

Transformation of National Agricultural Research and Innovation Systems to increase agriculture productivity of the countries Central Asia and Southern Caucasus

SYNTHESIS REPORT

The Caucasus and Central Asia



Tashkent, 2011

ABBREVIATIONS

AIS	- Agrarian Innovation Systems
AIC	- Agro-industrial complex
CACAARI	- Central Asia and the Caucasus Association of Agricultural Research Institutes
GDP	- Gross Domestic Product
GCAR4D	- Global Conference for Agricultural Research for Development
ICT	- Information-Communication Technologies
RI	- Research Institute(s)
NARS	- National Systems of Agricultural Research
AR4D	- (System) Agricultural Research for Development
CAC	- Central Asia and the (South)Caucasus
MDG	- Millennium Development Goals

The Report was originally written in Russian; any grammatical or orthographical inaccuracy appeared here is responsibility of translators into English.

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ANNOTATION
to the Synthesized report on
«Transformation of national systems of agricultural research and innovations to
increase efficiency of agriculture»

1. Methodology, recommendations and orientation (alignment) for compiling national reports¹

The report synthesizes the national reports of eight countries of Central Asia and South Caucasus: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan². Methodology and structure has been developed for compiling national reports³. The basic task in view is disclosing and discussion of the following questions: how systems of agricultural research and innovations should be transformed and are transformed at present according to national priorities in agricultural research. In turn, priorities of agricultural research are based on the problems, revealed and stated in national reports, and needs of branches of agriculture, such as:

- Plant growing, the basic crops, also including fruits and vegetables,
- Animal industries
- Land tenure
- Water use (an irrigational infrastructure, management and salinity)
- Fish farming
- Forestry and wood products
- Agro-biodiversity
- Trans-boundary diseases
- Climate change
- Desertification
- And others, specific to each country

An important aspect at definition **of national** priorities is its ranging, as it allows synthesizing **regional** priorities of agricultural research, which will become a basis of drawing up of Regional strategy of transformation of system of agricultural researches and innovations. For realization of the given problem, and for exception of duplication of work of national experts, it was recommended to use the synthesized report⁴ of 2010, which has already described the current status and problems of national systems of agricultural research.

It is necessary to notice, that basic distinction between national reports of 2010 and of the current year is that, Regional strategy should give clear answer to the question: how systems of agricultural research and innovations should be transformed according to

¹ More detailed recommendations on drawing up National reports are presented in [Attachment No.1](#).

² The given (synthesized) report, states the synthesized information on 8 countries listed (hereinafter) as the English alphabet: Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan. The author of the given report uses names of these countries as they are resulted in the given report, and admits that other names, for example "Republic Uzbekistan" instead of "Uzbekistan" can be an alternative, and does not mean by it any political context.

³ For more detailed proposed structure you can refer to [Appendix No. 2](#).

⁴ «Brief Report and Conclusions on Activity of the World Conference on agricultural research for development (WCARFD) in Central Asia and Caucasus» -S.P.Beniwal, Leading consultant, CACAARI, Tashkent, Uzbekistan

national priorities in agricultural research. This activity needs to be fulfilled for the purpose of increase efficiency of agriculture, unlike the conducted work in 2010, when questions were discussed on what spheres of system of agricultural research should be transformed, and why these transformations should have effective impact on improvement of agricultural' production.

Thus, the basic questions in the field of AR4D in the region of Central Asia and Southern Caucasus have been defined in the previous stage, which were formulated in six assignments:

- i) Food security
- ii) Improving living standards and well-being
- iii) Environment' protection
- iv) Realization of required structural reforms
- v) Solution of special tasks (both existing, and future)
- vi) Strengthening national systems of agricultural research

Following the results of electronic discussions and advisory meetings, the most important research themes for the region have been identified: 1) System of introduction and distribution in agriculture; 2) Systems of agrarian research; 3) Plant growing; 4) Water resources and irrigation; 5) Climate change and desertification; 6) Research of animal industries; 7) Fruit-and-vegetable growing; 8) Mountain agriculture; 9) Biological diversity; 10) Seed production; 11) Marketing and sale of agricultural production; 12) Issues of participation of women; 13) Pastures; 14) Forestry; 15) Standard base and a policy of agricultural development; 16) Communications, partnership and interaction, and others.

Following the results of work of 2010, six basic elements have been allocated, which are important for maintenance of agricultural development, and improvement means of farmers for existence:

- i) Strengthening system of innovations (Research, education and introduction),
- ii) Maintenance of availability of technologies,
- iii) Developing favorable strategy for creation conditions of conducive strategy, including high volumes of investments into agricultural research and development, and also into agrarian sector, for overcoming “deficiency of investments”, and solution of gender issues,
- iv) Increase input supply base of farmers,
- v) Diversification incomes of farmers and agricultural population,
- vi) Rendering farmers services in processing after harvesting, trade etc.

The basic problems and opportunities, which systems of agricultural research are facing now include creation of technologies, dissemination of knowledge and introductions, which have been stage by stage discussed at national, regional and global level at GCARD conference in Montpellier in March, 2010. The conference identified necessary changes in systems of research and innovations.

As it was underlined at GCARD-1 conference, in countries, where the agriculture is traditional, its research and technical potential is financed at the expense of state. AR4D in many countries is not adapted for solving questions on increase efficiency of agriculture for the purpose of increase profitability of activity of agricultural production, and improvement well-being of the population, by increase of food security. Average volumes

of investments on agricultural research in percentage, out of contribution of agriculture to gross national product in developing countries, make 0,58 %, in comparison with 2,4 % in the developed countries.

GCARD-1 Road Map proposes for realization continuous process of reforms and capacity building, directed on mobilization of all potential of agricultural knowledge and the innovations, called to satisfy the requirements, related to developments in the field of agriculture and the foodstuffs. The Road Map proposes the plan from six points on transformation of agricultural research, with a view of its development all over the world, which, in its turn, requires actions to be taken by everyone, who is engaged in creation, maintenance of availability and application of agricultural knowledge:

1. Need in the general focus to the key priorities, defined and solved by science and a society;
2. Necessity of true and effective partnership between research and those, to whom it serves;
3. Increase in investments for the solution of huge future problems, and maintenance of demanded return with a view of development from AR4D;
4. Capacity building of all subjects for creation of agricultural knowledge, for its exchange and application for development' issues;
5. Availability of the working relations, allowing building in research wider context of development, and the actions, providing real progress in development.
6. Improvement quality of demonstration and awareness on impact, with a view of development and return from agricultural innovations.

Considering importance and usefulness of GCARD' Road map, it was recommended for the national experts, to take into consideration positions of the road map, and its maintenance, during development National strategy of AR4D' transformation.

According to the conclusions of Road map GCARD-1, Systems of AR4D should be transformed, in order to be able to:

1. Establish the basic priorities and measures of AR4D defined by national, regional and global requirements for development;
2. Promote equal participation and transparency of activity of all interested parties in agricultural innovations;
3. Take measures on increasing investments in personnel, institutional and financial resources in order to adequately solve arising problems, and to reach planned objectives;
4. Develop required personnel and institutional capacity for generation of actual agricultural knowledge, and its introduction in practice, and receiving results;
5. Develop innovative activity, according to programs and a policy of development;
6. Cover productivity of the activity by means of conducting monitoring and evaluation, and the reporting.

However, in the course of transformation and strengthening of national AR4D systems, there are deterrents, which are outside the limits of the competence of AR4D, but still requiring the contribution from AR4D for finding solutions. These factors, constraining development, include:

1. Insufficient financing of AR4D, and lack of regulations on increase of investments into agricultural research, that is reflected in its productivity, owing to which,, activity of national systems of agricultural research is seen as not effective.
2. Insufficient attention to many aspects of agriculture, including: the favorable political conditions, the appropriate government, institutional and personnel capacity, to developing marketing and access to the markets, infrastructure, financing, mobilization of farmers both local businessmen, management of the related risks; all of these factors impact on an agricultural production, and productivity of both farmers, and rural households.
3. Insufficient interrelation between research processes and development programs, in particular, there exists an urgency on creation favorable conditions, investments and mechanisms for development of rural areas, as well as such questions, as nutrition, health and the markets.
4. Lack of involvement of all corresponding parties in agricultural research, technological developments, programs and training measures.
5. Complexity in definition national priorities and AR4D' objectives, and shortage of effective mechanisms for realization of the given priorities in practice, through national and regional organizations of AR4D, for the purpose of creation of equal partnership, and carrying out corresponding research for the solution of social and economic problems, food security and ecological stability.

6. National reports

Originally, national experts have carried out considerable work on studying condition and strategy of development of agrarian sector, increase efficiency of agriculture. Reports have been prepared in the course of teamwork by means of electronic discussions between Secretariat of CACAARI, and national experts, which should become a component of National strategy on transformation systems of agricultural research and innovations, with a view of increase of agriculture' efficiency.

Considering the fact, that Regional strategy on AR4D' transformation should be based on the national priorities, specific features of national approaches, programs and a policy by realization of positions, principles and priorities of Road map GCARD-1, it was provided, that National strategy should be discussed at national level with participation of all interested AR4D parties, and decision making persons..

Proceeding from the aforesaid, it is impossible to confirm: do the national reports reflect the standard positions of national strategy of transformation AR4D, or are they conclusions of research work of the national expert? Nevertheless, national reports have been prepared on the basis of the available statistical data, the published documents, and national programs, and the development strategy.

7. Problems and assumptions in compilation of the Synthesized report

The assignments on drawing up of national reports didn't set conditions on necessity of providing the official, exact and authentic statistical data, in details reflecting an economic

and social situation of the country, and its agricultural population, a financial and economic condition of subsectors and agrarian and industrial complex' branches, condition of production, available capacities and potential. Providing sources of information also was not set as requirements to national reports. Lack of the above-stated requirements is explained by the planned discussion of the content of reports, and the resulted data at the national level.

The divergence of values of the statistical data, resulted in national reports, and the data from other sources, accessible in the Internet, has caused certain complexities in interpretation of the synthesized information. There are data from national reports in the basic part of the synthesized report, while in appendices, the available data was received from the Internet, in particular from FAOSTAT, AQUASTAT and Economywatch. If for any reasons, there is no certain statistical information in the national report, in the synthesized report, the information was used from other sources, accessible on the Internet. This became necessary with a view of providing the synthesized data.

It should be noted, that divergences in the statistical data are also available among various sources of information on the Internet.

The other problem in drawing up of national reports is definition of an indicator of a share of investments into agricultural research in Gross Product of agriculture. As it has been noted in the Road map of GCARD1, «Average volumes of investments on agricultural research in percentage from the contribution of agriculture to gross national product to developing countries make 0.58 %, in comparison with 2.4 % in the developed countries». Along with this statement, financing of agricultural research is also mentioned in the Road map. Lack of the accurate definition, that includes this indicator, has caused certain difficulties at calculation investments' volume in AR4D.

Each national report differs by its structure and content. Not all reports provide all information, which was required according to the suggested structure.

Cross-cutting issues of AR4D, especially questions concerning extension system and Agricultural Innovation Systems (AIS), and also cooperation' status between an agricultural science, education and extension system, are poorly resulted in the national reports. One of the reasons of non sufficient adequate statement of these questions is its weak condition, or fragmentation of activity.

Value and usefulness of reflected in reports National strategy will increase, after its discussion at national level, together with discussion of the Preliminary draft of Regional strategy, with participation of all interested parties, and decision making people, and also after consideration of the additional recommendations, received at Meeting on Discussion of questions of Transformation and strengthening System of agricultural research and innovations in the region of the Central Asia and Southern Caucasus in November, 2011.

1. Brief overview on the countries of the region

1.1. Introduction

Like other countries of the former Soviet Union, the countries of the Central Asia and Caucasus (CAC) have inherited de-structured systems of agricultural research (ARS), with the broken research-and-production relations between research and academic institutes. In spite of the fact, that integrity of ARS system has been broken, which initially was coordinated by command system in the centralized order, the CAC countries could somewhat keep scientific potential, which has appeared in damage in new economic conditions.

In the early nineties, ARS system in the CAC countries started to endure transformation processes along with agricultural reforms, which took place in the light of transition from the centralized planned system, to economy with market relations. All countries of the region, from the very first days of gaining independence, defined a course on democratic development of the country, increase well-being of the population and elimination consequences of stagnation in economy. Nevertheless, each country follows its own way of renovations and development, proceeding from the political vision, social and economic potential and possibilities, which are in many respects reflected in transformations in the agricultural complex, directed on maintenance of food security, satisfaction of requirements of the country, maintenance of necessary resources for effective functioning of other sectors of economy. Achievement of tasks in an agrarian sector, primarily demands increase efficiency of an agricultural complex, which is provided by means of perfection activity of all its branches: plant growing, animal industries, poultry farming, fish farming, management of land and water resources, and others, introduction effective forms of housekeeping, modern agro-technologies, creation new varieties and species. These tasks are actual for all CAC countries, and demand the rational approach in AR4D activity, for the purpose of its transformation with a view of development, which find its reflection and solution in the processes and programs of development of national system of agricultural research and innovations in each CAC country.

The system of agricultural research and innovations is at transformation stage now. Along with rendering the state support, national, regional and global programs are realized in the region in various spheres of agrarian sector, at availability of research components. Besides, the international development agencies, and also international financial institutions allocate means in the form of grants and soft loans, for maintenance of branches of economy and to support experts involved in them, including for research activities. However, all rendered efforts bear fragmented nature, and financing AR4D is not sufficient for expectation of full return.

As it has been marked in the GCARD Road map, the increase in investments into agricultural research gives notable effect in increase of efficiency of agriculture. Average volumes of investments on agricultural research in percentage out of contribution of agriculture to gross national product in developing countries make 0,58 %, in comparison with 2,4 % in the developed countries. The given indicator is not significant in countries of CAC: in Armenia - 0.01%, in Azerbaijan - 0.043%, in Georgia-0.01⁵, in Kazakhstan - 0.37%, in Kyrgyzstan - 0.01%, in Tajikistan - 0.1%⁶, Turkmenistan - n/a⁷, Uzbekistan-

⁵ Own estimates of the developer of Synthesized report, on the bases of data, received from Internet.

⁶ % for total science out of GDP of Tajikistan

0.13%⁸. Nevertheless, in CAC countries, tendencies are planned to increase investments in AR4D. For example, in Kazakhstan, it is predicted to systematically increase state financing of agrarian research to level of the developed agrarian states: by 2014 to 1 % from a gross product of agrarian and industrial complex, and by 2020- to 2 % from an agrarian and industrial complex' gross product, that corresponds to position of Road map GCARD-1. In 2020, the volume of investments at the expense of all sources of financing will increase in Turkmenistan, in comparison with 2000 in 17,1 times⁹.

Basic, thereupon seems the orientation point, defined by the Road map to treble by 2025 volumes of investments in AR4D in comparison with the present level, which will be the main reference point of developed regional strategy.

Also, monitoring and evaluation of a course of realization of the Regional strategy will be conducted taking into account a biennial cycle between GFAR conferences, and it will be also annually discussed at annual meetings with participation of all interested persons - Assembly CACAARI. Thus, process of transformations AR4D and innovations will be conducted according to Road map principles.

1.2. Geographic aspects, population¹⁰

The region covers 8 countries, from which five countries are located in the Central Asia: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, and three countries in Southern Caucasus: Azerbaijan, Armenia and Georgia. A climate in the countries of Central Asia is sharp-continental, and in Southern Caucasus - transitive to subtropical.

Table 1. Indicators of the areas in the region of Central Asia and Southern Caucasus, estimates by data FAOSTAT, 2009.

Indicators	Total, thousand ha	% out of total territory
Total territory	418,893.9	100.0%
The land area	410,738.2	98.1%
The agricultural area	292,127.1	69.7%
The irrigated land	13,456.3	3.2%
Arable land	34,348.5	8.2%
Perennial plantings	1,098.1	0.3%
Meadows and pastures	256,680.5	61.3%
Woods	16,014.9	3.8%
Internal waters	8,155.7	1.9%

⁷ Not available

⁸ Own estimates of the compiler of Synthesized report.

⁹ From national report of Turkmenistan.

¹⁰ Indicators the statistical data on territory are resulted (on the countries) in the [Appendix 3](#). Population indicators are in the [Appendix 4](#). Indicators of number of economically active population are in the [Appendix 5](#). Indicators of active agricultural population are in the [Appendix 6](#). Tendencies of growth of the population are in the [Appendix 7](#).

Total territory of 8 countries make 4.18 km², which is more than India, but less than Australia, and territory of Kazakhstan exceeds almost twice the total territory of the other 7 countries of the region. Land area of CAC makes 98.1 % (or 410.7 thousand in hectare) from the total territory of the region; accordingly, internal waters make about 2 % from the total territory. The most notable fact is the shortage of water for needs of agriculture in the countries of the Central Asia.

The need in fresh water increases from year to year; however, its volumes are reduced in connection with anthropogenous impacts. In CAC countries, the national and regional climatic programs are developed and realized, directed both on decrease of emissions of greenhouse gases, and on adaptation to adverse consequences of climatic changes, which provide active involving of all interested parties in its realization.

The irrigated land makes 3.3 % from the total land area, or 13.4 thousand hectares. The greatest relative density of the irrigated land in percentage parity is in Azerbaijan - 17.3 %, and more than 9 % in Armenia and in Uzbekistan. However, the area of the irrigated land in Uzbekistan exceeds the areas of the irrigated land of Armenia, Azerbaijan, Georgia, Kyrgyzstan, and Tajikistan put together. In Kazakhstan, the area of the irrigated land makes 3.5 million hectares, or 1.3 % from the total land area.

Population density in these territories is also diversified, thus, despite the least territory in the region, Armenia has the most dense population 111 men/km², and accordingly, on the contrary, the most extensive country Kazakhstan, has the least population density - 5.7 men/km² in CAC. Average population density makes 18.8 men/km² in the region.

More than 78 million people live in the region, of which more than half - 55.3 % make agricultural population. The greatest relative density of agricultural population is represented in Kyrgyzstan - 65.5 %, and in Uzbekistan - 63.8 %. The country in CAC with the least relative density of agricultural population is Armenia, with population density- 35.7 %.

As the tendencies of population growth of CAC show, the agricultural population increases by rather bigger rates, than urban population, accordingly this refers both to active rural and urban population. However, specific weight of the agricultural population¹¹ is reducing. Reduction of the agricultural population and urbanization are natural tendencies of economic development, and it shows, that other sectors of economy, such as the industry, communication, transport, education and public health services are also developing. Especially, it is necessary to distinguish sphere of services, which is integrated into all sectors of economy, and promotes development of communications.

1.3. Macroeconomic situation¹²

Despite of not so favorable weather and economic conditions in 2010, it was possible to keep an indicator of growth of Gross output in the region at level of 6.2 %. The most

¹¹ Agricultural population is defined as all persons depending for their livelihood on agriculture, hunting, fishing and forestry. It comprises all persons economically active in agriculture, as well as their non-working dependents. It is not necessary that this referred population exclusively come from rural population.

¹² Details of macroeconomic indicators are shown in [Appendix 8](#).

considerable indicator of growth of gross national product was registered in Turkmenistan, with an indicator of 9.2 %. The indicator of Gross output on the region has made 284.5 bln. US dollars. Gross national product average index per capita among the countries makes 3,454 US dollars, while the Gross output per capita in the CAC region makes 3,602,9 US dollars. The greatest indicator of gross national product per capita has been marked in Kazakhstan at a level of 8.8 thousand US dollars. The unemployment average level in the region makes about 7 %.

Tab. 1. The basic economic indicators of the countries of the Central Asia and Southern Caucasus, 2010

	GDP growth (permanent prices, national currency)	GDP (current prices, USD, billion)	GDP specific weights in gross product of the region	GDP per capita (current prices, USD)	Unemployment level, % out of manpower
Armenia	2.60%	9.39	3.3%	2,845.8	7%
Azerbaijan	5%	54.37	19.1%	6,008.3	6.05%
Georgia	6.38%	11.67	4.1%	2,658.0	16.80%
Kazakhstan	7%	138.43	48.7%	8,883.0	5.78%
Kyrgyzstan	-1.36%	4.62	1.6%	863.7	5.83%
Tajikistan	6.50%	5.64	2.0%	740.5	n/a
Turkmenistan	9.22%	21.42	7.5%	3,939.2	n/a
Uzbekistan	8.50%	38.99	13.7%	1,380.3	0.20%

Source: <http://www.economywatch.com/>

n/a* - not available

For CAC, as well as for many other countries, years of 2010-2011 have been caused by acceptance of necessary measures on restoration and strengthening of a monetary, credit and budgetary policy, after recent world crisis, which in different degree was reflected in economy of the countries of the given region, and also on well-being of the population, that could be traced on delay of GDP' growth ¹³ per capita in 2008-2009. Growth inhibition of the produced Gross output has been noted both in other spheres of economy, including in agriculture ¹⁴.

If to compare delay of growth of GDP and the Gross output, made by agriculture, recession of the last is less considerable. Most likely, it could be explained by huge resource potential of an agrarian sector, which is capable to generate necessary resources not only for other sectors of economy, but also for improvement well-being of the population.

Considering that the agricultural sector is resource-demanding sphere of economy, it has undergone serious influence of an economic crisis; political efforts of the countries for the last two-three years have been directed not only on rendering support to an agricultural sector, but also on learning the lessons, useful development of efficient national strategy, taking into account risks, which can impact not only the enterprises-producers and

¹³ See [Appendix 9](#). GDP per capita in CAC countries.

¹⁴ See [Appendix 10](#). Gross agricultural product per agricultural population in CAC countries

processors of agricultural production, but also small farmers and vulnerable groups of agricultural population.

2. National and regional development objectives

2.1. General development goals

After gaining independence, almost simultaneously, the countries of the Region of Central Asia and Southern Caucasus have defined priorities of national development - increase well-being of the population. The main objective of development of eight states is improving living standards of the population, on the basis of dynamical and universal economic growth, increase level of incomes, formation modernized and diversified economy, complex development of all territories, fair distribution of incomes, and also further development and essential improvement of quality of services in spheres of education, public health services and other socially significant branches.

The basic sources of improvement of well-being include expansion possibilities for employment, and generating incomes on the basis of economic growth, development of labor-consuming branches of economy.

Achievement of the national development goals, reflected in national concepts, strategy and development programs¹⁵ is identified by comprehensive measures, developed for its achievement, and also by the indicative reference points, accepted by the governments of the countries.

The most overall goals of national development of CAC countries include:

- i) Maintenance stability of the state independence, and food security;
- ii) Strengthening and development sectors of economy;
- iii) Support social sectors of economy;
- iv) Strengthening monetary and credit system;
- v) Ensuring a favorable social environment for the population, and others.

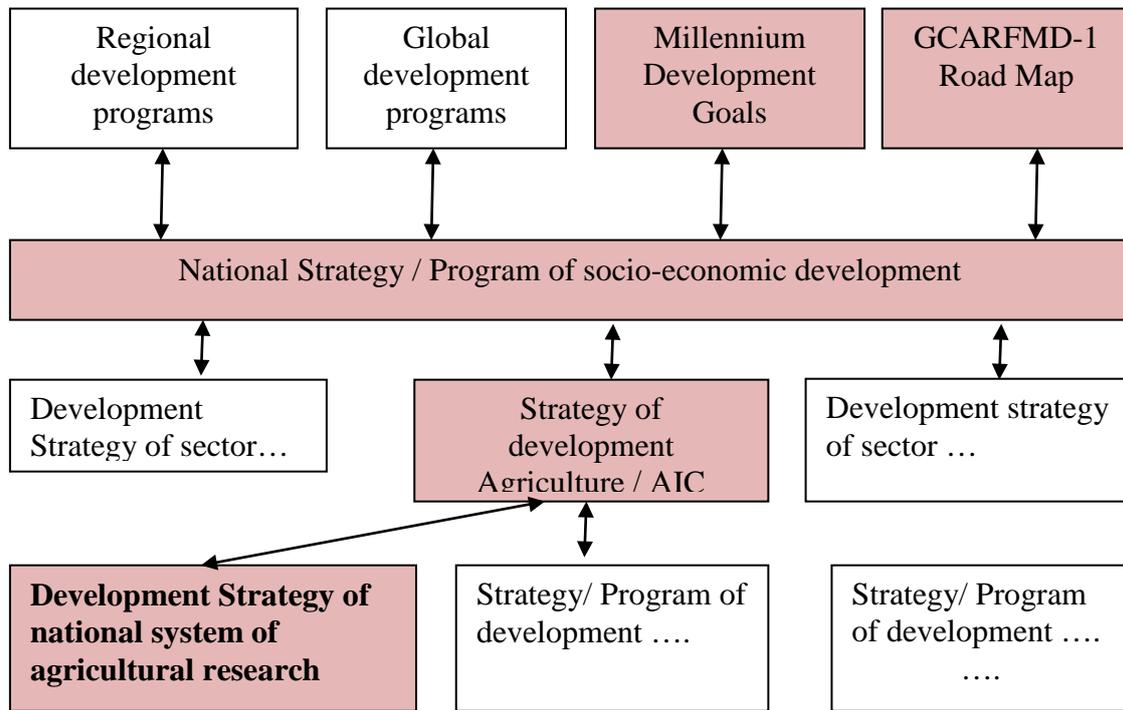
2.2. Inclusive nature of national strategies and development programs

The national development goals defined in short - medium both long-urgent programs and strategies of development will be reference points not only for economy as a whole, but also for economy' branches, and represent inclusive process.

Inclusive nature of national strategy covers not only internal (intra-economic), but also external aspects of regional and global tendencies. For example, the national goals of social and economic development of countries are constructed taking into account the millennium development goals (MDG); CAC countries have taken the obligation to fulfill these goals by reaching considerable results in various spheres of social and economic life of the country. Thus, for example, in the strategy of joint-stock company "Kazagro-innovatsia" (Kazakhstan) it has been predicted to systematically increase state financing of agrarian research to level of the developed agrarian states: by 2014 to 1 % from a national produce of agrarian and industrial complex, and by 2020 to 2 % from an agrarian and

¹⁵ Names of Concepts, Strategy and Programs of development, mentioned in national reports are resulted in [Appendix 11](#).

industrial complex national produce, that corresponds to the provisions of the Road Map - GCARD-1.



Picture 1. Inclusive nature of strategies and development programs

2.3. Agricultural development and AR4D

In spite of the fact, that there are national strategies in the field of development of agriculture, and in transformation system of agricultural research and innovations, not everybody mention principles and the positions resulted in "Road map" GCARD-1; the governments of the countries recognize a significant role of agriculture in national economy, and pay special attention to the need of its development, taking into account introduction of advanced and effective technologies, and mobilization of all subjects of agriculture in process of further intensification of the agricultural process, focused on maintenance of food security, for satisfaction requirements of the population, including its vulnerable layers.

Thus, strategy of transformation and development of research activity is a component element of the program of development of agriculture, which, in turn has been integrated into national system of development.

The overall goals in development of rural sector include:

- i) Development and private sector support;
- ii) Infrastructure Improvement;
- iii) Development of branches of agriculture (plant growing, animal husbandry, etc);
- iv) Introduction modern and resource saving technologies;

- v) Perfection system of financing;
- vi) Perfection system of agricultural research, an increase of its productivity and impacts on the solution of issues in agrarian sector;
- vii) Intensification of innovative processes;
- viii) Disbandment inefficient and resource- and capital-intensive mechanisms and systems;
- ix) Perfection of mechanisms (recourse-using) of land tenure and water use;
- x) Perfection system of relations between subjects of agriculture;
- xi) Strengthening communication between an agricultural education, an agrarian science and agricultural production; etc

The policy of sustainable growth of an agricultural production is provided with strengthening financial and economic position of production, including at the expense of completion of land reforms, perfection rights of land tenure and strengthening protection of the property rights to the produced output, expansion availability of markets, reduction excessive administrative barriers, improvement attraction of investments on agricultural production, and for modernization of used technologies.

In the process of achievement of planned goals in agricultural sector, the following questions will be solved: increase productivity of agriculture sector, and private sector' strengthening; expansion assortment and modernization of production; development of competition, and increase export potential; restoration and development of irrigational systems; development enterprise' activity and maintenance of the equal rights and guarantees on land tenure; rational use of water and land resources; strengthening input supply and legal base; creation favorable conditions for realization of products in the market; reduction consumer dependence on import of the basic foodstuffs, with increase production volume, that will lead to poverty reduction; clear division of a role of state and a private sector; maintenance of population with healthy foodstuffs; improvement of nutrition of the population; sustainable preservation of the base of natural resources.

With regard to integration of regional cooperation, the development programs are targeted for maintaining security and stability in the region, improvement constructive relations with neighboring countries, and therefore they are supported with various political dialogues, and economic agreements, other than from cooperation in sphere of agricultural research, an exchange of knowledge and technologies, which are based on institutional and interdepartmental relations between the countries. Nevertheless, heads of agro-industrial complexes, systems of an agricultural education and scientific research institutes recognize fragmented nature and the weak mutual-reporting (accountability) between national systems of agricultural research, and attach great value to regional and inter-regional cooperation in sphere of an exchange of knowledge and technologies, and to the collective approach in the decision of regional problems, and in development of actions for the further integration, taking into account features of national system of agriculture.

The most common regional goals of cooperation in sphere of agriculture and agricultural research are:

- i) Development inter-institutional relations;
- ii) Expansion communications with the international development institutes;
- iii) Realization of regional and sub-regional projects and development programs;
- vii) Combating desertification;
- viii) Effective utilization of water resources;

- ix) Realization of complex actions for decrease climate change' impact;
- i) Control of trans-border diseases; etc.

3. Agricultural sector

3.1. Brief overview of agriculture

The agriculture plays a considerable role in the economy of the region. More than 55 percent of the population lives in countryside. The agriculture provides the greatest part of the occupied population¹⁶, producing significant part of GDP¹⁷, provides inflow of the foreign currency to the country, disposes the most important natural resources, which directly impact on environment, for example, the land, water and biodiversity of plants; thus, agriculture plays special role in the course of protection of environment at the expense of rational use of natural resources.

Table 3. Socio-economic indicators of agriculture of CAC countries

	Share of rural population in total number of population	Share of agricultural population in total number of population	Share of agriculture in total number of the occupied population**	Share of gross agricultural product in GDP***
Armenia	35.7%	9.1%	45.8%	16.9%
Azerbaijan	47.9%	22.4%	39.2%	5.4%
Georgia	47.1%	14.6%	58.2%	8.4%
Kazakhstan	41.2%	15.3%	26.0%	4.4%
Kyrgyzstan	65.5%	20.4%	47.5%	40.0%
Tajikistan	73.6%	26.8%	67.6%	18.9%
Turkmenistan	50.0%	29.3%	48.0%	40.0%
Uzbekistan	63.8%	20.9%	44.0%	25.6%

*Source: FAOSTAT

**Received from different sources, including from internet

***From data of national reports

Branches of agriculture have various production capacities. The countries of the Central Asia especially differ from the countries of Southern Caucasus due to nature-climatic and geographical conditions. However, it is possible to assert with confidence, that plant growing and animal industries are the basic traditional branches of agriculture.

¹⁶ Mean indicator among the countries makes 47%.

¹⁷ Mean indicator among the countries makes 20%

Table 4. Ranking of 20 the most produced agricultural products in CAC countries (rating due to monetary volume of production), On the bases of data (and estimates) FAOSTAT for 2009.

	1 .	2 .	3 .	4 .	5 .	6 .	7 .	8 .	9 .	10 .
	Cow milk	Cattle meat	Tomato	Cotton fiber	Grape	Wheat	Potato	Mutton	Chicken	Chicken eggs
Armenia	1	2	4	x	3	11	5	12	x	10
Azerbaijan	1	3	4	x	8	2	6	5	10	11
Georgia	1	3	9	x	2	x	5	14	11	8
Kazakhstan	2	3	7	8	x	1	4	6	12	9
Kyrgyzstan	1	3	5	13	x	6	3	4	x	19
Tajikistan	3	6	2	1	7	8	4	5	x	x
Turkmenistan	4	1	7	3	6	8	11	2	13	10
Uzbekistan	3	1	5	2	7	4	11	9	x	15
Weighted-average place in 20 places	2.0	2.8	5.4	5.4	5.5	5.7	6.1	7.1	11.5	11.7

Rating has been compiled on the bases of data FAO (FAOSTAT)
x – not included into the 20 most produced agricultural products

The most produced agricultural products are the cow milk and horned cattle meat (beef) (HCM). The plant growing sector abounds with production of fruits and vegetables. Nevertheless, each republic has the most valuable products of agriculture¹⁸.

Despite availability of huge potential of agriculture, which includes a wide experience in managing agriculture, functioning systems of agrarian and industrial complex, and stage-by-stage realization of institutional reforms in a sector, there still exist a number of problems, which do not allow for agriculture to realize its full potential. These problems refer to various spheres of agricultural sector, such as: (i) plant growing; (ii) animal industries, including poultry farming and fish farming; (iii) agriculture and water use; (iv) forestry, (v) marketing and sale of agricultural production; (vi) remote, difficult for access and ecologically problem territories; (vii) trans-boundary diseases; (viii) climate change impact; and others, specific to each country.

3.2. Problems in agriculture

Farming and the water use

At the time of the crisis period of the end 1980, and beginning of 1990-th of the last century, there was no due care of drainage systems; thus, drainage canals collapsed, and ceased to work. Excessive use of water, and lack of a normal drainage have led to rising of ground water level, flooding of extensive territories, and also to land salinity. Deterioration of the irrigated land, including deterioration of irrigating water has led to decrease of both productivity, and the general production of many agricultural crops.

¹⁸ Rating of 20 the most valuable in monetary terms agricultural products are resulted in [Appendix 12](#).

Problems of economic nature have outgrown in ecological ones, as a result of that resettlement of people has been carried out from a number of settlements with the most critical ecological conditions, and the high rate of unemployment, caused by disappearance of the whole branches of economy (fishery and fish - processing, a water transport)¹⁹.

Exhaustion of water resources and increase of requirement for irrigating water²⁰ is aggravated by considerable specific expenses on irrigation and leaching of fields, low efficiency of irrigating systems, and prevalence of water retaining irrigation method on furrows, and other reasons, as well as the negative impact of climate change.

New irrigating systems are created now for irrigation on former technologies. New technologies of irrigation are expedient for introduction, first of all, on already developed land, where there is a social and transport infrastructure, and reconstruction of the old irrigated land, which would allow solving at once complex social, economic and environmental problems. Besides, once the most convenient and suitable land for amelioration has already been utilized, we can observe now emergence of land, which is hard for reclamation and require huge capital investments for development.

Animal husbandry

Shortage of quality forages is a principal cause of low efficiency of animal industries. Other principal causes of deficiency of a forage reserve include reduction of areas under forage crops, and deterioration soil' fertility, shortage, poor quality and high cost of the concentrated forages, shortage of raw materials for its production, weak development of forages of the enterprises, specializing in production and the free market of agricultural raw materials, etc.

The principal causes, preventing growth of a livestock of big horned cattle and its efficiency are:

- An insufficient forage reserve,
- Shortage of the land for realization of cattle-breeding activity,
- Lack of financial means for procurement of cattle;
- Weak development of a market infrastructure of "purchase and sale" of input resources, services and cattle-breeding production.
- Out-of-date systems of cultivation and insemination;
- An insufficient veterinary control;
- Threat of trans-boundary diseases.

Fishery

In fishery sector for today there is a low level of technical equipment for production of fish products; in some countries, reservoirs of local value have not been completely investigated for revealing its potential with a view of allocating on a long-term basis. The modern trade equipment is not applied. The activities on preservation biodiversity are not conducted. The aqua-culture in some countries is in embryo' status. There is no large-scale production of a breeding material of valuable breeds of fishes. Stocking of natural

¹⁹ Basically, Aral Sea zone

²⁰ For example, according to the provided by Turkmenistan materials, national requirements in irrigated water, with account of climate change will increase from 22 billion m³ in 2010, to 26,4 bln. m³ by 2025.

reservoirs is carried out on the basis of out-of-date schemes. There is no production of extruded mixed fodders for fishes. Practically, there is no canning production and state standards on processing of fish in the countries, where there is a natural potential.

Processing of meat and dairy products

There is a considerable level of import-dependence on meat' processing products in the region: sausage products, canned food meat and meat vegetation products. The basic problems are:

- Small commodity nature of production, the basic part of livestock of cattle is in a personal household farms, that causes poor quality of milk;
- Low share of breeding and pedigree cattle and, as a consequence - low level of efficiency of animals;
- Reduction of areas under forage crops, decrease volumes of output and high costs of mixed fodders;
- Cases of registration of the centers of especially dangerous diseases of animals and birds;
- Insufficiency of measures on support of small production; the limited access to credits for small-scale enterprises;
- Insufficiently developed infrastructure on procurement and a primary milk preprocessing; not occupancy of factories on processing in view of absence of qualitative raw materials, and due to seasonal prevalence of production.

Crop production

There are many other problems in other branches of agriculture. For example, crop production suffers because of: limitations of circulating assets for expansion of production of agricultural crops, and low availability of credit resources; insufficient capacities of preparation, storage and processing of crop products; lack of modern technology of processing of fruit-and-vegetable production; reductions and abandoning the areas of long-term fruit-berry plantings.

Forestry

The basic problems of forestry are: inefficient use of wood; low level reproduction of wood plantings; qualitative change of woods; illegal cutting of woods; inefficient use of potential of forestry for production; absence of production of saplings of fruit-berry crops. Preservation of bio-diversity: there is a threat of disappearance of breeds of animals and varieties of plants.

Desertification

Combating desertification is not only national, regional, but also a global challenge for an agrarian science of the Planet. Owing to geographical and environmental conditions, CAC' countries are also exposed to desertification, and bear heavy losses due to degradation of land resources, impoverishment of a biodiversity and biological resources and, as a consequence, deterioration of a social status of the population. Owing to that, combating desertification in the region becomes an issue of strategic value, and mitigation and prevention of this issue will be a guarantee of a sustainable development of the region.

Agro-biodiversity

Many relatives of cultural plants are under the threat of genetic erosion. Varieties of national selection - genetic sources of resistance to diseases, pests, cold, drought, etc are gradually disappearing. Lack of a genetic diversity to economic valuable signs is marked in breeding of some crops. In many countries, premises for storage of a genetic pool of plants do not actually correspond to the international standards

Climate change

The problems caused by climate change and environment aggravate loss of valuable genetic fund of agricultural crops for its use in breeding. Dryness in the region will be only strengthening; therefore, it will become extremely important to promptly create and introduce in production drought-resistant crops, and moisture - soil - and resource saving technologies of its cultivation.

Trans-boundary diseases

The basic problems here are represented by insufficient volume of conducted phytosanitary measures against especially dangerous diseases of agricultural crops (treatment of seeds, control with septoriosus and mildew diseases), control of weed vegetation; distribution of especially dangerous harmful organisms, causing a damage to an agricultural production, and etc..

3.3. Priority areas in solution problems in agriculture

Animal industries

The governments of the countries recognize that introduction of modern technologies, rendering qualitative services by the veterinary and research organizations of branch, the modern techniques are the important factors of development of animal industries. It stipulates availability programs for development of animal industries in the countries, which are directed on realization of measures on development of animal industries, in particular:

- Allocation of micro-credits to the population for procurement of cattle;
- Application of practice of artificial insemination of animals;
- Rational use of land, allocated for planting of forage crops;
- Support measures on providing forage harvesting machinery to agricultural commodity producers;
- Modernization combined feed industries, and improvement access to raw materials;
- Commercialization of works of zoo-veterinary centers;
- Perfection of rendering services to cattle breeders on breeding business, in realization of breeding cattle, introduction progressive technologies of artificial insemination of animals.

Plant growing

For increase production of plant growing, it is necessary:

- Developing and introduction scientifically-proved resource-saving agro-technologies;
- New highly productive varieties and hybrids; production of original seeds on a modern technological level;
- To raise productivity, increase application of chemical protection means of plants, mineral fertilizers;
- Transition to a diversification; expansion cultivations under olive and leguminous crops; the markets of grain, rapes, peas, mungbean and lentils is considerable;
- Construction and reconstruction of irrigational systems;
- Carrying out seminars, training courses of experts in agriculture, training scientists abroad for studying modern lines in breeding and seed-growing development;
- Renovation of agricultural machinery, scientific and technical and industrial infrastructure; enlarging farms and strengthening the state support for the re-equipment of production' facilities;
- Bringing of standards in conformity with the standards, accepted in the world trade, etc.

Water use

Introduction of water-saving technologies will be crucial; improvement water supply of agricultural population; clearing existing and construction of new drainages; introduction of the closed circulation of water in fish ponds; introduction of modern technologies, methods of irrigation (drip, sprinkler irrigation, etc.). Development technologies is actual: on rational use of water resources, improvement of an ecology-ameliorative condition of the irrigated land, decrease use of water volumes on an irrigation; on reduction of load for a drainage; restoration of the salt affected soils, restoration and increase fertility of the irrigated land, perfection technologies and means for an irrigation, system of water supply and watering of pastures, improvement an ecological situation in a zone of an irrigation, etc.

Land tenure

At present, it is required to strengthen activities directed on:

- Restoration of soil' fertility at the expense of maintenance increase humus content in soil, prevention of water and wind erosion; rational use and protection of a vegetative cover of mountain-foothill and deserted-pasture zones;
- Maintenance protection of land, increase soil' fertility and ecological safety of agro-technologies;
- Optimization structure of areas under crops and crop rotations for the purpose of increase of efficiency of agricultural land, prevention erosive processes and improve reproduction of soil' fertility;
- Expansion application of soil-protective and water saving technologies for soil' processing, directed on natural reproduction of fertility of soils.

Forestry

Purposeful scientific research will be required, directed on protection, reproduction and use of animal and flora; improvement technologies on creation and formation balanced,

sustainable agro-forest-ameliorative landscapes, protective-decorative plantings; strengthening activities in order to avoid outbreak of mass reproduction of pests, reducing ecological, genetic and economic resources of woods; rehabilitation zones of the ecological disaster, one of which is the region of Aral sea; preventive maintenance and elimination of consequences of wood and steppe fires. It is very actual creating a regional information database of genetic resources, as well as creation new varieties of agricultural crops with such important features, as resistance to diseases, extreme conditions of germination, high productivity and others.

Climate change

Realization of measures on protection, rational use and improvement quality of water resources is necessary; restoration of an optimum water-salt mode of irrigated areas, restoration and increase of soil' fertility, control against anthropogenous erosion; increase level of forestation of territories of republic, zones of formation of a drain of the local rivers, with a view of decrease landslide and mud-flow threats; improvement and restoration environment in local zones of ecological intensity. It is necessary to support initiatives on carrying out joint scientific conferences, symposiums and seminars, the edition of proceedings and the collections, concerning questions of climate change.

Land degradation

It is necessary to carry out complex of actions on increase soil fertility, decrease salinity and improvement of drainage.

Agro-biodiversity

It is necessary to preserve and use rationally a gene pool of plants; use an agro-biodiversity for reception disease, cold, drought-salt resistant and other varieties of cultural plants; preservation and use endemic breeds of animals; preservation of national reserves. Accurate regional coordination of actions is needed for the solution of complex problems, related to an agro-biodiversity, and involving in this activity all interested organizations: creation of regional committee on preservation and rational use of biological resources becomes very important.

3.4. Themes of agricultural research for the region

During synthesizing resulted in national reports problems and priorities in agriculture, the following themes²¹ were revealed for research in the regions:

- Restoration and preservation agro-bio-diversity;
- Restoration of the degraded lands;
- Effective and careful use of water resources;
- Further development of breeding and organization of seed-growing;
- Mitigation consequence of negative impact of climate change;

²¹ The compiler of the synthesized report cannot assert, that the resulted questions, which require further studying, have been placed as it should be in the order of priority, as in the national reports, thus, they are resulted without ranging. However, priority of subjects of agricultural research should be discussed during discussion of the synthesized report and a preliminary draft of the Regional strategy on transformation ARFD at forthcoming Regional Meeting (Brainstorm Meeting, October 25-29).

- Improvement agro-technologies, introduction innovative, resource saving and ecological technologies and practices;
- Restoration, use and preservation of pastures;
- Restoration and preservation of a gene pool of domestic breeds of agricultural animals, and breeding of animals;
- Improvement of the "know-how" and processing of agriculture' production;
- Agriculture in remote, hardly accessible and ecologically difficult territories;
- Veterinary science, especially preventive maintenance and treatment of infectious diseases;
- Improvement management of natural resources;
- Scientific bases of the organization of agricultural cooperatives;
- Questions of introduction results of research, and transfer of new knowledge to agricultural production;
- Marketing and sale of agricultural production;
- Combating desertification;
- Control trans-boundary diseases;
- Monitoring and an evaluation of influence of AR4D' transformation;
- Development extension system;
- Strengthening communication between science, education and extension;
- Perfection standard base and the policy of increase volumes of financing of agricultural research.

3.5. Policy of CAC countries in development of agriculture

The national agricultural policy represents a component of the state social and economic policy, directed on sustainable development of agricultural production, improvement social conditions of both agricultural and urban population, who depend on agriculture, and development of its branches.

The synergy approach, based on the general tendencies of national strategy of development of agriculture, defines strategic issues of a sustainable development of agricultural sector in the region, expressed in the following:

- i) Sustainable social and economic development;
- ii) Increase efficiency of an agricultural production;
- iii) Maintenance and increase employment of agricultural population;
- iv) Improvement social conditions, and increase living standards;
- v) Rational use of water, land and other natural resources.

The general principles of a regional policy of agriculture' development includes:

- 1) An involvement of all managing subjects into the processes of agricultural development;
- 2) A transparency and availability of the information on a current status and prospects of realization of complex measures, taking into account pessimistic and optimistic forecasts;
- 3) Integration the regional markets, and expansion access to the international markets of agricultural production, raw materials and the foodstuffs; maintenance of equal conditions for competition between the countries of the region;
- 4) Increase productivity in introduction results of agricultural research, scientific developments, attraction of qualified personnel;

- 5) Expansion a range of agricultural services, knowledge dissemination and maintenance of necessary institutional conditions and a legal basis for commercialization;
- 6) Gradual transition from focused on resource maintenance system of agro-business, to the innovative system.

The basic levers of realization of reforms in agriculture of the region include:

- Subsidizing activity of agricultural producers;
- Realization system of the preferential taxation;
- Realization of purchase, storage, processing and delivery of agricultural production, for national needs;
- The State price control for a source of raw materials, and agricultural products;
- Granting of the necessary information and knowledge, and rendering consulting assistance to subjects of agriculture;
- Involving public organizations in processes of realization of agricultural programs;
- Realization of projects and development programs, with attraction of foreign donors;
- Participation in the regional and global programs in agriculture' sphere.

Forms of participation of associations of agricultural producers in formation and realization of a national agrarian policy include:

- Participation in developing drafts of standard legal acts, target programs, the national report;
- Participation in generalization and distribution of achievements of science and technology, the Russian and foreign experience in sphere of development of agriculture;
- Granting the necessary information for formation and realization of a national agrarian policy;
- Development of recommendations for public authorities; etc.

Despite realization of a rational policy, which is ongoing till the moment of gaining of state independence by the countries of the region, some aspects, on which the attention of agrarian policies is directed, cannot have unequivocal influence on sector development, bearing only positive or a negative effect. Thus, for example, presence of various patterns of ownership, and managing agriculture, serves as the important factor of development of market relations, by means of competition' development, and with the account of interests and possibilities of various levels of population; this factor does not limit the right to conducting agricultural activity of vulnerable groups, for whom the agriculture represents some possibilities and means for subsistence. At the same time, dissociation of agriculture creates difficulties in coordination and realization of universal approaches in realization of the measures, directed on perfection of agrarian system; due to this, labor productivity suffers, and it becomes unprofitable to apply modern agro-technologies, use the newest agricultural machinery. For example, thereof Armenia, despite serious agricultural potential, provides itself with the foodstuffs on 55 %, and the rest, it is compelled to import.

The system of the state procurement is practiced in the region, with a view of stabilization of the prices in the market of agricultural production, raw materials and the foodstuffs, and

also for maintenance level of incomes of agricultural population and agricultural production, by purchase of agricultural production from producers, at growth²² or reduction²³ of prices for the sold agricultural produce.

3.6. State support for agriculture' development

The basic directions of the state support in the sphere of development of agriculture are:

- Ensuring availability of credit resources for agricultural production and processors, and also for small farmers, and those, who has no own land for agriculture practicing;
- Creation mechanisms for effective and careful use of natural resources, including water use, land tenure;
- Restoration, maintenance and development of an agricultural infrastructure, including restoration of irrigational and drainage systems, elimination salinity and ensuring moisture of the land;
- Creation conditions for development of breeding animal industries, including poultry farming, creation of the highly productive hybrids, adapted for local conditions;
- Support development of breeding and seed-growing, by means of financing scientific research, input supplies of the industrial-pilot centers, increase number of elite farms;
- Development forestry fund, and also maintenance of planting of long-term plantings and its care;
- Rendering of the consulting services to agricultural production, increase potential and education of experts for agriculture' branches;
- Supply with information at realization of national agrarian policy.

For the purpose of support of scientific potential, and strengthening its influence on social and economic development of the country, it becomes extremely important to maintain sustainable state financing, escalating financial resources in the sphere of science.

3.7. Innovation' policy of the countries

The governments of CAC' countries realize, that transformations in agriculture, for the purpose of increase of efficiency of agrarian production, will be impossible, without stimulation and support of an agrarian science, innovative system, introduction of effective technologies, and mobilization of all managing subjects of system of agricultural research and innovations. Realization programs of agricultural development in the region envisages realization of cardinal changes in system of agricultural research, and creation the necessary and favorable environment for development of national innovative systems, working out effective mechanisms for advancement of innovations. Thus, the policy of transformation the system of agricultural research and innovations is focused on three basic objectives, which are interrelated: (i) expansion innovative proposals from an agrarian science, (ii) increasing susceptibility to innovations of the agriculture itself, and (iii) formation of an effective "transiting" network from science to production.

²² On condition, that price becomes higher, than settlement prices.

²³ On condition, if prices drop lower, than minimal prices.

In the course of transformation and strengthening system of agricultural research and innovations, with a view of increase of efficiency of agriculture, and also well-being of the population, it is necessary to solve the problems, related to escalating of intellectual and personnel potential, and establishing necessary links between the academic institutes, the regional (regional) research organizations, experimental stations, research-production and pilot farms. Creation of an effective communication system between research establishments and production will allow introducing scientific achievements effectively, and disseminate an advanced experience.

Within the agriculture of the countries of the Central Asia and Southern Caucasus, there are still unprofitable agricultural enterprises, which are incapable in introduction of innovations.

Necessity of introduction of high technologies, and improvement agricultural production has repeatedly strengthened in connection with occurrence of thousands new small productions in the name of peasant (farmer) and personal house-hold farms, which have not joined into cooperative farms, associations or other territorial formations. Thus, the urgency of service of agricultural consultations in the capacity of conductor and the carrier of an advanced experience and innovative ideas is raising now.

Development of innovative processes was not real at an early stages of transition to market economy, when recession was marked in CAC' countries as a result of structural transformations, inflation, dissociation of agrarian and industrial complex, and due to outflow of intellectual and personnel potential from research establishments,. However, many barriers have been overcome as a result of carrying out agricultural policy in each country, with various approaches, but with the general main objectives, which include:

- i) Increase volumes of output and quality of agricultural production;
- ii) Maintenance sustainable development of strategic, and also specific and traditional branches of agriculture;
- iii) Increase in employment of agricultural population, including payment of the workers, occupied in agriculture;
- iv) Preservation and reproduction of the natural resources, used for the needs of an agricultural production;
- v) Development market infrastructure for agricultural production, raw materials and the foodstuffs;
- vi) Creation favorable investment climate and increase volume of investments in agriculture' sphere.

Development of innovative systems in the region is considered now as a necessary condition for protection against crisis situations, and for increase of agricultural efficiency; thus, increase of innovative activity of agricultural sector will not only allow raising a technical and economic level of production, but it will also essentially improve an investment climate.

In agriculture sector, it is possible to distinguish five basic directions of development of innovations: breeding-genetic, industrial-technological, organizational-administrative, social and economic and ecological directions, which particularly act more and more as the factors, which really impact on development of food systems, based on agriculture, thus reflecting its objectively existing multi-functionality. Therefore, now, developing

ways of integration of an agrarian science into the general strategy of development of agriculture is acquiring ever growing value in the methodological plan.

4. Systems of agricultural research in the region

4.1. The status and problems of AR4D

Agricultural Research Systems (ARS) in the CAC countries have much in common, owing to their general heredity from the former Soviet Union. However, they developed in different ways according to national policies of development of an agrarian science. Systems of agricultural research have undergone considerable changes; however these changes continue to be carried out according to national political courses. The more and more increasing focus is attached to agricultural research, as agriculture is considered as one of priority directions of development of science in the region.

Coordination of agricultural research at national level is conducted by various ways in the different countries of the region. Research is coordinated by the Ministries of Agriculture in Armenia, Azerbaijan, Kyrgyzstan, Turkmenistan, whereas, it is coordinated by the Ministry of Education and Science in Georgia, the joint-stock company (JSC) "Kazagro-innovation" in Kazakhstan, the Tajik agrarian academy in Tajikistan, and Uzbek scientific-production centre of agriculture (USPC) in Uzbekistan.

There is an urgent need in creation strong links between agrarian universities and systems of research and introductions, so that they also could promote agricultural development in the countries, and the region of CAC.

Undesirable tendencies in sphere of an agrarian science and its use in agrarian innovative processes consist of reduction of personnel' potential in science, increase in quantity of the scientists, (doctors) occupied in science, increase combined jobs, absence necessary conditions for social protection of scientists (related to creation reliable and effective system of protection of the rights for scientific intellectual property, and also with improvement of an economic and social status of scientists).

Weak communication between scientists, introduction services, farmers, especially farmers-women on the one hand, and the persons, responsible for decision-making on the other hand is inherent in many countries of the region. Lack of such interaction undermines efficiency of a technological transfer to farmers, who, thus are deprived of innovations in the field of agricultural research on improving efficiency and production, and also miss opportunity for impacting in increase of agricultural productivity. Absence of any information-extension services also adversely impacts to participation and a role of farmers in activities on improvement of agricultural research.

The majority of the CAC countries do not pay sufficient attention to aspects of transfer of technology, and cannot create effective system of introduction, by means of which, the technology could serve to the requirements of farmers. In most cases, this fact is explained by low profitability of the organizations, rendering extension services, or insufficient financing from the state.

4.2. Need in developing extension system

CAC Countries have advanced differently in AR4D development. The Major factor in developing system of agricultural research and innovations is the proper attention from the governments of the countries.

Activities on private sector involving, in particular NGO', measures on carrying out activity on knowledge dissemination, attraction private businessmen, suppliers of additional means of production and services, can partially fill existing vacuum of weak system on knowledge' dissemination.

Processes of creation various forms of cooperation of education-research establishments (first of all, universities) with sector's science and production are realized now in the countries of the region. There are ranges of systems on establishing mutual relations, which include measures like conducting activities on separate contracts with educational and industrial structures, the conclusion of research agreements between industry and university, conducting the joint research, financed on the basis of received grants, organization centers for joint research, the university research centers, etc. Effectively realized mutual relations between AR4D participants can develop more strongly in future, and are developing now under condition of closer integration.

The given process is accompanied by reforms in education systems, mostly due to retraining of personnel for agriculture, in particular, experts and consultants of extension service, who have been entrusted to create bridges between science, education and production, and direct these actions for complex satisfaction of inquiries of agricultural production.

The major condition of effectively working extension service is the combination within this service functions like education, dissemination of knowledge, science and consultation. All these functions are carried out in some extent in CAC countries. However, the effect from activity of extension service is not significant, as its components were developed separately in the various state structures, which do not have close connection among themselves.

Unfortunately, developing situation in AR4D is separated from the extension service, which functions in isolated manner without due coordination of activities from the Ministries of Agriculture. Besides, process of education of extension' experts should be based not only on theoretical knowledge of teachers, but also on a practical operational experience of such service. In this connection, in many CAC countries, it is considered expedient creation of such organizational structure, which could unite systems of a professional training, applied scientific research and extension. Leading agrarian universities, where highly-skilled personnel of professors, teachers and scientific employees in various areas of an agricultural science and practice is concentrated, can serve as bases for the given complex system at national level, as these employees have consultation experience, and thus, it is necessary to strengthen laboratory-research base in these facilities.

The organization of such structure with uniform system of coordinating actions will allow raising efficiency of all directions in activity of extension service, and will help in saving considerable financial means. The head organization in the given structure should educate personnel of the top skills for the branch, accumulate and disseminate the latest

achievements in the field of theoretical knowledge and experience in agriculture on the newest techniques and technologies; it should also directly participate together with other scientific research institutes in formation ideology of development of the sector. Functions of such structure can be expanded by inclusion issues on coordination of activity into the scientific structure of research, educational and other organizations, studying requirements of rural commodity producers in ICT services, including collection, processing and distribution of information, preparation and edition of the educational, inquiry, information and advertising literature, arranging conferences, symposiums, exhibitions and other scientific and practical activities on national, and even at regional level. Thus, the main objective of the strengthened extension system should be rendering assistance in reforming and development of agricultural sector, by means of creation complex system of knowledge transfer to agricultural production.

The primary goals should include:

- Perfection system of scientific maintenance of agrarian sector with a view of unification fundamental and applied research, with system of knowledge dissemination;
- Modernization system of retraining and improvement of professional skills of personnel for the sectors of agriculture, with the purpose of activating extension-information work
- Creation system of information-consulting service of agricultural production.

For achievement of objects in view, it is necessary to carry out measures, directed to:

- Developing and introduction the financing scheme of scientific research, focused on requirements of the farmers, including budgetary and off-budget financing, and self-support elements;
- Developing and introduction the mechanism of delivering advanced achievements of an agricultural science directly to agricultural production, and also rendering consulting and information services;
- Creation retraining courses for heads, experts, consultants and teachers of agrarian sector in the basic perspective directions at agrarian institutes and in centers, designed for skills' improvement.

One of the basic conditions of successful activity of extension system is the state support, and the integrated development of an agricultural science and an agricultural education, which should be directed on demand formation from agricultural production for research works in the sector, including the organization of consulting and knowledge dissemination' systems among farmers and other workers of sector, on constant renovation of technologies, and development effective, modern and science-intensive production.

Development of extension service should promote activation usage of labor, material and financial resources, and directing the basic efforts to key directions, where scientific activity, education and consulting services have increased demand at the moment.

The scientifically-proved agricultural strategy, undoubtedly, should consider and lean against strongly pronounced multi-functionality of modern agriculture, its systematic influence on realization of the major social, demographic, ecological and political problems of the government. Such complex approach is impossible without AR4D participation, which should prove expediency of budgetary expenses for maintenance and development of agrarian sector, taking into account generalized synergy effect of

functioning agricultural sector in the system of national economy, and lay the foundation for its innovative growth.

4.3. AR4D: Requirements, Priorities and Principles²⁴

Priorities of agricultural research of the Central Asia and Southern Caucasus' Region are based on the national priorities, defined by existing both predicted requirements, and challenges, which the national agrarian systems are facing at present, as well as on specific features of national approaches, programs and policies on realization of positions, principles and priorities of the Road map GCARD-1.

According to the discussed national priorities, the basic needs for transformation of agricultural research for development in the agrarian sector of the region include:

- Integration and strengthening relations not only between systems of agricultural research, but also between national bodies and the structures, which coordinate their activity;
- Discussion at national and regional level questions of an urgency of agricultural research, for increase efficiency of agriculture;
- Recognition at the high level of the fact, that the sufficient attention is not paid at present to system of agricultural research, and to following through the governmental intentions and decisions to full execution;
- Entering additional provisions into the existing legislation, for the purpose of creation a basis for commercialization of scientific research;
- Strengthening political determination in support of agricultural research for development, in particular by increasing investments;
- Working out the operating mechanism for introduction achievements of a science in agricultural process;
- Creation favorable conditions for development and stimulation of agrarian innovative systems;
- Rendering the state support to development service of extension / introduction, and creation necessary conditions for commercialization of its activity;
- Further integration of an agricultural science, education and introduction' service;
- Perfection system of a professional training, and improvement professional skills of workers of an agrarian science, and also of the workers, specializing in different branches of agriculture;
- Carrying out scientific research in the field of agriculture, directed on creation high technology, resource saving and non-polluting productions;
- Working out measures on attraction young experts in scientific and pedagogical activity, by improving their interest (granting soft loans, maintenance with habitation, etc.);
- Maintenance equal participation of all interested parties in system of the agricultural research, including non government organizations, the women' organizations;
- Creation systematic structure for maintenance of carrying out monitoring for definition requirements of agrarian sector, including system of agricultural research;

²⁴ In Russian language the given concept has fortunate name: 3 R' (Requirements, Priorities and Principles)

- Maintenance of a transparency of pursued transformations in agriculture, and its access to workers of agrarian sector.

The basic priorities of agricultural research in the region include:

1. Maintenance an existing gene pool of agricultural crops, and creation new competitive varieties and hybrids, development breeding and seed-growing, and introduction nonconventional crops in agrarian production;
2. Creation and releasing universal, new competitive agricultural crops, resistant to adverse environmental conditions;
3. Perfection existing, and introduction new resource saving technologies on production, processing and storage of agricultural products;
4. Application achievements of biotechnology in breeding and reproduction of agricultural plants and animals (organization production of non-virus high quality seed and planting material, cloning and transplanting of embryos);
5. Developing new highly effective and ecologically safe methods of control of harmful organisms of agricultural crops and wood plantings, working out measures of control of the harmful organisms, suitable for conducting organic agriculture;
6. Perfection and introduction technologies on an effective utilization natural, in particular, soil and water resources, preservation and increase soil fertility, improvement amelioration techniques, and also working out and introduction modern technologies on designing, construction and operation of hydro-ameliorative structures and systems, providing an effective utilization of water resources;
7. Preservation a gene pool of breeds of agricultural animals and birds, improvement breeding and productive features, developing new technologies of feeding and the maintenance;
8. Developing and realization the effective measures, directed on improvement of a forage base, introduction modern technologies, rendering qualitative services from the veterinary and research organizations of sector;
9. Developing and realization comprehensive measures, directed on preventive maintenance, diagnostics and treatment infectious and non infectious diseases of agricultural animals, and also ensuring safety of foodstuffs; test and use new vaccines and medical products;
10. Mechanization technological processes of an agricultural production, designing agricultural machinery, intended for various natural-zone conditions and production potentialities, and working out complex programs on technical service;
11. Study the basic economic problems of food security of republic; developing and introduction progressive ways of management in the conditions of small farms;

Priority spheres of agricultural research include:

- Plant growing, the basic crops, also including fruits and vegetables,
- Animal industries
- Land tenure
- Water use (an irrigational infrastructure, management and salinity)
- Fish industry
- Forestry and wood products
- Marketing and sale of agricultural production
- Remote, hardly accessible and ecologically problematic territories
- Agro-biodiversity

- Trans-boundary diseases
- Climate change
- Desertification
- And other spheres, specific to each country

The problems, which are preventing transformation of agricultural research for effective influence on increase productivity of agriculture:

- Limitation financial resources and the state support for research and development' works;
- Lack of effective system of stimulation for introduction of scientific developments in production;
- Non-attractiveness sphere of scientific activity for highly-skilled personnel and young scientists; rupture of continuity of generations of scientists;
- Absence effective interaction between all participants of innovative process;
- Weak and / or fragmented communication in a chain between research, introduction and consumption of agricultural knowledge and production, scientific activity;
- Morally and physically worn out condition of technical base and scientific laboratories;
- Insufficient qualification of researchers, an information and language barriers, interfering realization agricultural research, based and focused on requirements of agrarian sector;
- Limitation of information base, as a consequence of its insufficient development, or limitation of access.

The general principles of a regional policy on strengthening system of agricultural research should be:

- 1) Consecutive increasing investments into agricultural research and innovative activity;
- 2) An involvement of all managing subjects into processes of agricultural developments;
- 3) A transparency and availability of the information on a current condition and prospects of realization of complex measures, taking into account pessimistic and optimistic forecasts;
- 4) Increase productivity of introduction results of agricultural research, scientific developments, attraction the qualified personnel;
- 5) Expansion range of agricultural services, knowledge dissemination, and maintenance necessary institutional conditions and a legal basis for its commercialization;
- 6) Development comprehensive, scientifically-proved measures on consecutive transition from the oriented on resource-maintenance system of agro-business to innovative, ecological and resource-saving agrarian system.

4.4. Stages of the Regional strategy for AR4D transformation

It is obvious, that transformations in systems of Agricultural research with a view of enhancing its contribution in increasing efficiency of agriculture, and rationalization of its activity, as well as transition to innovative practice, demand from its participants the joint

efforts, expressed as Regional strategy of transformation system of agricultural research and innovations. The strategy is based on the national priorities, specific features of national approaches, programs and a policy, according to realization of positions, principles and priorities of Road map GCARD-1, and consists of the following stages.

Short-term stage

Creation extension service, by means of rendering assistance to agricultural producers in acceptance well-founded economic decisions, directed on intensification of production, application of new technologies, and also on radical change of the developed crisis situation in an agricultural sector of the region, at the expense of improvement information' supply, using scientific potential of scientists, and introduction results of scientific and technical developments.

Priority direction in the short-term period for transformation National systems of agricultural research consists of system of improvement extension / introduction and consulting services.

The following measures are realized at this stage:

- The program for the intermediate term and long-term periods has been developed;
- Lists and projects of necessary regulating and standard documents have been identified;
- Development of complex measures for full and universal participation of all participants of agrarian innovative systems;
- Pilot practice of monitoring and evaluation for realization of the transformations' program has been introduced;
- Criteria and a step-by-step action plan on each strategy directions have been formulated;
- Program of joint regional research for the intermediate term and long-term periods has been formulated;
- Investment' strategy has been developed;
- Draft system of a supply with information of agriculture has been developed;
- Target indicators have been identified.

Intermediate stage

Increasing investments for improvement existing infrastructure, and also formation of a new infrastructure of agricultural research and education is important for development of agricultural research. For achievement these goals, all AR4D participants should undertake efforts on improvement agricultural development, and its innovative systems, according to new quickly varying events in agrarian sector of the country.

The following actions should be carried out at an intermediate' term stage:

- Realization of strategic forecasting and planning of agriculture, which should be carried out with AR4D;
- Approval program of research at national and regional levels for the long-term period;
- Development and approval necessary regulating and standard documents, including on selection of research projects and programs;

- Realization of the actions, directed on full and universal participation of all participants of agrarian innovative systems, including youth and women;
- Working out and realization measures on commercialization and-or maintenance of necessary volume of financing for extension system;
- Approval investment strategy;
- Full formation of a personnel reserve, taking into account predicted directions of research;
- Joint regional and global research;
- Creation the regional fund of agrarian research;
- Introduction System of a supply with information of agriculture;
- Updating target indicators.

Long-term stage

In order to maintain agricultural development, and improve means of farmers for subsistence at this stage, AR4D should achieve potential level of production' capacity.

The following activities will be realized at this stage:

- Strengthening system of innovations;
- Creation conditions for designing, development, introduction resource saving and ecological technologies for conducting agricultural activities, on the basis of integrated approach: research, education and introduction;
- Creation favorable conditions for comprehensive equal participation all participants of innovative system, including youth and women;
- Increased investments into agricultural research and development;
- Functioning extension system with full capacity, by means of its commercialization, and/or maintenance of necessary volume of financing to extension system
- The target indicators will be thus achieved.

4.5. Planning and forecasting

For transformation AR4D on an innovative basis, it is expedient development, introduction and functioning system of strategic forecasting and planning of agriculture, which should be carried out by AR4D:

In this direction, AR4D should develop:

- The long-term forecasts of social and economic, technological and ecological character, which will be periodically cleared and used for choosing priorities and developments of strategic plans in a sector;
- National and regional target programs and the projects, focused on achievement of chosen priorities of development of agricultural sector;
- Indicative plans for the intermediate term prospect, linking and concretizing objectives of strategic plans, national and regional target programs (indicators of these plans, as a rule, should have focusing recommendatory nature for interested parties, but should be obligatory for the Ministries of Agriculture and AR4D;

4.6. System of information maintenance of agriculture

Systems of information' maintenance of agriculture should include the following information:

- On legislative and the regulatory legal statutes, related to agriculture, and regulating relations between managing subjects in agricultural' sphere;
 - On taxes and the taxation of subjects, operating in agriculture;
 - On level of the custom' duties, volume of tariff' quotas and its application, volume of import and export of the main types of agricultural production, raw materials and the foodstuffs;
 - On a course of realization of national, regional and global target programs;
 - On condition of development branches of plant growing and animal industries;
 - On innovations in agriculture;
 - On achievements and approbations results of activity of agrarian scientific / research institutes and the centers;
 - On high technologies and the innovations, developed and realized at national, regional and global level;
 - On availability, quantity, and condition of agricultural machinery;
 - On availability and the prices for fuel-lubricating materials, chemicals, pesticides, mineral fertilizers, seed and breeding material;
 - On volume of stocks of agricultural production, raw materials and resources;
 - On the prices for agricultural production;
 - On forecasted and actual indicators of production of the basic types of agricultural output, raw materials and the foodstuffs;
 - On planting of agricultural crops, its harvesting, about number of livestock, a volume of output of milk, and other agricultural production;
 - On carrying out tenders for delivery of agricultural production, raw materials and the foodstuffs for the state needs;
 - On condition of irrigation-drainage systems, and land reclamation in agriculture;
 - On monitoring of land, allocated for an agricultural use;
 - On financial and economic condition of the agricultural organizations, and the enterprises of processing of agricultural production;
 - On phyto-sanitary and epizootic condition of the land in the region, and implemented actions for revealing, liquidation and the prevention distribution of animals and plants' diseases, activators of infectious diseases of animals, pests of plants;
- On number of people, occupied in agriculture' branches, and able-bodied population.

4.7. Indicators of results out of transformation of AR4D

The basic indicators of agriculture development, according to the purposes and the tasks defined in the Regional strategy of transformation AR4D, should be:

- Indexes of gross output of agriculture, and the food-processing industry,
- Investments into agriculture,
- Indicators of incomes of the citizens, living in rural settlements,
- Indicators of consumption of the basic foodstuffs per capita,
- Balance of receipts from foreign trade in foodstuffs,
- Indicators of a share of a domestic foodstuff in the consumer market
- Profitability of an agricultural production,
- Indexes of technical equipment of the agricultural organizations,
- Indicators of parity of the prices,
- Index of growth volume of services in social sphere for rural citizens, etc.

4.8. Problems in developing the Regional Strategy

The basic problems at drawing up of Regional strategy are formulated in the Road map of GCARD, and confirmed by objective evidence. They consist of the following moments:

- Difficulties, arising at integration measures at regional level, owing to complexity of social, cultural, political and nature protection factors in the various states.
- Under financing of the regional organizations and the networks, which have limited distribution and an involvement from national participants of AR4D, in comparison with that is required.
- Lack of wider international political obligations on rendering support to organized at regional level measures, and the development' organizations, on an exchange of technological innovations.

Objectives of National AR4D, and all CACAARI members and participants include informing the persons, taking decisions about necessity of transformation system of agricultural research and innovations, which can render the essential and critical contribution in increase efficiency of agriculture, and in the same way, in increase well-being of the population. Regional strategy on realization of this process represents and recommends substantive provisions, requirements and priorities in transformations.

The general conclusions

In spite of the fact, that the Agricultural sector is vulnerable for external negative factors, such as global economic and financial crises, adverse weather conditions, acts of nature, still, having huge resource' potential, it is one of the base sectors of economy, and thus capable to generate necessary resources not only for the other sectors of economy, but also for improvement well-being of the population. The critical factor in delivering of agricultural production to level of its functioning on full potential capacity is participation of AR4D as the locomotive of all processes, which require immediate attention from the state, which in its turn will be expressed in the quality of institutional, political and financial support.

Methodical recommendations

for the national report:

«Transformation national systems of agricultural research and innovations for the purpose of increase agricultural efficiency»

National experts and the persons, involved in process of drawing up national strategy, should carefully study GCARD-1 Road map, and directions of its sections, in order to realize, how national systems of agricultural research and innovations should play their role for achievement real changes in increase efficiency of an agricultural production. They should take into account the fact of increase investments into system of agricultural research and innovations by three times, within the next 15 years, till 2025.

The national report should be circulated for discussions at national level with participation of all interested parties, and must be developed initially from position of country groups, according to National strategy on realization of GCARD-1 Road map, and additional proposals on developing of the regional strategy.

Taking this into consideration, National reports should present / state:

1. The Review of organizational structure of national system of agricultural research, its component elements (the agrarian information system, extension' system, innovation system, basically their roots are in science and education; they are integral from each other; fundamental base of modern Agrarian innovative systems - science and education)
 2. The Review of standard-legal base, mechanisms of institutional and legal regulation of relations, and cooperation in the system of agricultural-industrial complex.
 3. Economic and financial mechanisms of financing and management of the complex, maintenance its financial and economic stability by system of agricultural research.
 4. Theoretical aspects of commercialization of science, creation mechanisms of self-financing and ensuring niche in all market mechanism (intellectual property and the mechanism of its regulation - the factors, stimulating innovative system, presence of legal mechanisms - the law, statutory acts, etc.).
 5. Measures at national and regional levels, which need to be undertaken for inclusion in regional and international processes, etc. Short-term, intermediate term and long-term stages of transformations, with indication concrete terms and conditions, which in turn should be provided for its normal functioning.
1. The review of the status, and definition necessary actions for coordination the donor assistance, investments and external assistance for support and development of an agricultural science, an agricultural education both consulting services, and dissemination of knowledge in the agrarian sector.

Structure

National report:

«Transformation national systems of agricultural research and innovations to improve agricultural efficiency»

1. **Introduction** (Brief information on the country, which includes):
 - 1.1. Geographic aspects, population
 - 1.2. Land area: Total; arable (cultivated); irrigated and rain-fed; pastures
 - 1.3. Macro-economic situation
 - 1.4. Methods of means of subsistence (% involved in agriculture, etc.); poverty' level: Present figures for 2010 in %
 - 1.5. GDP and share of agriculture, GDP per capita

2. **Development goals of the country**
 - 2.1. Brief listing country' development goals
 - 2.2. Specify place and expected role of agriculture in achieving these goals. Briefly discuss "how" questions on satisfaction of the national goals on the sovereignty, economic independence, a social equality and protection of the environment will be solved.

3. **Agricultural sector of the country**
 - 3.1. Support means for subsistence (% population depending on agriculture)
 - 3.2. How and at what extent an agriculture ensures occupation
 - 3.3. Contribution in GDP
 - 3.4. Contribution in inflow of hard currency into the country, through export
 - 3.5. Contribution in environment protection
 - 3.6. Zones, where agriculture is practiced
 - 3.7. Types of farmers-interested participants
 - 3.8. Problems that agriculture is facing, including degradation of natural resources (only briefly)

4. **National systems of agricultural research, and requirements in capacity building: Brief description:**
 - 4.1. Agriculture' research systems,
 - 4.2. Agriculture' education systems
 - 4.3. Extension services and support of the village,
 - 4.4. The status of cooperation among research, education and extension systems
 - 4.5. The role of organizations of civil society (NGO, Farmers' organizations, Women's organizations) in developing agriculture,
 - 4.6. The role of private sector in agriculture' research and development,
 - 4.7. Priority needs (NARS) in the sphere of infrastructure and the basic funds, capacity building (in Research Institutes, education and extension system). Identify sectors, where capacity building is required

5. **Key problems, needs and priorities in agricultural research** (Include key issues in thematic branches (the basic branches) (Please refer to the regional report of CAC for 2009)

- 5.1. Production of agricultural crops (including fruits and vegetables)/livestock
- 5.2. Land tenure
- 5.3. Management of water resources (irrigation infrastructure, management and salinity)
- 5.4. Fishery
- 5.5. Forestry and wood products
- 5.6. Agro-biodiversity
- 5.7. Trans-boundary diseases
- 5.8. Climate change
- 5.9. Desertification

6. Prevailing questions (put them in the order of priority)

- 6.1. National system of agricultural research and development, including all involved parties (state, civil society and private), their functions and responsibilities, mechanism for regulation relations, partnership, etc. Underline the present situation of Agrarian Innovation System (AIS).
- 6.2. Identify problems, priorities and propose possible solutions/actions
- 6.3. Investments in agricultural research and development (for the last 10 years in different AR4D sub-sectors in the country). Specify any positive and negative developments. Specify donor' support. Allocate mechanisms of coordination and monitoring.
- 6.4. Political measures for improvement land tenure, access and the right of use; infrastructure and marketing' improvement; expansion opportunities and improvement conditions for earning incomes; and increase role of women in agriculture and AR4D
- 6.5. Capacity building (increasing)
- 6.6. Cooperation and partnership (at national, regional and international level)
- 6.7. Management issues (of nature, and involvement of all interested parties of AR4D, including farmers, women, NGO, private sector, etc.)
- 6.8. Exchange of knowledge among interested participants on AR4D
- 6.9. Monitoring and evaluation

7. Need in research priorities around the country

- 7.1. Provide the brief overview of each priority with specification of problems
- 7.2. Put them in the order of priority, proposing possible solutions/measures, which need to be taken. This will help in definition common needs and commonalities in the actions at the regional level.

Also specify current undertaken collective measures, and also measures on transformation System of agricultural research, and its strengthening

Indicators of areas, occupied under agricultural land in CAC countries
FAO data, 2009.
(thousand ha)

	Armenia		Azerbaijan		Georgia		Kazakhstan		Kyrgyzstan		Tajikistan		Turkmenistan		Uzbekistan	
Country area	2,974.0	W	8,660.0	Q	6,970.0	Fm	272,490.0	W	19,994.9	Q	14,255.0	Q	48,810.0	Fm	44,740.0	Fm
Land area	2,848.0	Fm	8,262.2	Q	6,949.0	Fm	269,970.0	Fm	19,180.0	Fm	13,996.0	Fm	46,993.0	Fm	42,540.0	Fm
Agricultural area	1,753.5	Fm	4,757.3	Q	2,508.0	Fm	208,480.0	Fm	10,617.3	Q	4,750.0	Q	32,610.0	Fm	26,651.0	Fm
Agricultural area, irrigated	274.0	Fm	1,433.0	Fm	433.0	Fm	3,556.0	Fm	1,018.3	Q	719.0	Fm	1,800.0	Fm	4,223.0	Fm
Arable land	457.5	Fm	1,874.0	Q	448.0	Fm	23,400.0	Fm	1,276.0	Q	742.0	Fm	1,850.0	Fm	4,301.0	Fm
Permanent crops	53.0	W	227.1	Q	120.0	Fm	80.0	Fm	75.0	Q	133.0	Q	60.0	Fm	350.0	Fm
Permanent meadows and pastures	1,243.0	Fm	2,656.2	Q	1,940.0	Fm	185,000.0	Fm	9,266.3	Q	3,875.0	Q	30,700.0	Fm	22,000.0	Fm
Forest area	266.2	Fm	936.0	Fm	2,744.8	Fm	3,314.6	Fm	936.9	Fm	410.0	Fm	4,127.0	Fm	3,279.4	Fm
Inland water	126.0	Fm	397.8	Fm	21.0	Fm	2,520.0	Fm	814.9	Fm	259.0	Fm	1,817.0	Fm	2,200.0	Fm

Source: FAOSTAT | © FAO Statistics Division 2011 | 06 September 2011

Fm = Estimates of FAO

Q = Official data by request of FAO

W = Received from official documents

**Indicators of number of population on CAC countries,
Thousand men
Estimate for September, 2011
(Source FAOSTAT: <http://faostat.fao.org/site/291/default.aspx>)**

	Total population	Total population, men		Total population, women		Total population, rural		Total population, urban		Total population, agricultural	
	th.men	th.men.	%	th.men.	%	th.men.	%	th.men	%	th.men	%
Armenia	3,100.0	1,443.0	46.5%	1,657.0	53.5%	1,108.0	35.7%	1,992.0	64.3%	283.0	9.1%
Azerbaijan	9,306.0	4,607.0	49.5%	4,699.0	50.5%	4,461.0	47.9%	4,845.0	52.1%	2,082.0	22.4%
Georgia	4,329.0	2,039.0	47.1%	2,290.0	52.9%	2,041.0	47.1%	2,288.0	52.9%	634.0	14.6%
Kazakhstan	16,207.0	7,785.0	48.0%	8,422.0	52.0%	6,671.0	41.2%	9,536.0	58.8%	2,476.0	15.3%
Kyrgyzstan	5,393.0	2,660.0	49.3%	2,733.0	50.7%	3,531.0	65.5%	1,861.0	34.5%	1,098.0	20.4%
Tajikistan	6,977.0	3,429.0	49.1%	3,547.0	50.8%	5,137.0	73.6%	1,840.0	26.4%	1,873.0	26.8%
Turkmenistan	5,105.0	2,513.0	49.2%	2,592.0	50.8%	2,554.0	50.0%	2,551.0	50.0%	1,498.0	29.3%
Uzbekistan	27,760.0	13,799.0	49.7%	13,962.0	50.3%	17,697.0	63.8%	10,064.0	36.3%	5,792.0	20.9%
Total on CAC:	78,177.0	38,275.0	49.0%	39,902.0	51.0%	43,200.0	55.3%	34,977.0	44.7%	15,736.0	20.1%

**Indicators of number of active population in CAC countries,
Thousand people
Estimate for September, 2011
(Source FAOSTAT: <http://faostat.fao.org/site/291/default.aspx>)**

	Total population	Total, active economic population		Total, active economic population, men			Total, active economic population, women		
	Th.people	Th.people	% (out of total population)	Th.people	% (out of active population)	% (out of all population, men.)	Th.people	% (out of active population)	% (out of all population, women)
Armenia	3,100.0	1,592.0	51.4%	793.0	49.8%	55.0%	799.0	50.2%	48.2%
Azerbaijan	9,306.0	4,870.0	52.3%	2,570.0	52.8%	55.8%	2,300.0	47.2%	48.9%
Georgia	4,329.0	2,356.0	54.4%	1,259.0	53.4%	61.7%	1,097.0	46.6%	47.9%
Kazakhstan	16,207.0	8,682.0	53.6%	4,400.0	50.7%	56.5%	4,282.0	49.3%	50.8%
Kyrgyzstan	5,393.0	2,491.0	46.2%	1,431.0	57.4%	53.8%	1,060.0	42.6%	38.8%
Tajikistan	6,977.0	2,901.0	41.6%	1,542.0	53.2%	45.0%	1,359.0	46.8%	38.3%
Turkmenistan	5,105.0	2,431.0	47.6%	1,284.0	52.8%	51.1%	1,147.0	47.2%	44.3%
Uzbekistan	27,760.0	12,916.0	46.5%	6,957.0	53.9%	50.4%	5,959.0	46.1%	42.7%
Total on CAC:	78,177.0	38,239.0	48.9%	20,236.0	52.9%	52.9%	18,003.0	47.1%	45.1%

**Indicators of economically active population in CAC countries,
Thousand people
Estimate for September, 2011
(Source: FAOSTAT: <http://faostat.fao.org/site/291/default.aspx>)**

	Economically active population, involved in agriculture			Economically active population, involved in agriculture, men			Economically active population, involved in agriculture, women		
	Th.people	% (out of total active population.)	% (out of agricultural population)	Th.people	% (out of agricultural active population)	% (out of all population, men.)	Th.people.	% (out of agricultural active population)	% (out of all population, women.)
Armenia	145.0	9.1%	51.2%	122.0	84.1%	8.5%	23.0	15.9%	1.4%
Azerbaijan	1,089.0	22.4%	52.3%	511.0	46.9%	11.1%	579.0	53.2%	12.3%
Georgia	345.0	14.6%	54.4%	222.0	64.3%	10.9%	123.0	35.7%	5.4%
Kazakhstan	1,181.0	13.6%	47.7%	902.0	76.4%	11.6%	279.0	23.6%	3.3%
Kyrgyzstan	507.0	20.4%	46.2%	358.0	70.6%	13.5%	149.0	29.4%	5.5%
Tajikistan	779.0	26.9%	41.6%	364.0	46.7%	10.6%	414.0	53.1%	11.7%
Turkmenistan	713.0	29.3%	47.6%	334.0	46.8%	13.3%	380.0	53.3%	14.7%
Uzbekistan	2,695.0	20.9%	46.5%	1,530.0	56.8%	11.1%	1,165.0	43.2%	8.3%
Total on CAC:	7,454.0	19.5%	47.4%	4,343.0	58.3%	11.3%	3,112.0	41.7%	7.8%

Tendencies of growth of the population, including rural and agricultural

Countries	Total population, thousand people			Rural population, thousand people			Agricultural population, (including forestry and fishery), thousand people		
	2008	2009	2010	2008	2009	2010	2008	2009	2010
Armenia	3,077	3,083	3,090	1,115	1,118	1,121	306	298	291
Azerbaijan	8,731	8,832	8,934	4,202	4,238	4,271	2,059	2,048	2,036
Georgia	4,307	4,260	4,219	2,038	2,011	1,985	687	660	636
Kazakhstan	15,521	15,637	15,753	6,541	6,540	6,537	2,522	2,485	2,449
Kyrgyzstan	5,414	5,482	5,550	3,452	3,485	3,516	1,180	1,168	1,156
Tajikistan	6,836	6,952	7,075	5,031	5,113	5,197	1,960	1,950	1,941
Turkmenistan	5,044	5,110	5,177	2,593	2,604	2,614	1,534	1,536	1,537
Uzbekistan	27,191	27,488	27,794	17,202	17,367	17,527	6,141	6,047	5,955
Total on CAC:	76,121	76,844	77,592	42,174	42,476	42,768	16,389	16,192	16,001

Source: FAO Statistical Yearbook 2010

Appendix 8.

Basic macro-economic indicators of Central Asia and South Caucasus' countries, 2010.

	Armenia	Azerbaijan	Georgia	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
National currency	AMD (Dram)	AZM (Manat)	GEL (Lari)	KZT (Nenge)	KGS (Som)	TJS (Somoni)	TMM (Manat)	UZS (Soum)
Population	3.30	9.05	4.39	15.58	5.34	7.62	5.44	28.25
GDP' growth (fixed prices, national currency)	2.60%	5%	6.38%	7%	-1.36%	6.50%	9.22%	8.50%
GDP (current prices, national currency, billion.)	3,508.2	43.7	20.8	20,398.2	212.2	24.7	61.1	61,831.2
GDP (current prices, USD, billion.)	9.39	54.37	11.67	138.43	4.62	5.64	21.42	38.99
GDP deflator	204.3	205.2	188.6	2,106.2	680.4	15,386.1	208.6	8,654.9
GDP per capita (fixed prices, national currency)	520,422.5	2,351.8	2,512.5	62,146.8	5,835.6	21.1	5,380.8	25,292.1
GDP per capita (current prices, national currency)	1,063,347.5	4,826.1	4,737.5	1,308,950.6	39,704.2	3,242.7	11,226.6	2,189,015.4
GDP per capita (current prices, USD)	2,845.8	6,008.3	2,658.0	8,883.0	863.7	740.5	3,939.2	1,380.3
Capital investments in % out of GDP	33.32%	18.48%	15%	32.79%	24.87%	17.16%		29.67%
Gross national savings in % out of GDP	19.60%	46.18%	5.19%	35.34%	17.43%	19.34%		36.34%
Inflation of average consumer prices (index to the basic 2000)	226.2	234.6	243.0	230.1	203.8	857.5	313.2	2094.5
Inflation to the end of the year in %	9.35%	7.88%	11.24%	7.97%	18.93%	9.80%	4.77%	12.05%
Unemployment level in % out of workforce	7%	6.05%	16.80%	5.78%	5.83%			0.20%

Source: <http://www.economywatch.com/>

Appendix 9.

GDP indicators per capita

**GDP per capita,
In fixed prices of 2000, in \$US**

Countries	1999-2001	2003-2005	2007	2008	2009
Armenia	629.7	989.7	1,425.5	1,520.0	1,298.6
Azerbaijan	648.7	990.0	1,934.2	2,118.8	2,289.4
Georgia	651.0	891.8	1,228.0	1,271.2	1,233.9
Kazakhstan	1,240.2	1,814.2	2,343.8	2,403.5	2,414.3
Kyrgyzstan	276.7	312.4	345.2	369.5	373.5
Tajikistan	140.5	193.3	230.7	245.0	249.1
Turkmenistan	654.2	1,156.6	1,572.0	1,714.0	1,827.2
Uzbekistan	556.3	642.5	782.1	843.4	901.8

Source: FAO Statistical Yearbook, 2010

**GDP growth per capita in comparison with the previous year
In fixed prices of 2000**

Countries	1999-2001	2003-2005	2007	2008	2009
Armenia	100.0%	157.2%	144.0%	106.6%	85.4%
Azerbaijan	100.0%	152.6%	195.4%	109.5%	108.1%
Georgia	100.0%	137.0%	137.7%	103.5%	97.1%
Kazakhstan	100.0%	146.3%	129.2%	102.5%	100.4%
Kyrgyzstan	100.0%	112.9%	110.5%	107.0%	101.1%
Tajikistan	100.0%	137.6%	119.3%	106.2%	101.7%
Turkmenistan	100.0%	176.8%	135.9%	109.0%	106.6%
Uzbekistan	100.0%	115.5%	121.7%	107.8%	106.9%

**GDP growth per capita in comparison with 2000,
In fixed prices of 2000**

Countries	1999-2001	2003-2005	2007	2008	2009
Armenia	100.0%	157.2%	226.4%	241.4%	206.2%
Azerbaijan	200.0%	152.6%	298.2%	326.6%	352.9%
Georgia	300.0%	137.0%	188.6%	195.3%	189.5%
Kazakhstan	400.0%	146.3%	189.0%	193.8%	194.7%
Kyrgyzstan	500.0%	112.9%	124.8%	133.6%	135.0%
Tajikistan	600.0%	137.6%	164.2%	174.3%	177.2%
Turkmenistan	700.0%	176.8%	240.3%	262.0%	279.3%
Uzbekistan	800.0%	115.5%	140.6%	151.6%	162.1%

Appendix 10.

Indicators of Gross Output per capita of agricultural population

Gross agricultural product per capita of agricultural population, in fixed prices of 2000, in \$ US

Countries	1999-2001	2003-2005	2007	2008	2009
Armenia	1189.8	1781.3	2395.7	2499.8	2541.3
Azerbaijan	381.8	531.2	605.5	646.2	688.6
Georgia	715.4	907.2	1028.0	1199.6	1173.7
Kazakhstan	544.4	698.6	883.7	961.0	1039.7
Kyrgyzstan	370.8	439.9	462.2	470.1	475.0
Tajikistan	101.6	157.4	192.8	205.6	217.5
Turkmenistan	447.4	640.9	1101.2	1228.5	1361.8
Uzbekistan	605.9	816.4	1029.9	1092.8	1177.4

Source: FAO Statistical Yearbook, 2010

Growth of Gross output per capita of agricultural population in comparison with previous year, in fixed prices of 2000

Countries	1999-2001	2003-2005	2007	2008	2009
Armenia	100.0%	149.7%	134.5%	104.3%	101.7%
Azerbaijan	100.0%	139.1%	114.0%	106.7%	106.6%
Georgia	100.0%	126.8%	113.3%	116.7%	97.8%
Kazakhstan	100.0%	128.3%	126.5%	108.8%	108.2%
Kyrgyzstan	100.0%	118.6%	105.1%	101.7%	101.0%
Tajikistan	100.0%	154.9%	122.5%	106.6%	105.8%
Turkmenistan	100.0%	143.3%	171.8%	111.6%	110.9%
Uzbekistan	100.0%	134.7%	126.2%	106.1%	107.7%

Growth of Gross output per capita of agricultural population in comparison with 2000, in fixed prices of 2000

Countries	1999-2001	2003-2005	2007	2008	2009
Armenia	100.0%	149.7%	201.3%	210.1%	213.6%
Azerbaijan	100.0%	139.1%	158.6%	169.2%	180.4%
Georgia	100.0%	126.8%	143.7%	167.7%	164.1%
Kazakhstan	100.0%	128.3%	162.3%	176.5%	191.0%
Kyrgyzstan	100.0%	118.6%	124.7%	126.8%	128.1%
Tajikistan	100.0%	154.9%	189.7%	202.3%	214.0%
Turkmenistan	100.0%	143.3%	246.2%	274.6%	304.4%
Uzbekistan	100.0%	134.7%	170.0%	180.4%	194.3%

Concepts, Strategy and Programs of development of the countries of Central Asia and Southern Caucasus, mentioned in National reports

Armenia

- Strategy of sustainable development of villages and agriculture of Republic Armenia for 2010-2020
- Strategic program of the government of Armenia on poverty overcoming for 2003-2015
- Program of development of agriculture, an increase level of self-maintenance by foodstuffs for 2008-2012
- The concept of development priority directions of an agrarian science of Republic Armenia 2009-2013

Azerbaijan

- Governmental program of social and economic development of the regions of the Azerbaijan Republic in 2004-2008, and 2009-2013
- Governmental program on sustainable economic development and poverty reduction for 2008-2015
- Governmental program on stable maintenance of the population of Azerbaijan with food products in 2008-2015

Georgia

- Intermediate term program of development of economy till 2015

Kazakhstan

- Strategy «Kazakhstan - 2030: Prosperity, security and improvement well-being of all Kazakh people»
- Program on agriculture development in Republic Kazakhstan for 2010-2014

Kyrgyzstan

- Strategy of development of the country for 2009-2011

Tajikistan

- National strategy of development of Republic Tajikistan for the period till 2015
- Strategy of poverty reduction of Republic Tajikistan
- Concepts of the state demographic policy of Republic Tajikistan for 2003-2015
- Concepts of an agrarian policy of Tajikistan in the National strategy of development for the period till 2015
- Strategy of poverty reduction of Republic Tajikistan on 2010-2012 r.
- Program of food security of Republic Tajikistan for the period till 2015

Turkmenistan

- National program of social and economic transformation of Turkmenistan for the period till 2030.
- Strategy of economic, political and cultural development of Turkmenistan for the period till 2020

Uzbekistan

- Concepts of further deepening of democratic reforms, and formation of a civil society in the country
- Concept of a sustainable development of Republic Uzbekistan
- National strategy of sustainable development of Republic Uzbekistan

Rating of 20 the most valuable in monetary terms products of agriculture
(on the bases on non-official data of FAOSTAT), for 2009

Armenia			Azerbaijan		Georgia		Kazakhstan	
№		Thousand \$ US		Thousand \$ US		Thousand \$ US		Thousand \$ US
1	The cow milk	175,675	The cow milk	396,688	The cow milk	159,251	Wheat	2,012,036
2	Meat of cattle	133,878	Wheat	225,352	Grapes	85,799	The cow milk	1,446,402
3	Grapes	119,267	Meat of cattle	213,532	Meat of cattle	78,863	Meat of cattle	1,069,220
4	Tomatoes	102,953	Tomatoes	145,211	Nuts	34,943	Potato	358,423
5	Potato	77,985	Mutton	130,756	Potato	30,009	Pork	321,072
6	Vegetables	47,446	Potato	130,666	Corn	24,791	Mutton	310,053
7	Apples	35,551	Apples	86,374	Tangerines	22,355	Tomatoes	218,781
8	Plums	31,031	Grapes	73,829	Eggs	19,822	Cotton-fibre	127,199
9	Peaches	29,942	Fruits, fresh	70,524	Tomatoes	18,995	Eggs	119,597
10	Eggs	29,028	Chicken meat	66,682	Apples	17,834	Barley	118,863
11	Wheat	26,587	Eggs	60,047	Chicken meat	17,663	Horse-flesh	111,307
12	Mutton	22,994	Nuts	48,776	Walnuts	12,731	Chicken meat	104,954
13	Cherry	19,069	Water-melons	46,374	Pork	12,600	Seeds of sunflower	95,554
14	Pears	18,806	Persimmon	43,723	Mutton	10,089	Rice	82,148
15	Cabbage	16,997	Cucumbers	38,022	Peaches	9,581	Onions, napiform	74,771
16	Water-melons	16,643	Onions, napiform	35,456	Fruits	7,469	Wool	69,637
17	Cucumbers	16,071	Wool	29,188	The sheep milk	6,425	Carrots	65,368
18	The sheep milk	15,381	Eggplants	21,900	Honey	6,273	Water-melons	65,161
19	Apricots	14,906	Vegetables, fresh	19,901	Tea	6,168	Cucumbers	57,379
20	Pork	13,688	Raspberry	19,349	Cucumbers	6,135	Goat meat	50,390

Rating of 20 the most valuable in monetary terms products of agriculture
(on the bases on non-official data of FAOSTAT), for 2009
(continuation)

№	Kyrgyzstan		Tajikistan		Turkmenistan		Uzbekistan	
		Thousand \$ US		Thousand \$ US		Thousand \$ US		Thousand \$ US
1	The cow milk	348,236	Cotton fiber	139,633	Meat of cattle	378,203	Meat of cattle	1,677,411
2	Meat of cattle	264,003	Tomatoes	114,564	Mutton	348,382	Cotton fiber	1,612,856
3	Potato	113,816	The cow milk	104,109	Cotton fiber	314,424	The cow milk	1,211,420
4	Mutton	112,499	Potato	92,643	The cow milk	231,621	Wheat	794,858
5	Tomatoes	71,754	Mutton	90,955	Cotton seeds	132,014	Tomatoes	779,780
6	Wheat	65,164	Meat of cattle	81,831	Grapes	131,471	Cotton seeds	541,919
7	Apples	61,745	Grapes	79,283	Tomatoes	120,847	Grapes	514,226
8	String bean	40,810	Wheat	76,114	Wheat	112,970	Apples	257,977
9	Horse-flesh	29,493	Onions napiform	57,128	Wool	71,741	Mutton	254,177
10	Carrots	29,407	Carrots	41,791	Eggs	41,137	Carrots	248,251
11	Onions, napiform	28,647	Vegetables	37,085	Potato	39,022	Potato	223,888
12	Pork	26,524	Apples	28,442	Rice	32,185	Onions, napiform	166,976
13	Cotton-fibre	23,296	Cotton seeds	22,442	Chicken meat	27,775	Vegetables	162,059
14	Wool	21,055	Rice	20,230	Meat of goats	23,963	Apricots	160,111
15	Vegetables	20,236	The goat milk	18,691	Onions, napiform	23,523	Eggs	123,330
16	Corn	19,998	Apricots	11,262	Apples	22,837	Cherry	85,175
17	Tobacco	19,121	Wool	10,420	Plums	19,991	Silk cocoons	75,575
18	Goat-meat	18,172	Peaches	10,343	Water-melons	19,664	Cucumbers	69,491
19	Eggs	17,085	Water-melons	10,270	Apricots	18,495	Cabbage	66,926
20	Garlic	16,855	Cabbage	10,175	Carrots	17,464	Almonds	54,917

For notes: