Institutes under the coordination of ANCS and Technical Universities in Bucharest, Iași, Cluj, Timișoara in order to access the research infrastructures and identify the institute future researchers among the participating students;
- Economic and business background, professional associations in order to provide knowledge, new results and increase personnel professional competences:

- Chamber of Commerce and Industry of Romania and with County Chambers (Bucharest, Dolj, Prahova, Iași, etc);
- Ministry of Agriculture and Rural Development, County Agricultural Chambers;
- Employers Association of Agricultural Tractors and Machines Manufacturers in Romania, PACTMAR;
- National Federation of Romanian Manufacturers – FNPAR;
- Romanian Association of Technology Transfer – AROTT.

At external level, with:

- Research Institute for Fishing and Irrigation (HAKI), Szarvas, Hungary;
- Godollo for Quality Testing, Hungary;
- European Hygienic Engineering & Design Group (EHEDG), Frankfurt, Germany;
- Leibniz Institute for Agricultural Engineering Potsdam-BORNIM, Germany;
- Texas A&M University-Corpus Christi, Department of Mechanical Engineering, USA;
- Committee of Agricultural Engineering of the Polish Academy of Science;
- Research Institute for Mechanization in Agriculture - VIM, Moscow, Russia;
- Turkish Chamber of Agricultural Engineering, Ankara, Turkey.

• PARTICIPATION TO INTERNATIONAL INVENTION EXHIBITIONS, with international jury committee

According to INMA strategy related to increasing visibility of research results, during 2007 – 2011, the research teams participated with patents/patent demands in 13 International Exhibitions. Prizes obtained, as well as the estimations for the subsequent period (2012-2015) are at it follows:

Den. No.	Exhibition name	
	Obtained results during 2007 - 2011 (prizes and medals / patent, patent demand)	Proposed results 2012 - 2015
1	INVENTIKA - Bucharest, Romania	
	2 WIPO prizes: 2007 – RO 120941; 2010 – RO 123067 14 Gold Medals: 2007 – RO 120941; A 00781 2008 – A 00532; A 01012 2009 – RO 122401; A 00466; 2010 – RO 123067; A-00939; A-00020 2011 – RO 123242; RO 123369; RO 123311; RO 123333 3 Silver Medals: 2008 – A 00781; 2009 – A 00945 2010 – RO 123043;	2 WIPO prizes 15 Gold Medals 5 Silver Medals 2 Bronze Medals

Den. No.	Exhibition name	
	Obtained results during 2007 - 2011 (prizes and medals / patent, patent demand)	Proposed results 2012 - 2015
	2 Bronze Medals: 2007 – A 00543; 2010 - A-00958 2011 - A-00959 2 Special Awards: 2009 – Group of inventions 2010 – Group of inventions	
2	Geneva, Switzerland	
	1 Gold Medal: 2008 – A – 01012 2 Silver Medals: 2011 – RO 123104; RO 123157 1 Special Award: 2008 - A 00532	1 Gold Medal 2 Silver Medals 2 Bronze Medals
3	EUREKA (INNOVA) - Brussels, Belgium	
	2 Gold Medals: 2009 – RO 122401; 2010 – RO 123043 3 Silver Medals: 2011 – A 00493; A 00781; A 1 Special Award: 2010 – RO 123043	2 Gold Medal 2 Silver Medals 2 Bronze Medals
4	Hanover Messe - Germany	
	5 Special Awards: 2010 – A 00216; A 00544; A 00554; A 00917; A 00918 2011 – A 00918; A 01013; A 00020	5 Special Awards
5	iENA - Nurenberg, Germany	
	2 Gold Medals: 2011 – RO 123239; RO 123242 1 Silver Medal: 2010 – A-00493 3 Special Awards: 2010 - A-00493 2011 - RO 123239; RO 123242	2 Gold Medal 2 Silver Medals 4 Special Awards
6	ARCA - Zagreb, Croatia	
	1 Gold Medal: 2008 – A 00020 1 Silver Medal: 2008 – RO 121802 1 Special Award: 2008 - RO 121802	3 Gold Medal 3 Silver Medals
7	Warsaw, Poland	
	2 Silver Medal: 2008 – RO 123043; Ro 122401 1 Bronze Medal: 2008 - RO 123104	1 Gold Medal 2 Silver Medals
8	Moscow, Russian	
	1 Bronze Medal: 2010 – RO 123104	2 Silver Medals

Den. No.	Exhibition name	
	Obtained results during 2007 - 2011 (prizes and medals / patent, patent demand)	Proposed results 2012 - 2015
9	INFOINVENT - Chisinau, Moldavia	
	1 Gold Medal: 2011 – RO 123311 2 Silver Medals: 2011 – RO 123369; RO 123242 1 Bronze Medal: 2011 – A 00959	2 Gold Medal 3 Silver Medals
10	ECOINVENT - Iași, Romania	
	2 Gold Medals: 2007 – RO 120941; 2008 – RO 121802 1 Silver Medal: 2007 – A 00543	3 Gold Medal 2 Silver Medals
11	PROINVENT - Cluj-Napoca, Romania	
	1 Silver Medal: 2008 - A 01012 1 Bronze Medal: 2007 – A 01291	1 Gold Medal 2 Silver Medals
12	INVENT-INVEST SIR 20 - Iasi, Romania	
	1 Gold Medal: 2010 - A 00216; A 00544; A 00554 1 Special Award: 2010 - A 00216	1 Gold Medal 2 Silver Medals
13	International Congress for Researches and Inventors – Bucharest, Romania	
	1 Gold Medal: 2008: A-00493 3 Special Awards: 2008 - Group of inventions	1 Gold Medal 1 Silver Medals
	Total: 2 WIPO prizes 25 Gold Medals 16 Silver Medals 6 Bronze Medals, 17 Special Awards	2 WIPO prizes 32 Gold Medals 28 Silver Medals 6 Bronze Medals 9 Special Awards

- **Communicating / publishing the INMA researches during 2012-2015.**

As a general rule, INMA researches publication aimed to widely disseminate the results obtained and demonstrate the viability of extent and multiplication of technologies, products and services appropriate to economic and business environment. Research teams have published mostly in national magazines and less in international ones. Drawing up the institute magazine „INMATEH - Agricultural Engineering” has also played an important role in research results dissemination.

Nowadays, this magazine can be characterized as it follows:

- Evaluated by CNCSIS (National Council for Scientific Research belonging to High Education System) and recognized with B+ category.

- Bilingual Romanian-English editing, 3 issues per year.

- Indexed in the following international data bases:

1. ULRICHS (Ulrichs Web Global Serials Directory) - since May, 2010;

- <http://ulrichsweb.serialssolutions.com/login>

2. CABI since III-rd trimester, 2011

- <http://www.cabi.org/cababstracts>

3. Romanian editorial platform SCIPIO since 2011

- <http://www.scipio.ro/>

- Since 2011 it has been introduced within the project „National Electronic Access to Scientific Research Literature – ANELIS”

- www.inmateh.eu

Starting with 2012, the magazine will be submitted to evaluation by SCOPUS international data base and will be improved in order to obtain ISI category.

At the same time, prestigious international paths will be accessed in order to publish the institute research outcomes and the institute will actively participate in international congresses, conferences in its activity field.