



Date : 17/06/2008

Development of Agriculture Information Services in Central Asia and Caucasus

Oleg Shatberashvili

Georgian Federation for Information and Documentation
gfid@caucasus.net

Ajit Maru

Global Forum on Agricultural Research (GFAR) Secretariat
ajit.maru@fao.org

Meeting: 141. Agricultural Libraries DG
Simultaneous Interpretation: Not available

WORLD LIBRARY AND INFORMATION CONGRESS: 74TH IFLA GENERAL CONFERENCE AND COUNCIL
10-14 August 2008, Québec, Canada
<http://www.ifla.org/IV/ifla74/index.htm>

Abstract

A study of the status of agriculture information services in five countries of Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan) and Caucasus (Armenia, Azerbaijan, Georgia) was made under GFAR/CACAARI initiative in 2007.

The status of access to agricultural information and information exchange; the status of telecommunications; status of Radio and TV; organization and management of scientific and technical information systems and services in agriculture; use of information and communication technology for scientific and technical information purposes; research-to-farmer information transfer; problems in using ICT for information services in agricultural research and development were studied in all the eight countries of the region. Also included in the study was the status of FAO Depository Libraries, other agricultural libraries, agricultural collections of National Libraries and of other ST libraries. The availability of electronic information resources was also examined. The functions and services relating to access to resources as well as to development of national and regional resources and the possible solutions to the problems in information management are discussed. The use of the National and local TV and Radio for agro information dissemination in the CAC region have been evaluated. Finally awareness of the main stakeholders of the available services and their development is discussed. Possible policies of the agro information development in the CAC region are presented.

Keywords: Agricultural information services, Central Asia, Caucasus, Global Forum on Agricultural Research, Information transfer

1. Introduction

A study to assess the status of agriculture information services in five countries of Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan) and Caucasus (Armenia, Azerbaijan, Georgia) was made under Central Asia and the Caucasus Association of Agricultural Research Institutes (CACAARI) and the Global Forum on Agricultural Research (GFAR) Information and Communications Management for Agricultural Research for Development (ICM4ARD) initiative. This group of Central Asia and Caucasus (CAC) countries occupy the geographic area exceeding 4 million sq. km (about 3 % of the Earth's dry land), which is characterized by a great variety of agricultural directions, plant and animal species, etc. They have a total population of more than 75 million, a large number of which (up to 40%) live in rural areas and are dependent on agriculture for their livelihoods. The annual economy growth is currently about 10% or more in all countries (30% is reported in Azerbaijan). The GDP per capita is highest in Kazakhstan (more than USD 6,000), and lowest in Tajikistan (less than USD 1,000).

Developments in the CAC region's diversified agriculture, with up to 100 agricultural research institutions and universities is not very well known internationally. Not numerous published research results on the subject of our study were devoted to developments in individual countries [1, 2, 3]. These developments take place in the very unusual context of the Research and Development Sector in the post-soviet era in these countries.

Agricultural research and innovation can contribute significantly to agricultural development in the CAC region. An assessment of agricultural information services can enable improving these services and in turn improve agricultural research and innovation in the CAC region. The situation in the region has much in common with other post-soviet regions. It makes a study of agricultural information services in the region and its results important for comparison with trends in global agricultural development.

2. Methodology

The following elements of the information infrastructure were considered the most important for the future progress of the information support to agriculture in CAC region:

- a) status of agricultural and agriculture related libraries;
- b) availability of information resources;
- c) use of information and communications technology for scientific and technical information purposes;
- d) research-to-farmer information transfer and status of extension services;
- e) status of telecommunications, status of Radio and TV;
- f) organization and management of scientific and technical information systems and services in agriculture.

Data and information related to the above criteria on the status and trends of development of agro-information systems and services in the Central Asia and Caucasus region between 2004-2007 was collected through national information nodal points in each of the CAC countries. The data was collected through questionnaires which were accompanied with instructions for generating information on each of the above listed elements. The filled questionnaires were processed. Not all the data collected were compatible to the study. This was partly due to the level of formalization of the questionnaires and partly to the lack of required data in the countries. Even less specific statistical data requested for the country was often unavailable [4, Appendix A]. After the primary data processing it was concluded that additional data search was necessary. Thus information available on the Internet and national publications were used and, in some cases more experts in the countries were involved to supplement the study to make satisfactory qualitative description of the agro information development in the CAC region. This data though not published has been discussed among GFAR, Food and Agricultural Organization (FAO) and CACAARI information management experts to assess the feasibility and steps towards development of CAC Regional Agro Information System (RAIS) similar to systems in other regions of the World [5].

3. Background: recent years changes in STI sector

A rapid economic growth is observed in the entire Region, yet there is about 30-fold decline in use of Scientific and Technical Information (STI), including agricultural information, compared to 1990 [6]. The fact is very important in the context of implementation of STI projects. It is a result of a dramatic reduction of R&D Expenditure in the all post-socialist area.

Table 1

Expenditures on R&D in post-socialist states, % of GDP (Used to be ~ 2-3% in 1985)

	2003	2004	2005	2006	
Armenia	NA	NA	0.2	NA	
Azerbaijan	0.2	NA	NA	0.1	
Georgia	0.2	0.2	NA	< 0.2	
Kazakhstan	0.3	NA	NA	0.14	1.5 – 2 (plan for 2012)
Kirgizstan	0.2	NA	NA	NA	
Moldova	0.2	NA	0.4	NA	~1 (plan for 2008)
Russia	0.3	NA	NA	~ 1	
Tajikistan	0.1	NA	NA	NA	
Turkmenistan	0.4	NA	NA	NA	
Uzbekistan	0.2	NA	NA	NA	
Latvia	NA	0.4	NA	0.6	
Lithuania	NA	0.7	NA	NA	

Table 1 illustrates that in spite of above mentioned economic growth, in the majority of countries expenditures on R&D are either not growing or growing very slowly, and in all cases is much below the level when research starts to influence industry sectors.

Another peculiarity is that though the majority of these countries fall, according to their GDP per capita, in the range of developing countries, they are different from common developing countries because they approach the current level of developing countries not as a result of positive development, but as a result of declining growth following the end of the Soviet Union as illustrated in Figure 2. The right term for the majority of post Soviet countries R&D sector is not *development*, but *rehabilitation* of the R&D Sector.

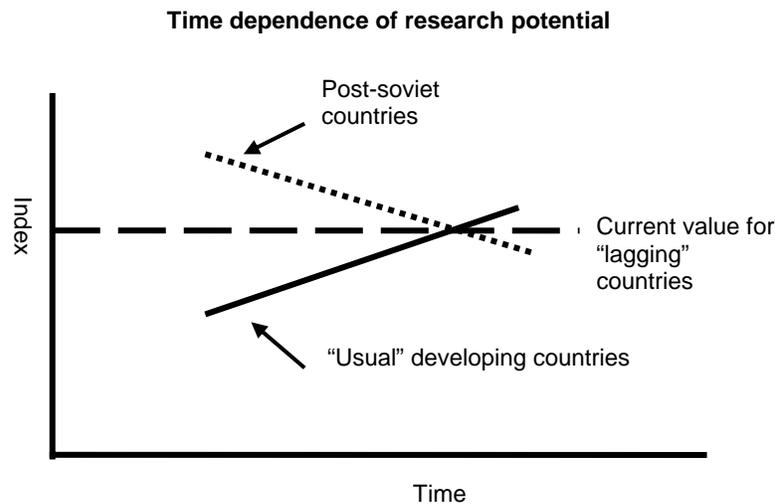


Fig. 1

At the end of 20th century with the collapse of the socialist system changes of global scale took place. The number of the emerging new states was comparable to the number of developing countries emerging in 1950s after the Second World war and post-colonial era. However, for these new countries, the international information community did not elaborate appropriate support in STI sector similar to UNESCO's UNISIST program in 1950s). A systematized data of information systems' performance in the post-socialist countries is not available, yet disembodied data [6] show their poor state:

- Georgian National Library allocated only USD 60,000 for subscription in 2005, reduced to ~ USD 20,000 in 2006
- In 2006 only around 20 organizations in Russia are using DBs of STN International, the largest ST libraries subscribe for 20 – 40 titles of international journals

In 2005 all rural libraries in Turkmenistan were closed down (American Libraries, Apr. 2005.). In other CAC countries they have problems, etc.

The shortcomings in the agriculture research and information systems are resulted from the general attitude to research and innovation in the post-soviet countries.

4. Availability of agricultural information resources

Availability of agricultural information is a key issue for an information service. The study considered access of users from the CAC region to several groups of information resources, namely, to international information (in printed and electronic forms, free and chargeable), to local and regional information (including participation of their creation), and to different services and service modes.

4.1. Access to international information

FAO Depository Libraries are established in almost all countries, with acquisition of books, brochures, CD-ROMs, etc. Their usage intensity depends on several factors. Among them one of the most important is organization where the collection is located: for example, in a library or an information center, which agriculturists are used to visit, or in an arbitrary organization (which sometimes is the case). Language is still a barrier for agriculturists, therefore when there is some current awareness service with at list a title translation, the usage is higher.

National Libraries exist in all of the countries. Specialized (National) agricultural libraries still exist in some countries under Ministries of Agriculture (e.g. Azerbaijan, Kazakhstan) and **libraries of agricultural universities** function in all of the countries. Provincial and **municipal libraries** are located in predominantly rural areas though many of them have been closed down. These had supported large agricultural acquisitions in the past. Now, libraries in all of the CAC countries do not purchase international publications (books, journals) primarily due to the costs involved limiting access to agricultural information.

The study indicates that in all CAC countries there are technical means, as well as other necessary conditions for **access to free electronic information**, first through the Internet and, second, through FAO resources, open access and free US National Agricultural Library resources and the AgroWEB Network resources. In majority of the countries these resources are made use of, by researchers and food processing and agri-business sectors.

Access to some commercial and proprietary STI databases is made available through projects sponsored by international donors. To be worth mentioning is the AGORA project, which insures free access to a number of agricultural full text e-journals, as well as eIFL project giving access for a symbolic fee to EBSCO full text e-journal DB, comprising about 5.000 journal titles, agricultural ones among them. ASFA project distributes a CD-ROM insuring free access to a large number of full-text journal articles on fishery. There are some other databases useful for agriculture sector (BioOne, TIBORDER, DOAJ) in free access for post-soviet country researchers.

Access to other chargeable electronic resources (Dialog, STN International, CABI, etc.), is very limited due to financial and organizational weaknesses. There are two countries (Georgia and Kazakhstan) where National ST Information centers (having

significant responsibilities in the agro information sphere) work with this kind of resources.

The status of access to International information is summarized in the Table 2

Table 2

Availability of international information resources in CAC region

Resource	Availability in Countries
Books, journals	Not available in all
FAO Depository Library	Available in 5 of 8
Access to free internet resources	Available in all
Access to chargeable DBs through sponsored projects	Available in 4 of 8
Access to full-text e-journals through sponsored projects	Available in 4 of 8
Access to other chargeable electronic resources	Available in 2 of 8

4. 2. Input to International and National DBs and Networks

An estimated annual output of the CAC’s weakened research system (see above) still is 4 - 5 thousand articles in periodicals and non-periodicals. More than 90% of them is published either in the national languages or in Russian. Their processing, exchange and access needs to be a subject of attention.

FAO AGRIS/CARIS. The quality (especially through collaboration) of agricultural research depends not only on the access to international information, but on the international visibility of local research and on local exchange of information as well. In this regard in a number of the CAC countries (see Table 3) agricultural research data (journal publications, R&D reports, etc.) are collected and processed with purpose of input to FAO AGRIS/CARIS and some other DBs. A shortcoming is irregular and incomplete manner of work, which may be attributed to in the weak STI systems.

- **Multidisciplinary STI databases.** In some countries (e.g. Georgia) comprehensive multidisciplinary DB on R&D outputs are developed, comprising the National flow of publications, R&D reports, books, patents, dissertation thesis, etc. Part of it is agriculture research output. Irregularity is a shortcoming in this case too.

- **Input to International AgroWeb Network** (Former Socialist countries) trough development of the National AgroWeb sites may become a promising instrument of the regional agricultural data collection and exchange. Almost all CAC countries take part in it.

- **Input to Databases on agromarket.** Agricultural Market Information DBs are reported in Armenia and Kazakhstan. They contain periodically updated information on prices for the main food products and agricultural produce in all Provincial Centers of the countries.

Databases on plant species. Recently all CAC countries announced development (assisted by International Center for Agriculture Research in Dry Areas, ICARDA and International Plant Genetic Resources Institute, IPGRI) of DBs on plant species collections (genetic resources). This sort of DBs is a good opportunity to enrich ICT-based national, as well as regional information resources.

Table 3 shows how the region is fulfilling contribution to STI databases.

Table 3

Input to International and National DBs and Networks	
DBs and networks	Realization in Countries
AgroWeb	Implemented in 6 of 8
AGRIS/CARIS	Implemented in 4 of 8
National DBs	Implemented in 8 of 8
DBs and networks	
AgroWeb	Implemented in 6 of 8
AGRIS/CARIS	Implemented in 4 of 8
National DBs	Implemented in 8 of 8
DBs and networks	
DBs and networks	Realization in Countries
AgroWeb	Implemented in 6 of 8
AGRIS/CARIS	Implemented in 4 of 8
National DBs	Implemented in 8 of 8

4.3. Information services and modes

A variety of traditional modes of information services like question-answer, selective dissemination/current awareness and printed publications, as well as Web services and CD-ROM publications can be made available to **researchers** in the region (see Table 4). To make the information available in each country there is at least one organization which has access to the information resources and provides one or more service for researchers. This services are not widely available in the region and wherever available most often used by members of the organization that receives the information.

An important type of information services, very necessary, but currently absent is subject-focused agro information centers in agriculture fields of a common interest for CAC countries, where these countries possess very high expertise. In the past there had been two such centers: on tea growing and processing (Georgia) and cotton growing and processing (Uzbekistan). It is supposed that centers will be based on existing research organizations. Taking into account weakening of information departments in research organizations, this direction will play very positive role in rehabilitation of information services as a whole.

Table 4

Availability of service modes

Service modes	Realization in Countries
Question-answer mode	Implemented in all
Selective dissemination/current awareness	Implemented in 3 of 8
Local publications (printed)	Implemented in all
Local publications (CD-ROM)	Implemented in 2 of 8
Local publications (WEB)	Implemented in all

4. 4. Information for farmers and Extension service

In spite of some reported achievements in Armenia, Georgia and Kazakhstan (publications for farmers, agro market information Web sites), an overall situation with information tailored for farmers in the Region is unsatisfactory. Figure (2) below is a consideration of the situation. The functioning of the Research-to-farmer mode of an information service could be presented schematically as follows (Fig. 2)

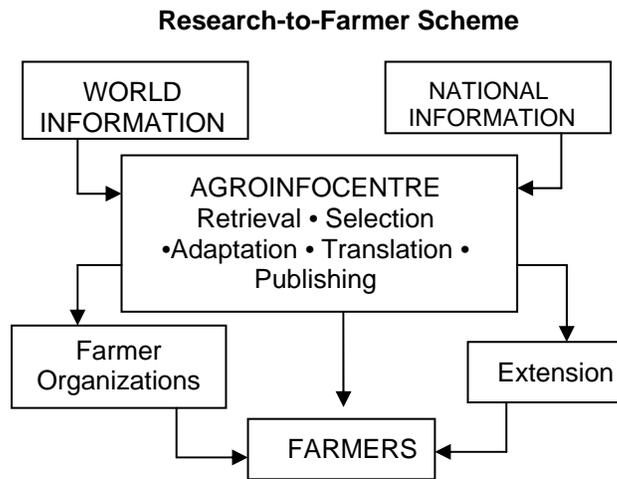


Fig. 2

Though there is a direct channel from an agroinfocentre (or library) to farmers on the scheme, it is more realistic that the main information flow will reach farmers via Extension service. Therefore, the last plays a principal role in Research-to-Farmer scheme.

One should take into account that not only Extension, but farming itself is a new enough activity in the Region. In the past agriculture there was based on the large collective farms (kolkhozs and sovkhozs). Each kolkhoz had its own agronomic, veterinary, etc. service. After collapse of the Socialist system, privatization process replaced each kolkhoz by hundreds of very small and weak farms. The way of rural population activity has been changed dramatically. Need for Extension services became very high, but the services are in a rudimental state.

An intensive international support was given for the development of Extension services to all countries in the CAC region. It was efficient for training people and accumulation of a basic knowledge. But, usually, after projects' close-out established Extension units do not get financial aid neither from central nor local authorities. Extension networks should be a key for efficiency of both research and information services, yet in many CAC countries they are not considered as an integral part of research and innovation systems, working coherently with information services. We have not seen even a single Extension service development project in the Region, where library and information services were involved, though the projects mostly are sponsored, and therefore designed, by international donors. Also, it is rare when beneficiaries of the projects are existing research institutions and universities. Neglect of libraries and information services, as well as research systems will interfere with extension developments. Even Kazakhstan, Armenia and Azerbaijan announcing plans for strengthening research-farming cooperation do not articulate existing information services' place in the process.

Problems with implementation of a Research-to-Farmer information transfer are caused mainly by the state of Extension services, though there are some others too. Fortunately, this is different from some developing regions [5, p.32], illiteracy is not a problem in CAC. As to language barriers, it is a serious (and expensive) task for agroinformation services. Information for rural areas should be prepared in the National languages (except, perhaps, Kazakhstan where Russian is widely used). European languages are not widely accessible even for agriculture researchers.

Just a glance at the list below of arbitrary chosen (from several hundreds) information requests addressed to TECHINFORMI (Georgian Institute for STI) is enough to indicate that a majority of them does not come from farmers.

Examples of arbitrary chosen information requests

- Animal production in Belgium and Italy (statistics)
- Farm machine – pickup baler standard
- *Clostridium perfringens* – animal diseases
- Hybridization of rabbits
- Gene engineering in cattle breeding
- Current state of winemaking in foreign countries
- *Codex Alimentarius's* chapters
- Standard (ISO) – *Soil Quality: Determination of Chemical Composition*

- Infectious diseases in waterfowl – salmonellosis, staphylococcus
- Blood morphological and biochemical indices in rabbits.

Therefore, the farmer oriented information services are worth to pay a special attention to.

5. Prospects of ICT use for agricultural information services

In our study special attention was paid to potentialities and facilities for the development of ICT based services. It covered expertise, computer and communication facilities, status of radio and TV (especially important for informing farmers), etc.

5. 1. General capacity

Modernization of traditional modes of information services using ICT, seem feasible in the Region. There is enough capacity (hardware, software and skills) which can be allocated in the majority of countries for execution of ICT projects to enable scientific and technical information for agricultural research and innovation. Nevertheless, there are problems in implementation of information related projects in agriculture sector that need to be further discussed and resolved. One of them is that the abovementioned capacity, with minor exceptions, is not enough concentrated neither in agricultural information services nor in agricultural research organizations.

5. 2. Status of telecommunications in the Region

Telecommunications as a vehicle of modernization of information services, especially in remote areas was included into the list of topics studied. Telecommunications is the most rapidly growing sector in the CAC countries. The quickest development is observed in **mobile phone** services (up to 50% annually). Less rapidly growing are internet services. Degree of monopolization influence their prices.

At the end of 2006 when this study was started , the situation was as follows. The most expensive **internet** was in Kazakhstan (data of BBC), where state-owned Kaztelecom dominates the market. The cheapest internet was in Georgia. The dial-up service was charged 0.59 USD/h in Georgia, 0.83 USD/h in Kazakhstan; limitless access - from 25 USD/month in Georgia, to >45 USD/month in Kazakhstan, others were in between. Since then in some countries the situation has been worsened. For example, in Georgia more than 90% monopolization of the internet market by Caucasus Network was allowed and Georgian Telecom was sold to Kaztelecom. Prices went up. The dial-up mode does not exist in Georgia any more, while ADSL connection starts now from 40 USD/month. Internet availability does not exceed 5% in the countries on the whole, and is negligible in rural areas.

Cheap **terrestrial phone** availability in cities is from 40 to 60% dependent on the country (the highest is reported in Armenia), in plain rural areas ~ 4-5%, in mountain areas ~ 0.2 %. Consequently, in rural areas prevailing communication means are expensive mobile phones, which cover up to 80% of countries' inhabited parts. However, bandwidths are

narrow. Therefore, in mountain rural areas internet could be based only on very expensive satellite connection (installation costs ~USD 2,000, monthly fee - ~ USD 200). In practice, this is a rare solution. It could become more common through integration of government-supported programs of internet for schools, libraries, extension, etc (if there are any). School programs are the most common, the rest - not reported.

Summing up, we can say that internet access by individual farmers is not envisaged soon. More feasible is to use internet in extension and outreach. Though, currently few extension workers use computers for office purposes and even fewer have access to internet.

5. 3. Status of RTV in the Region

Currently in some country's capitals more than dozen public and private domestic **TV channels** are broadcasting. Usually from 1 to 3 of them are covering almost all the country's territory, having there of the national statute. Often they are also available on satellites and in internet. In the all countries there are also a number of provincial TV channels, some of them are available via satellites and cables on the all country territory. In the cities up to 50% of inhabitants have access to dozens of international channels via cable TVs. Satellite receivers become popular in rural areas, though for the majority of inhabitants they are not affordable because of relatively high installation price.

FM radio stations operate in many provincial cities and towns. In the capitals, their number could amount to 20. Some of them are available via satellites and internet, also retransmitted to all country territory. However, the situation varies from country to country. In all countries population living in remote villages has access to radio broadcast, either central or local or both. Nevertheless, radio is not used widely in dissemination of agro information. Existence of community radios is not reported, therefore in contrast to many countries' experience, community radios are not used for agro information purposes in the CAC region. Only Armenia reports the use of the National and local TV and Radio for agro information dissemination (including information for farmers)

6. Information Systems Organization and Management

First of all, the background difficulties mentioned at the start of report affect agriculture information services in CAC. Higher percent of GDP (or agricultural production volume) should be allocated for its progress.

In some CAC countries **the responsibility of the national agro information development** is not assigned to a concrete governmental agency. A most spectacular case is Georgia, where agricultural universities and research institutions (including the National STI Institute - TECHINFORMI which is the largest provider of agro information services) are subordinated to the Ministry of Education and Science, while agriculture sector is managed by the Ministry of Agriculture and Food. In their charters agro information is not mentioned. All extension projects were fulfilled in cooperation

with the Ministry of Agriculture and Food. In some other CAC countries though formal assignment is made, on the personal managerial level awareness of goals and practices in the sphere is low, due to enormous civil servants replacements of recent years.

Difficulties with **governmental inter-agency coordination** negatively affect, for example, development of internet access in rural areas hindering from joint actions of governmental and donor programs for education, agriculture, health, etc.

The functions and services relating to access to resources, as well as to development of national and regional resources, are scattered among too many organizations and poorly coordinated. In addition, involved organizations are often not able or uninformed of requirements of agricultural research information systems [7]. A coordinating body often is not defined. It is a rare case, when access to international DBs, development of national DBs, input to AGRIS-CARIS, collection of R&D reports, FAO depository libraries, input AgroWEB, etc., are based on a single organization (Georgia seems to be closer to such model than others). At current stage, taking into account either underdevelopment or deteriorated state (e.g. in case of libraries) of existing services higher concentration of functions seems practical. In the future, as services will become stronger, some functions may spin off.

The main cause of all abovementioned shortcomings is an absence of **agricultural information policy** in the CAC countries. It, in its turn, comes from the absence, as a rule, of research policy and agriculture policy. As far as local partners demand for capacity building projects international assistance is less focused on policy issues too.

Elaboration and adoption of National agricultural information policies is the key issue of information systems organization and management in CAC. It will solve principal issues listed above, as well as help to find right solutions for many particular issues, which being improperly solved lead to inefficiency of both the whole National systems and their parts.

An important part of the all CAC countries National policies' should be **regional cooperation** aimed to development of CAC RAIS. It should be built on the interconnected National Focal Points (centers) providing access to world, regional and national information resources. A procedure of the centers choice (performance requirements) itself will contribute to putting the National systems in good order. The overall targets of RAIS, namely:

- provide relevant information to research in the region;
- insure channeling of appropriate research results to agricultural practice;
- insuring national input to international and regional resources;
- providing a range of information services;
- promoting services and ICT to research institutions, rural areas etc.,

give a good chance to involve into development all national stakeholders, including governmental agencies. RAIS may become a driving force for development of *standard for all countries part of the National agriculture information resources in the form of databases* , which then can be placed in the any of existing networks of agro-information

sites, creating good exchange environment. Bibliography of ARD products (articles, reports, patents, etc.) is the best subject to start with. The abovementioned Databases on plant species are a ready made element for it. The existing AgroWEB sites network could be good internet environment, in case a right solutions are made about it.

The quality and future efficiency of the **AgroWeb Network** depends mainly on a choice of organizations responsible for the National AgroWeb sites. It means choosing organizations a) already possessing a considerable part of information to be exchanged through the sites, and b) having permanent governmental support. Unfortunately, in some cases the National AgroWEB sites, which originally were based on the properly chosen institutions, have been recently transferred to informal working groups. It is a spectacular example of a policy absence.

It is clear that policy issues in agriculture information are not isolated from policy issues in a country in general. **ICT policies** in CAC countries which as a rule are absent are urgently required since the promotion of agriculture information both to research organizations and to rural areas depends on them.

7. Conclusion

The study of agriculture information services in Central Asia and Caucasus has shown that in spite of certain recent developments, e.g. access to remote electronic information resources (including full-text electronic journal DBs), involvement into international cooperation, etc., the overall state of them is to be improved in a number of directions defined by the study.

There is the need to improve access of researchers to international and regional STI and participate in sharing and exchanging regional information internationally. It implies both traditional library networks and ICT-based services. The goal is to provide high quality information including analytic subject oriented information.

There is the need to enable access to agricultural information to not only researchers but to farmers, and agricultural intermediaries in the market chain. It is a new challenge created by political and economical transformations. In this regard, extension networks should be considered as an integral part of research and innovation systems, working coherently with information services.

The abovementioned challenges create the need for improved Institutional structures for R&D output processing and for information sharing and exchange.

The shortcomings in the agriculture information systems have resulted from the general lack of support to research and innovation in the post-soviet countries both by national governments and the International community. There is the need to rehabilitate R&D sector on the whole and agricultural R&D in particular.

An important circumstance hindering agriculture information systems progress is a low awareness level of responsible governmental agencies of the goals and practices in the

agro information sphere. While Institutional issues such as the need for cross-sectoral coordination at the ministerial level are well known an important cause is also enormous civil servant replacements of recent years. Many young inexperienced people have entered governments. Under these conditions there is an exigency of recommendations for the top level managers of agriculture sphere on the development of agro information systems. Their final goal is to convince the principal stakeholders to develop and adopt both National and regional agro information policies. The International organizations' efforts should be focused on this task, rather than on capacity building activities.

A policy based approach to strategize and implement agriculture information systems rehabilitation and development will prevent mistakes described in this study. The issue of policy is growing in importance. The current high food import dependence in the vast geographic area which would not be thought 15 years ago [8] cannot be tolerated. A policy based approach to information support to agriculture may help to change the situation in the region.

Acknowledgement

The authors express their thanks to Dr. Zakir Khalikulov (ICARDA) for organizational support.

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