Data Transmission Networks in the Area of Agriculture

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Author: Nersessyan Y.
Supervisor of studies:
R. Harutyunian, PhD in ThS

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In this review have been presented data transmission networks in the area of agriculture of RA. A list of information databases as well as showings for collection of these data, have been described. Technical facilities and hardware of the Ministry of Agriculture and other relative organizations, engaged in the collection of information in the area of agriculture, have been presented.

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Introduction

Data transmission network is a comparatively new tendency in science and technology. Many developing countries experience serious difficulties with going on external market. It is necessary for them to create information networks, for the development of economy, including in the area of agriculture.

The following international organizations are supporting developing countries, including the Republic of Armenia, in the area of information technologies development:

- WB (World Bank)
- IMF (International Monetary Fund)
- UNICEF (United Nations Children's Fund)
- EBRD (European Bank of reconstruction and Development)
- USAID (United States Development Agency)
- EU (European Union) etc.

Such large non-governmental international organizations as WVI, CARE etc. are participating as well in this process.

The market of information products and services (IPS) is a complex of economical, legislative and organizational relations in the process of exchange between IPS providers and users. The market economy gives a completely new impulse to the development of information market in FSU republics, including the Republic of Armenia.

It concerns the agriculture as well. The means for information exchange, presented by international Internet network, dominate in the area of international and intranational information exchange. Further, its role will increase.

The information science, including all aspects of data receiving, storage, transmission and use, has been characterized as a progress mover. Thanks to the global character of up-to-date information, it became available for the world community. The use of information technologies may render assistance in solution of global problems, connected, first of all, with the necessity of crisis phenomena overcoming. The optimization of information processes and improvement of information technologies allow the effective use of information resources of society, which is the most important strategic factor for its development.

The use of newest information technologies, including information networks, will create prerequisites for effective use of scientific and technical information, as well as for successful interaction of scientists and specialists with modern automatized systems in general.

1. Data Transmission Network in the Area of Agriculture of RA

The local network, connected with global network, has been created in the Ministry of Agriculture of the Republic of Armenia. This local network includes 70 computers and Central server on the basis of two-processor complex Pentium II – 266, mutually duplicated each other for reliability. The information is circulating both within departments of the Ministry, and in global network.

10 marzes of Armenia are connected to the global network. In every marz are three objects with one computer.each. These objects enter into communication through

telephone line, and further by communication channels to Yerevan. Besides marzes and ministries, the Ministry of Statistics, the governmrnt, Majors of towns are linked up to that system as well. Information exchange is going on the level of Word and Excel software. Varieties of communication are outlined by introduction of Internet, Vincop-up etc. The information flow is regulated by time. In the server are created folders to accumulate information, and folders to receive information.

All subscribers, including Government, are operating in this regime. The information has been receiving, depending on the season of agricultural works. Two objects are concentrated in marzes – Agricultural Department, Statistical Department. The information from Statistical Department's goes directly to the Ministry of Statistics for processing and integration.

An intensive work has been carried-out in the Ministry of Agriculture to create a group of analyzers for information processing. This system will be expanded with the inclusion of Ministry of Social Security and Ministry of Public Health in it.

The program of the network creation in the area of Agriculture, has been supported by European Union for the period of five years (1998-2002), as well as by various ministries to supply with modern equipment. This network began to operate in October of 1999.

Taking into account the opinion of European Union councellors about the enlargement of the network, it has been decided to include several objects more to the Global network:

1. Plants Protection – 1 computer
2. Quarantine Plants Control – 1 computer
3. Arpa-Sevan reservoir – 1 computer
4. Vorotan – 1 computer
5. "Vorogum" (irrigation) service – 2 computers
6. Farming –1 computer
7. Agrochemistry – 1 computer
8. Agroservice – 1 computer
9. Agricultural Academy – 3 computers
10. Management Coordination for Development and Reconstruction Program in North-western Agricultural Regions – communication channel
11. Administration Department by Realization of Irrigation Systems Restoration Program – communication channel
12. Administration Department for Supporting Agricultural Reforms Programs Realization – communication channel
13. Agrodepartment in Kapan – 2 computers
14. Analytical Information Computer Centre – 1 computer and E-mail.

At the Marz level, the Agricultural Administration Departments report direct to the Marz Administrations and also to the Ministry of Agriculture in Yerevan. The 4 Agricultural Inspections in the Marzes, sometimes not located in the Marz capitals, are meant to report to the Marz head of Agricultural Inspections, but in reality report direct to the inspectorate offices in Yerevan.

The current users of the agricultural information subsystem are the Marz Administrations, the Ministry of Agriculture, the Ministry of Territorial Affairs and, indirectly, the Ministry of Finance. Potential users and providers include the various agricultural enterprises, including Agrobusiness Development Centre and "Vorogum",

which are soon to be connected to the Global network. External users may include USDA, CARE and World Bank.

More external interest in the system, possibly extending to farmers, could be induced by an expansion of the System, to include a fuller range of variables.

The Ministry of Agriculture compiles data on cropped area, livestock numbers, livestock breeding rates and so on, from Village Heads. Tha data are based on simple inventories and collection methods, and are apparently not systematic and lack transparency. When in Marz level statistics discrepancies occur, the Ministry of Agriculture instructs the Village Heads to provide revised data. The advantage of the Ministry of Agriculture system is that it permits highly disaggregated data collection on community level.

Table 1

List of databases functionning in branch network of agriculture

N	**Indices**	**Periodicity**	**Territory**
1.	Main indices	Quarterly	Region
1.1.	Population of towns and villages. Migration	Quarterly	whole country
1.2.	Social and economical situation: Incomes of the population, their use and distribution	Quarterly	whole country
1.3.	Economical showings by main branches	Quarterly	whole country
1.4.	Employment and unemployment	Quarterly	Marzes
1.5.	Social and economical situation in the country	Monthly	whole territory
1.6.	Import-export in the area of "Agricultural production, chemicals, trucks, agricultural equipment".	Quarterly	whole territory
1.7.	Index and mean prices for agricultural goods realization	Monthly	Marzes
2.	Agricultural production		
2.1.	Spring sowing period	April 1, May 1, June 1	Village community
2.2.	Areas under agricultural cultures (final report)	June 1	Village community
2.3.	Crop capacity of agricultural production	Monthly (from August 1 to December 1)	Village community
2.4.	Livestock-raising. Number of cattle, sheeps, goats, horses, pigs, poultry, and other showings,	Monthly	Region

	including the production of milk, wool and meat		
2.5.	Number of agricultural animals	Yearly	Village community
3.	Information about farms		
3.1.	Farms and collective farms, arable lands, perennial seedings	Yearly	Marzes
4.	Processing industry		
4.1.	Processing industry in the past and today	Monthly	the whole Republic
4.2.	Capacity and its use today	Yearly	the whole Republic
4.3.	Privatization process level, including the share of Government	Quaterly	the whole Republic
5.	Agricultural markets		
5.1.	Procurement prices of production means	Monthly	Marzes
5.2.	Circulation of retail trade objects	Yearly	Marzes

Table 2

The data collection by the following showings

N	**Indices**	**Periodicity**	**Territory**
1.	Balance of lands	Yearly	Marzes
2.	Use of perpspective pastures of the reserve fund	Yearly	Marzes
3.	Privatization of lands, including arable lands (irrigating and non-irrigating); orchards and vineyards	Twice a year	Region
4.	Operations report about agricultural works	Weekly	Marzes
5.	Lands under cereals, potato, vegetables, tobacco, melons and gourds, orchards, vine-yards, and their crop capacity	Weekly	Marzes
6.	Enterprises, processing agricultural production. Volume of output	Yearly	Marzes
7.	Head of livestock	Yearly	Regions
8.	Breed (calfs, lambs, piglets)	Yearly	Regions
9.	Loss of cattle	Yearly	Regions

10.	Milk, eggs, wool	Yearly	Regions
11.	Animal breeding produce and its realization (meat, milk, dairy products, wool, eggs)	Quarterly	Regions
12.	Number of agricultural equipment and means of transport. Their condition.	Twice a year	Marzes
13.	Volume of mechanized field-works	Seasonal	Marzes
14.	Number of existing material-technical means, their necessity, depending on season: 1. fertilizers 2. disinfectants 3. chemicals 4. fuel 5. spare parts 6. others	Twice a year	Marzes
15.	Lands to be irrigated by: "Vorogum" enterprise, from local resources: deep-water wells; artesian wells	Yearly	Marzes

Table 3

Data, included in network by the following showings

N	**Showings**	**Periodicity**	**Territory**
1.	State Inspection report for lands using	Monthly, Quarterly	Regions
2.	Readiness of agricultural equipment for harvest	Yearly	Marzes
3.	Annual technical examination of agricultural equipment, participating in spring sowing	Yearly	Marzes
4.	Annual technical inspection of equipment, taking part in harvest	Yearly	Marzes
5.	Sale or writing off of agricultural equipment in state enterprises	Twice a year	Marzes
6.	Number of agricultural equipment’s units	Yearly	Marzes
7.	Registration of agroequipment,	Monthly	Marzes

	number-plates' assignment		
8.	Assignment of number-plates for trailers	Monthly	Marzes
9.	Annual purshasing of equipment	Monthly	Marzes
10.	Registration of agrotechnics, re-registration, writing-off obsolete equipment	Monthly	Marzes
11.	Assignment of drivers' licences to the tractor drivers	Monthly	Marzes
12.	Readiness of equipment to the spring sowing	Yearly	Marzes
13.	Assignment of copies of driver's licences	Monthly	Marzes
14.	State privatization service	Monthly	Marzes
15.	Veterinary control	Monthly	Marzes
16.	Report about violations in farming, discovered by inspectors of marzes	Monthly, Quarterly, Yearly	Marzes

The Agricultural Administration Department, as well as the Ministry of Statistics provide the following types of information to the Ministry of Agriculture through the Global Network:

- Progress in planting operations
- Fields under main cultures
- Crop capacity
- Production of agricultural processing enterprises
- Domestic cattle, loss of cattle, its reproduction
- Domestic cattle's meat, meat products, production of milk, sheep-breeding products
- Use of reserve lands, including meadows and pastures

The following types of information are collected by Agricultural Administration Department and the Ministry of Statistics, but they don't transfer these data to the Ministry of Agriculture:

- Number and condition of agricultural equipment
- Demand for farmer's equipment. Use of arable lands.

It is necessary to use more effectively the data, collected by the Ministry of Statistics. Data, collected not by the Ministry of Statistics, but form other sources, are basically dissimilar and ill-matched, and duplicate the work of the Ministry of Statistics. It is necessary to regulate data collection on the level of Marzes, and transfer it to the Ministry of Statistics for monitoring. It is necessary as well to get information from veterinary and plants protection organizations. There is a need for data up-dating of Hydrometeorology Department and "Vorogum". Such data obtaining on systematic basis may be ragarded as a priority.

The Ministry of Agriculture receives statistical information on agriculture from the Ministry of Statistics under a contract, and via a dedicated line. The global network is the

basic conduit of infromation to the I&S Unit in the Ministry of Agriculture. Pentium II computers are installed with dedicated lines. Reporting is weak but the causes of weak reporting are mixed, but are generally more related to administrative rather than technical constraints. With the dedicated lines, there are no communications bottlenecks, although digiting information is sometimes constrained by prolonged power cuts.

The Agricultural Inspection Departments are not currently reporting through the Global Network for three main reasons. First, questionnaires and report procedures are still only in draft. Second, the individual inspections tend not to report to the head of Inspections, where the computer and communications facility are located, but direct to their own departments in Yerevan. Third, Inspections staff have not received computer training.

Certainly, it is worth considering whether the computer stock should be positioned elsewhere. In the Ararat Marz the pentium was being used as a toy in the adjoining school.

The expansion of the Global network to include "Vorogum" and Agribusiness development centre must be welcomed. There are also other organizations working on agricultural related activities that could both contribute to and benefit from the system such as the Agricultural Research Institute in Yerevan. There is a need to explore the possibility of obtaining regular reports from the Plant Protection Services and the Veterinary Inspections, which will enable comprehensive reporting on crop and animal pests and diseases.

2. Database Management and Processing

The current database system is simply a subject /location/data file hierarchy, for retrieving a single subject /Marz/date report, wither in Excel or in Word. This is extremely tiresome for system users. A more attractive option is to update subject-defined databases. Ultimately, of course, relational databases would be ideal. This could be difficult to implement as there are apparently no Russian language versions of Access available and English language skills of the staff too limited to use English versions.

It is planned to create in the Ministry of Agriculture the Databases Analysis Department. The main type of analysis currently undertaken is the forecasting of agricultural production for upcoming seasons, and longer term (1-2 year) projections.

Computer skills are varied, but seven months of training are planned which is intended to provide 160 ministry staff with familiarity with Microsoft Office tools. The Agrarian Policy Department compiles analyses from other specialized departments, to produce a quarterly and annual policy paper, which is also submitted to the Ministry of Finance and the Government. The Agricultural Department of the Ministry of Stataistics contributes highly summarised reports to the Ministry of Statistics monthly bulletins as well as a more detailed annual report.

Three organizations are currently collecting information on market prices for agricultural commodities. The Ministry of Statistics collects retail prices for food and other commodities, the Agrobusiness Development Centre collects wholesale prices for farm products, while a USDA project collects farm produce price information through the Agricultural Service Centres.

Data are collected at weekly intervals by extension agents and cooperative workers, and then transmitted in hard copy to the Marz.

From the Marz, price data are transmitted by fax or E-mail to USDA's offcie in Yerevan, where they are compiled by one employee in a simple Excel file. In case of mechanical breakdowns, data are transmitted verbally by telephone.

One of the most important factors for the development of agriculture is receiving of meteorological and environment information.

Armenia is attended by 50 meteorological stations, and 30 of them transmit data with high degree of periodicity. Besides, the Department of Hydrometeorology has a modern receiving device to receive information in real time from 9 satellites. Agrometeorological observations are carried-out on 40 stations. Soil humidity are measured on 4 depths, but agrohydrological characteristics of soils are measured not often. To determine crop capacity parameters, the microclimatic observations are carried-out as well. The crop capacity forecasting has been defined for ten main cultures three times a year, during the whole spring season, on the basis of agrometeorological information. This information is directly transmitted to the farmers.

Conclusion

To establish horizontal integration and reporting capacity will entail a leading role for the Ministry of Statistics at national level.

While improved horizontal integration of information would be beneficial to a number of players at present, information flows between ministries are patchy. Ministry of Statistics provides a small portion of its agricultural data to the Ministry of Agriculture. The Ministry of Social Security provides data to the Ministry of Statisctics, but backward flows are suboptimal, as are those between Ministry of Social Security and Ministry of Health.

Until, solid institutional structures are created, there is no chance that integrated reporting in the area of agriculture will occur. For this reason, the short-term strategy focuses on basic enhancements to the agricultural subsystem and vertical information flows, as well as the establishment of the appropriate reporting structures. The Ministry of Agriculture and the Ministry of Statistics should discuss mutually beneficial harmonised data exchange system, to avoid reduplication. Thus, when organizations producing information on agriculture are connected to the Global Network, this problem will be solved. The Ministry of Agriculture and other potential users regard assess information, currently available from the enterprises and inspections, as very important. But it is worth determining exactly which information from the inspections are useful for any purpose, because some information (such as submission of agricultural vehicle registration numbers) is of no possible external interest.

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