

THE ARAL SEA BASIN—RUMORS, REALITIES, PROSPECTS[†]

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ABSTRACT

The Aral Sea basin has been for many years appearing in global and former Soviet mass media as an example of the rapacious attitude to nature on the part of socialist society. For the last 10 years Central Asia has been subsisting and surviving under conditions where the regional countries closely interact with the whole world community. Though the Aral Sea Program, which was laid down at the Paris meeting in 1994, remained generally unfulfilled, cooperation between Central Asian states as to joint water resources management has not only managed to survive but continues to develop. New rumors still continue to stigmatize the Aral Sea basin by overstressing current controversies that are allegedly ready to develop into a “war for water” in the region. As a matter of fact cooperation between the countries carried out by water management agencies and the Interstate Commission for Water Coordination (ICWC), which celebrated its tenth jubilee in February 2002, has been progressing regardless of complexities and differences in the environmental, social, political and natural situation in the countries and gaps between their levels of development. This cooperation enjoys the confidence of their future success, giving objective appraisal of achievements and drawbacks as well as ways to survive. Fair assessments and realistic approaches are needed on the part of those who are earnestly willing to help the region, and at the very least there should be noninterference and silence on the part of those who are not interested. Copyright © 2003 John Wiley & Sons, Ltd.

KEY WORDS: international cooperation; water management; agreements; Aral Sea basin

RÉSUMÉ

Depuis plusieurs années la presse internationale et de l'ex Union Soviétique dénonce l'exploitation irrationnelle du bassin de la Mer d'Aral par la société soviétique. L'Asie Centrale bénéficie depuis ces dix dernières années d'une coopération soutenue par la communauté internationale. Malgré l'inachèvement du programme de sauvetage de la Mer d'Arale, proposé lors de la réunion de Paris en 1994, les gouvernements de l'Asie Centrale continuent de développer leur coopération en matière de gestion des ressources en eau. Des rumeurs ajoutent à la problématique une véritable controverse, aboutissent à une perspective éventuelle de « guerre de l'eau » dans la région. La coopération facile entre les états, dirigée par les agences responsables des ressources en eau et par la Commission Internationale de Coordination Hydraulique (qui a fêté cette année, au mois de février, son 10^e anniversaire) progressé malgré les obstacles; politiques, sociaux et de l'environnement. Cette coopération s'accompagne de la certitude du succès futur, mettant en compte avec objectivité; ses réussites et ses échecs. On aurait besoin d'une évaluation véritable et d'un approche réaliste de la part de ceux qui voudraient s'engager réellement dans la région, ou du moins d'une abstention de la part de ceux qui auraient plutôt tendance à s'opposer. Copyright © 2003 John Wiley & Sons, Ltd.

MOTS CLÉS: la coopération internationale; aménagement de l'eau; les accords; bassin de la Mer d'Aral

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SOME BACKGROUND REFERENCE FOR THE PRESENT-DAY SITUATION IN THE ARAL SEA BASIN

Generations of people living for centuries and even millenniums in the harsh arid and semiarid climate across vast territories of the Turan lowlands, as well as in adjoining surrounding mountain and submountain ranges, associated their existence, development and welfare with water. The expression “water means life” is not a slogan for the people of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan as well as Afghanistan, Sinkiang and Iran. For them it is a reality, which determines chances for the survival and progress of people or dooms them to hunger and miserable existence—sometimes death. It is no accident that development of irrigation in the region has been closely related to the progress of civilization, as was the case with ancient cultures that emerged at the same time (sixth to seventh millennium BC) in Egypt, China, Mesopotamia, India and Central America. Roots of relationships between Central Asian nations are laid in deep traditions and a mutual history uniting these nations into one family strongly dependent on water use. Agriculture, in major part irrigated, cattle breeding, fishing, municipal and industrial water use have formed the basis for the livelihood of 70–80% of the population living, for the most part, in the rural area. For a long time the way of life and behavior patterns were determined by the water factor which stimulated elaboration and strict observance of key principles of oriental and later Muslim water law (*shariat*), which reflected legal regulations of “zoroastrism” (*videvdad*) as well as centuries-old traditions. This legal and custom framework included such provisions as:

- communal ownership of irrigated land and particularly of water;
- compensation for damage caused by water use or by some actions to water;
- prohibition to pollute natural water sources;
- water law linked to irrigated lands;
- common participation in all activities connected with maintenance of water works as well as flood control and other water-caused disasters.

Colonization of Turkistan by tsarist Russia left the local water law unchanged—especially as it applies to communal participation in work on operation, maintenance, renovation and rehabilitation of the irrigation network through the institute of *arykaksakal* and *mirabs*—water managers elected by the community.

During 70 years of Soviet power these principles changed. A strict and strongly controlled system of centralized water management in a top-down manner was created. Some parts of the system were managed according to hydrographic boundaries: “Water management of the Zarafshan river valley”, “Administration of the Amudarya downstream canals”, “Administration of the Kirov major canal”, etc. This system permitted successful delivery and allocation of water using huge water infrastructure with vast operational costs at the expense of the State, inter-farm and even on-farm level. But this water system suffered two immense shortcomings:

- Opinions of water users and consumers were not taken into consideration at all; as a result after the transition of agriculture, and the Central Asian economy in general, to a market economy, many water users turned out to be nonsolvent and nonself-sufficient;
- Water needs for the environment were strongly underestimated in favor of water users; as a result, ecological and sanitary demands and demands for deltas, the Aral Sea coast and the Aral Sea itself were ignored.

But some aspects of Soviet heritage had a positive influence on the current and future development of the region (Dukhovny, 1983):

- As early as the 1960s so-called “Integrated development of the Hunger Steppe deserted lands” was initiated, followed by other projects, among them Karshy, Djizak, Syrkhani-Sherabad, Kyzylkum, Yavan-obik. These projects combined versatile interests in water. Concurrently with irrigation, drainage systems were developed; large numbers of settlements, production plants, roads and communication lines were constructed.

Long before the worldwide campaign for integrated water resources management was launched, these works had given regional water specialists and economists the opportunity to comprehend advantages of this advanced technology, and to gain experience in operation and management which is nowadays spreading throughout the world;

- A high level of water education, research and training was established, creating potential specialists engaged in water management;
- Teamwork of water specialists in the former Soviet republics under single leadership in one system following similar standards, rules, methods and approaches created the proper conditions for sustainable work for future generations—their wish is to retain the previous interrelation that was formed in Soviet times;
- During the 6–8 years before the USSR disintegrated, the Soviet government paid a lot of attention to plans directed at improving the situation in the Aral Sea basin, which led to the approval of “the State Program on Priaralye” in 1986, the creation of two basin water organizations (BWOs), allocation of huge investment in various projects, particularly water supply and social improvements.

These provisions had an immense inertial effect, ensuring smooth operation and transition of water management from the former political system to a different one—from imperfect socialism to different forms of market economy with various degrees of transition accomplished in different countries.

SPECIFIC FEATURES OF WATER MANAGEMENT DURING THE PERIOD OF INDEPENDENCE

Deep insight into the role played by water in the region and responsibility to society for sustainable water sector operation generated prompt action undertaken by governments of all five countries, who in September 1991 declared the necessity of joint regional water resources management and use and in February 1992 established the Interstate Commission for Water Coordination (ICWC) (Figure 1). This commission to a certain extent took over some of the functions of the former USSR Ministry of Water Management, in organizing mutually beneficial cooperation related to water resources in the region and initiating a series of consequent activities.

However, though the Agreement of February 18, 1992 and consequent agreements between Heads of States (of March 26, 1993 and of January 11, 1994) defined major milestones and provisions for cooperation on transboundary waters, there is still clearly no possibility of preserving the desired status quo of the former shares of water allocation and use by virtue of new emerging geopolitical and economic differences in the development of Central Asian countries (Figure 2):

- Independence for the countries has determined differences in their political aspirations and intentions to appear on the international stage as independent players. Kazakhstan and Kyrgyzstan (at the start, especially) demonstrated their adherence to close cooperation between themselves and within the framework of various geopolitical unions, in the first line under the Russian protectorate. Tajikistan had for a long time been occupied by civil war and struggled with opposition, and then later joined the Kazakh–Kyrgyz coalition with Russia. Turkmenistan declared its independent stand and nonalignment approach to any blocks and unions expect water and orientation on bilateral agreements. Uzbekistan has chosen its own way, maintaining more or less close cooperation with all neighboring countries but simultaneously keeping a clearly independent line, having some elements of the Turkmenian position, but still not keeping away from various unions;
- Disruption of economic ties caused by obtaining independence immediately revealed certain advantages and shortages in terms of natural resources supply and geographic location of the five countries. There are large deposits of mineral and especially fuel resources in Kazakhstan, Turkmenistan and Uzbekistan; these countries enjoy sufficient land resources per capita (excluding densely populated zones in Uzbekistan). Kyrgyzstan, and Tajikistan especially, have scarce mineral and land resources; at the same time, water resources are concentrated here and these countries have a large hydro-energy capacity. The Central Asian countries, except Kazakhstan and Turkmenistan, have a landlocked geographical location, transport communications here are complicated, stretch long distances and are expensive, thus hindering access to

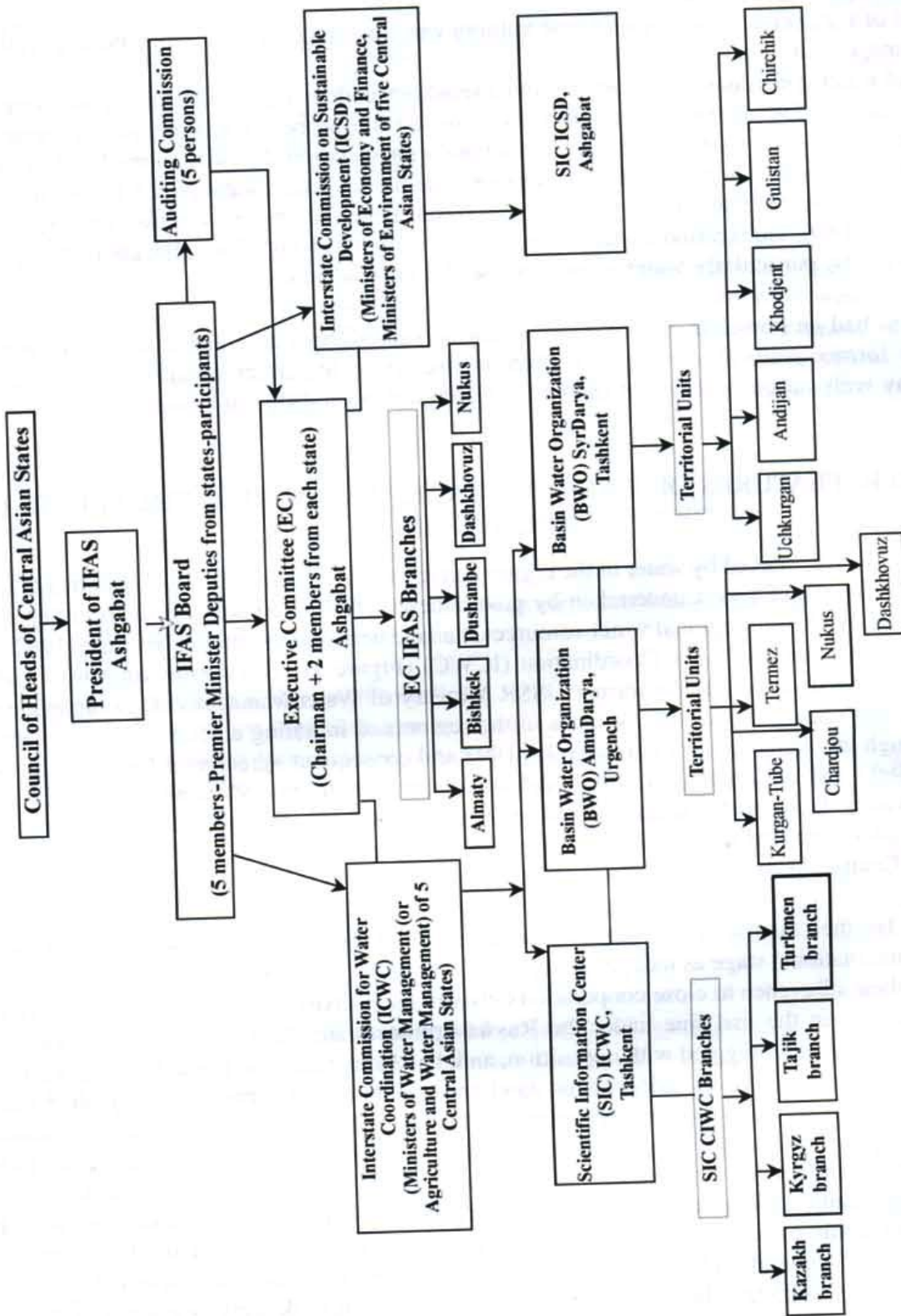


Figure 1. The organogram of regional structure of Aral Sea basin

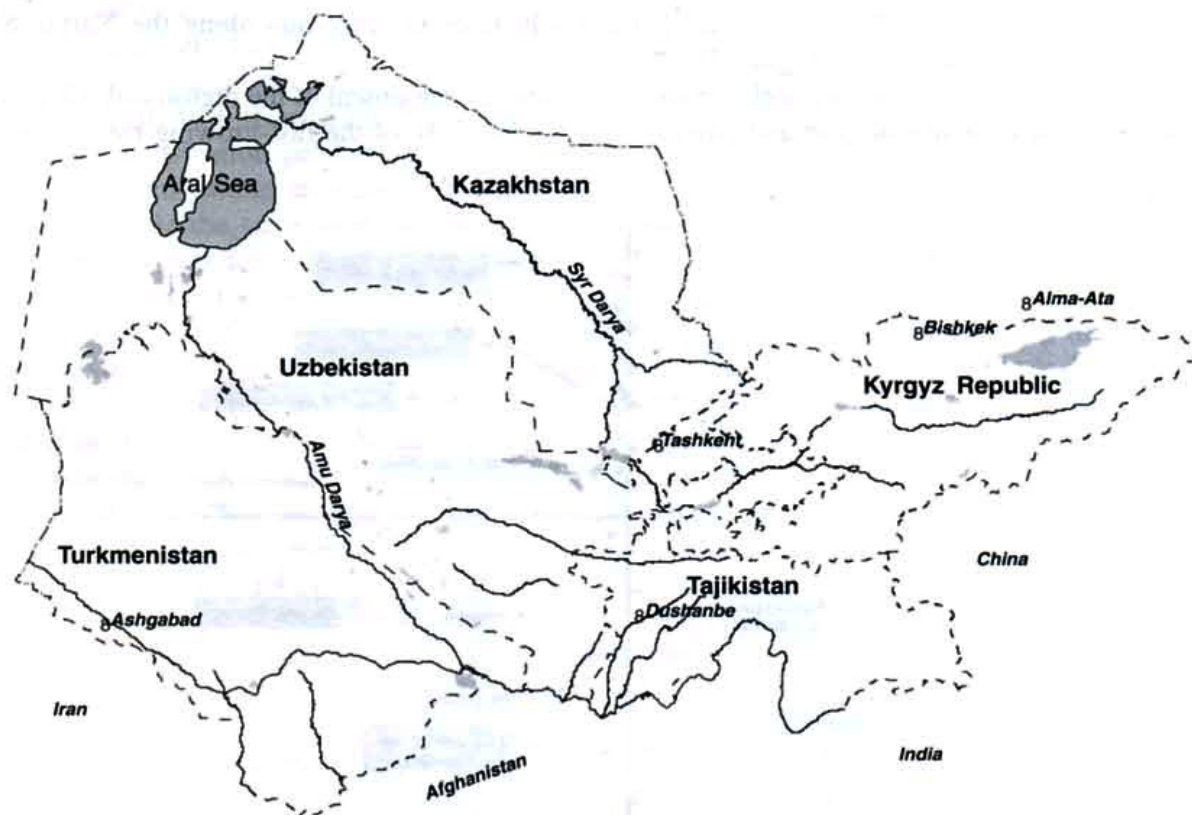


Figure 2. The Aral Sea basin

international food and other commodities markets. During the period of Soviet power their economies had been developing along raw material (agrarian) lines and nowadays greatly depend on Russia for all kinds of industrial products;

- Trends in economic development also differ drastically from country to country: they range from completely free market relations, very weak state interference, a little support rendered by it to various branches, privatization of everything including land, introduction of the self-repayment principle in all sectors (including the water sector, as is the case with Kazakhstan), to very strong regulation by the state of all relations and gradual transition to purely capitalist relations in Uzbekistan and Turkmenistan, and an intermediate position taken by Kyrgyzstan and Tajikistan.

All these resulted in the transformation of interpreting and implementing previously approved decisions and agreements, in their adaptation to the real dynamics of our states' formation in the new economic and geopolitical situation. As these processes apply to water resources management and use they led to various deviations from the approaches and management principles which existed in Soviet times:

- Kyrgyzstan due to its fuel resources deficit started to use the infrastructure of the Naryn cascade created in Soviet times for the purpose of gradual substitution of expensive organic fuel with cheap electric energy. With this objective they changed the mode of the Naryn regulation from irrigational (accumulating water in winter and releasing it in summer) to a hydro-energy one (accumulating water in summer and releasing it in winter). To ensure continuation of the former fuel provision system at the expense of its neighbors Kyrgyzstan offered rather crushing sale terms for summer electric energy and provision of barter gas and coal supplies from Kazakhstan and Uzbekistan at dumping prices. Though the Agreement of 1998 between Kazakhstan, Kyrgyzstan and Uzbekistan accepted these "rules of the game", concurrently they made this agreement difficult to fulfill due to conflict of interests between energy and fuel suppliers, each of them trying to make a profit at the expense of the other and refusing to accept parity terms of supplies—thus

fuel via energy egoism has taken water management schedules in reservoirs along the Naryn–Syrdarya power stations cascade “prisoner” (Figure 3).

- Irrigated agriculture, for centuries a priority in socioeconomic development of the region and still proceeding to constitute the basis of life support and employment for 60–70% of the fast-growing rural population in

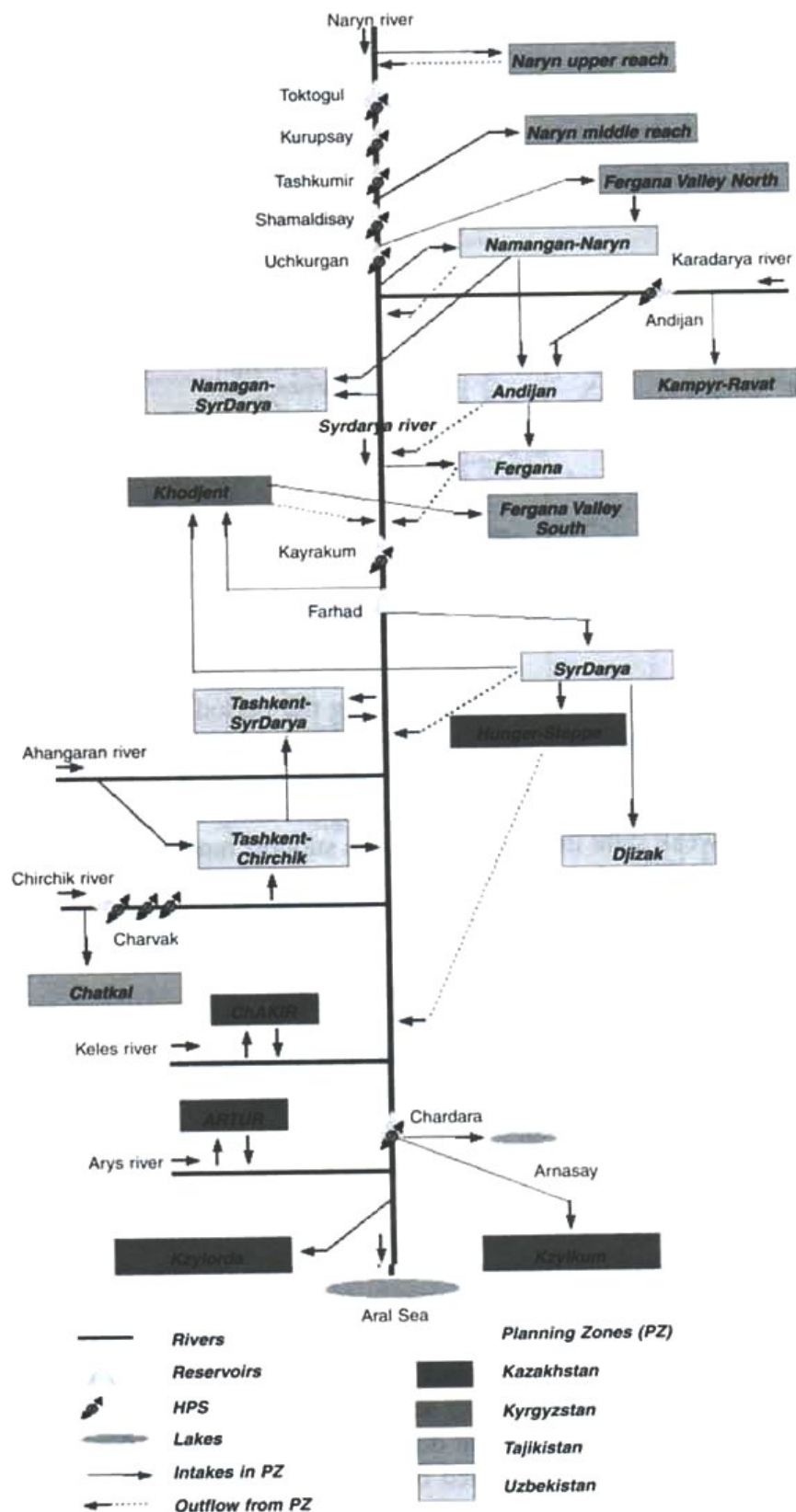


Figure 3. Linear scheme of Syrdarya River

the region, lost to a significant extent its apparent large profitability due to a series of external and internal reasons. A significant factor affecting the regional water sector is the sharp reduction in world prices for irrigated agricultural produce that has occurred during the last 10 years: rice, down 50% (from \$300 to \$150 t⁻¹); wheat, 40% (from \$200 to \$120 t⁻¹); cotton, down 55% (from \$1760 to \$800 t⁻¹). This factor determines low irrigation productivity, the inability of farming to actively participate in the supporting water sector when getting an income of \$100–200 ha⁻¹ instead of the \$500–1600 ha⁻¹ farmers used to get in the past. At the same time the social value of irrigation, which together with other related sectors provides employment for 40% of the (in major part rural) population, remains important. Any disturbance in water supply sustainability, caused by deviation from agreed annual schedules of water delivery, leads to immense social damage verging on disasters—cases that we have been witnessing for the last 2 years downstream of the rivers, especially in the Amudarya delta. Therefore not only the lack of assurances on the part of the states to observe the order of water distribution, but also imposition of artificial terms for water release from reservoirs that are unacceptable to the majority, combined with evidently speculative prices, make the current “order” of water–energy exchange improbable;

- Weakening of economies and significant (different in extent) decrease of national income per capita in all countries of the region led to a sharp reduction of subsidies and support of agriculture and the water sector, cutting down provision of agriculture with tractors, machinery, fertilizers and chemicals. The infrastructure of agriculture and water management deteriorated, especially at the former on-farm level—as a result water supply and reclamation conditions of irrigated lands sharply declined—this cannot but have an impact on crop yields;
- Introduction of market mechanisms in agriculture (privatization, breaking up large state and collective farms into hundreds and thousands of small farms) was not combined with establishment of proper commodity production and water distribution and use infrastructure. As a result vast complications arose in providing the new private farmer with corresponding services, as well as with seed, technologies, extension services and water. An almost twofold decrease in general incomes across the region, and a reduction of profitability over several fold led to immense impoverishment of the rural population, but at the same time to the impossibility for agricultural producers to protect their interests by their own strength as is being done by energy and fuel producers now emerging on the free market. Comparison of land productivity data shows the average for Central Asia was 1140 rubles or over \$2000 ha⁻¹ of arable land in 1980; nowadays this indicator hardly reaches \$700 ha⁻¹!
- The new situation challenged new young leaders to start managing local authorities, and these young leaders do not sufficiently provide real instruments for creating, managing and improving land productivity. If in the past more than half of district and province senior managers used to have agricultural and water specialists on their staff, then at present most local managers do not realize that water is useful only when it is within the limits of demand. All these things combined with insufficient ecological education paved the way to parochial aspirations on the part of local authorities to interfere in water allocation and distribution, thus hindering equitable and reasonable water allocation and causing damage to nature, complex demands for water being more acute during water-scarce years;
- Deficit of funding affected the condition of hydrometric and meteorological networks, quality of water and weather forecasts, which in turn have impacts on planning and regional water resources operational management. Though some donors render support along these lines, activities are still of not of a target-program nature—they are fragmented and not always effective.

Unfortunately, all these conditions and factors remain unnoticed by a variety of critics, who try to mix seeds with weed and spread doubts on the effect of real actions undertaken by political and water management organizations of the region. Therefore, rumors have been appearing in various publications and reports that allege “unwillingness” of Central Asian countries to cooperate (Swein and Rivere, 2001) and foresee water conflicts (Kagnat, 2000). Such rumors are used with the purpose of excusing the futility of “own assistance” (assistance that helps mainly the donor country) allegedly provided to the region and to deter other sponsors willing to help. In contrast to such an attitude, other splendid examples should be noted, which reflect the genuine unselfish assistance rendered by Canada (CIDA) and Switzerland (SDC) to the region, which is

directed at finding and eliminating weak points in regional cooperation and its consolidation. Among these activities are:

- establishment of the ICWC Training Centre and the whole training system under guidance of McGill University (Montreal);
- pilot introduction of integrated water resources management in the Aral Sea basin by the efforts of IWMI and ICWC (SDC);
- organization of training courses on international water law (UK DFID), Dundee University (Scotland) and many others.

It was this kind of assistance that helped ICWC during the last 10 years to:

- avoid occurrence of conflicts in water management and operation, and water allocation between the countries of the region;
- hold 32 meetings of the commission, which determined all activities undertaken by ICWC and its bodies;
- prepare and submit for consideration by governments of the states some principal legal, financial and institutional proposals, defining the order of interaction on water issues. Two of them have been signed by Heads of States as international agreements;
- reduce volumes of water use in the region from 110 to 103 billion m³ annually.

WATER SAVING AND RATIONALIZATION OF WATER DISTRIBUTION AND USE—THE “ARCHIMEDEAN” LEVER FOR SURVIVAL AND PROGRESS

It is only natural that retention of current tendencies and defects will not lead to any improvement. Joint reasonable search is needed for ways to enable survival and development. SIC ICWC has implemented, within the framework of several programs, simulation of different variants of future perspectives, including a “zero” variant—that is, preservation of all tendencies and trends in the “as usual” manner (but together)—the optimistic one, intermediate and national egoistic ones—“each country on its own”. The optimistic scenario supposes that regions in all sectors of water consumption should achieve the potential productivity of water; the intermediate scenario is only 60% from this level. The national “egoistic” scenario orients each country toward the satisfaction of its own interests without taking account of other riparian partners. It is noteworthy that according to the last variant of “everyone grabs”, each country tries to snatch as much as possible and as a result experiences a water deficit of 35–40 km³ annually even without taking into account water demand for nature.

Meeting the demands of the region is only possible with the optimistic or the intermediate variant, which is oriented at:

- cooperation and collaboration of all countries in achieving food self-sufficiency not for one country separately but for the whole region on some interrelated reasonable basis by way of produce division, specialization and mutual supplies;
- rational interrelated water resources management, based on integrated management according to the hydrographic principle with broad participation of water users at every level of hierarchy, intersectoral coordination, and elimination of the administrative framework;
- partnership between the state and water users in joint management and actively obtaining funds of both parties for covering expenses on water management development.

The main aspect in both variants is orientation toward achieving “land and water potential productivity (WPP)”.

Over the last five years the WUFMAS Program supported by the European Union, then Component A-2 of GEF and lastly “Best practice in water use” (IWMI–ICWC) (Khorst *et al.*, 2002) displayed, on vast areas

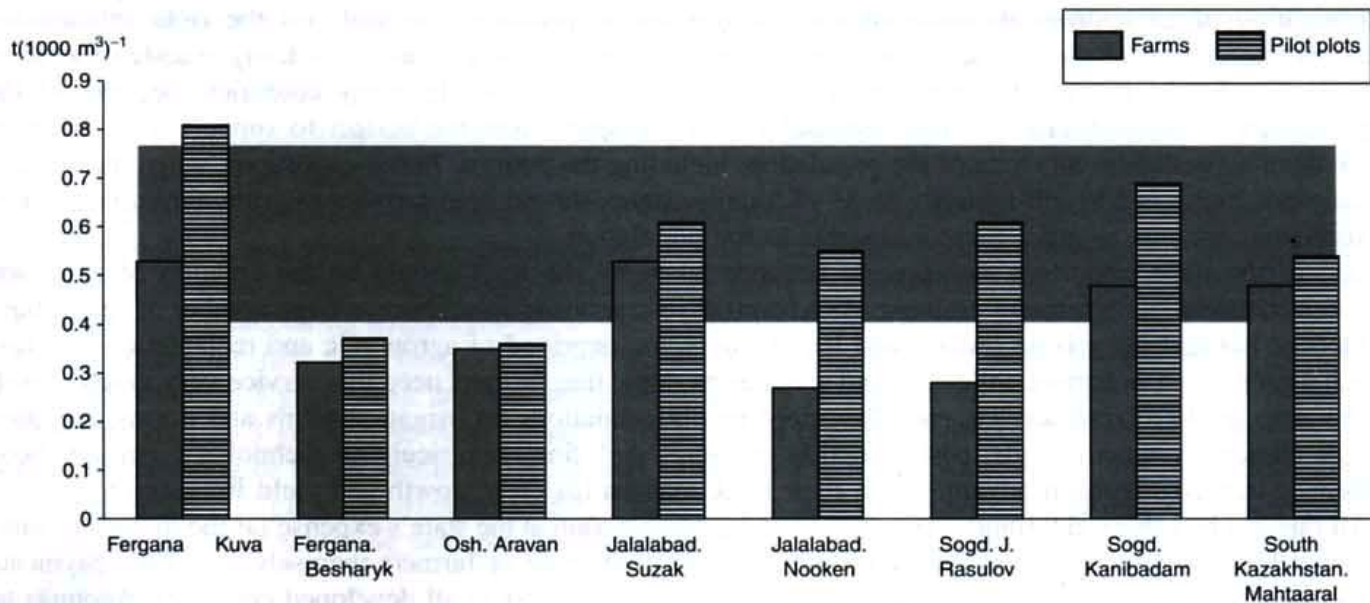


Figure 4. Potential and actual productivity of water on cotton fields at pilot plots in 2001

at various demonstration plots and farms, possibilities of achieving and even surpassing this water potential productivity (WPP) (Figure 4). The question arises: if all countries of the region try to achieve this level, how much water will be required to meet the demands of Central Asia where, together with northern Afghanistan, there will be about 70 million people in 2005? In order to produce 21 million t of cereal, 6 million t of cotton, 10 million t of other agricultural production, 47–50 km³ of water will be required according to WPP. If the degree of systems efficiency is 0.68–0.7, then gross water demand will be 70–73 km³ for irrigation and 7 km³ for drinking water supply, and municipal and industrial needs. In that use, there is no need at all to develop new lands—at present the potential hectare cost reaches \$6000–7000 ha⁻¹, and the same amount of agricultural produce can be obtained at much lower cost by increasing the productivity of existing lands. The “water saving” program should become across-the-board at all levels of the water hierarchy. First of all it relates to detailed analysis of reserves over all irrigation systems at inter-farm as well as at farm levels (including the restructured socialist cooperatives).

At system level water losses in the inter-farm and main network from water intake to farms in former borders vary within 10–12% and up to 26% (Andijan province). Generally, this indicator over provinces is more or less equal to 20 ± 3%. At the level of former on-farm systems the average amount of losses is 20 ± 5%. The following is of importance here:

- assessment of technical losses correctness;
- maximum reduction of organizational losses, mainly through Water User Associations (WUAs) establishment and development; introduction of strict water rotation methods such as *warabandi* or *sheihjeili*;
- water accounting in the headwork of all farms.

The main precondition for land and water productivity in irrigation is water and other technological elements used in the field and in farms and other units. But it should be well understood, that if a correct and strict water supply is provided by the hierarchy of water management organizations (BWO–WBA–WUA), final productivity depends also on the other required inputs such as fertilizers, pesticides and adequate farming practices. Under market conditions it is determined by:

- organization of environment and infrastructure that assists farmers to orient themselves in the complex financial world and in marketing;
- knowledge level and its update; assistance in effective methods and technology introduction;
- information, access to it and opportunity to use it.

Organization of an appropriate environment for agricultural producers depends on the right relationship between the state and the farmer. The state, based on agricultural producers' activity, tackles the most important task—to provide the population of the country with food. In many countries, because of the impossibility of self-sufficiency, huge financial means are spent from the budget to support food prices to make them accessible to all strata of the population, including the poorest. In our conditions, when the average income per capita is \$30–80 monthly or \$1–2.5 daily, states should help farmers to grow agricultural crops in sufficient amounts to make them accessible to the population.

One of the most important measures to be undertaken by the state should be the creation of extension services connected with farmers' training. As a result of restructuring agriculture, a large number of agricultural producers, particularly private owners and leaseholders, are deprived of agronomic and reclamation services, which used to exist in former collective and state farms. New free farmers need this service very much as well as the state seed-growing service, etc. They need recommendations on irrigation terms and norms, cropping pattern choice for specific soils, cost reduction measures and, finally, agricultural technology. Farmers need assistance in recognizing disadvantages in their land, reasons for crop growth and yield irregularity.

All this can be achieved through extension services organization at the state's expense (at the first stage, until a certain level of productivity is reached), and then at the expense of farmers themselves making payments to the so-called "advisory agrotechnical system". Such services exist in all developed countries. Attempts to create similar services were made in our republics during the period of reconstruction.

Work done in 1985–90 on 150 000 ha of land in several provinces of Uzbekistan revealed certain peculiarities in irrigated lands and irrigation water productivity. On the most part of irrigated land low yield is caused by:

- field irregularity and spottiness;
- untimely irrigation, negative impact of overirrigation and underirrigation;
- poor implementation of obligatory agrotechnical operations and works, inadequate counter weed/vermin measures, unbalanced use of fertilizers, etc.;
- lack of farmers' skill in yield management;
- low quality of seeds.

If the last factor should be under supervision of the state, the penultimate one can be solved by training and education. The first three factors are critical shortcomings and elimination of these defects is a very important way to increase land productivity.

Special research revealed that the most widely spread type of field irregularity in terms of productivity is the following:

- each field with the average cotton yield of 2.5 t ha^{-1} has 30% of area with yield of $3.0\text{--}3.5 \text{ t ha}^{-1}$, 20–25% of $1.5\text{--}2.0 \text{ t ha}^{-1}$ and 10% of less than 1.5 t ha^{-1} . Thus, average yield represents only 30% of the field area. If yield capacity on low fertility soils were to be increased up to 30–35% of average, average field productivity will increase up to 3.0 t ha^{-1} .

Main reasons causing such irregularity of background are as follows:

- unlevelled irrigated plot, inundation and underirrigation, which can be improved through laser leveling by quite inexpensive methods;
- different degrees of salinity and waterlogging, which can be avoided by reclamation measures;
- soil spottiness in terms of texture, that can be improved by addition of sand or on the contrary by clay grouting;
- lack of humus in some parts of a field.

Certification of lands, done 15 years ago, showed its effectiveness and understanding on the part of collective and state farms. Now geographic information system remote sensing (GIS (RS)), computerization and

informatics can improve it. It seems expedient to organize such a service within the project framework on the territory of experimental farms and then in the WUA. The service will be able to accomplish the following:

- Carry out certification of all fields and provide farmers with field passports indicating all necessary agrotechnical measures to be undertaken;
- Certification will be based on the results of GIS (RS), which during the first year specifies the degree of yield irregularity and through land observations identifies the reasons and methods of elimination. Then a technological map, a plan of water use for the farmer and a minimum cost map will be developed;
- Give recommendations on irrigation scheme and technique, furrow length and other elements;
- Create during the first year, using experience of the fields stipulated by adjacent projects “Copernicus”, USAID, FAO (in Kyrgyzstan), demonstration fields for the purpose of training first groups of farmers so that later after 2–3 years these demonstration fields can be organized directly on selected farms;
- Organize training of WUA members and owners of selected farms on water-saving methods (according to “Best practice . . . ”project), irrigation terms, furrow length, and other elements of irrigation techniques, as well as methods of achieving land potential productivity.

The base foundation for this system of training will be “IWRM training centers”—now in the process of being established, as branches of the ICWC Training Center, and their network of demonstration plots, where existing projects’ points will be used as well as private farms organized within the framework of this project.

IMPROVING THE INSTITUTIONAL, LEGAL AND FINANCIAL BASE OF WATER MANAGEMENT

Water saving as such will not be able to ensure by itself successful development of the region; this activity needs to be supported by appropriate institutional, legal and financial provisions—both at the level of interstate relations and of national policy.

At the national level

- Reversion to powerful intersectoral structures of water management at the state level, with functions of strictly pursuing water protection and water use policy of the state;
- Extensive and all-round implementation of “integrated water resources management”, released from administrative influence of local authorities, in which all interested provinces and districts will be represented, enjoying equal rights to participate in basin, sub-basin and system organizations of water management;
- Participation of water users, alongside the state, in management and funding of operational activity (as land profitability increases, the share of the state is to be reduced);
- Facilitating establishment of WUAs in agriculture and WUO in other branches of the economy;
- Establishment of extension services in water management and agriculture with training centers and demonstrative plots networks;
- Introduction of water use charges in accordance with *increasing block rates tariffs*: minimum payment for water use within the limits of crop biological water demand (technological demand of production), which increases within the limit and multiplying iteratively in case of overuse;
- Payment for water sources pollution;
- Implementation of mandatory water accounting at all levels of the water hierarchy;
- Mandatory introduction of water rotation;
- Development of legislation which promotes water conservation and environment protection;
- Establishment of extensive transparent information practices and access to an information system, database and knowledge base.

At the interstate level

- Assume a “common use” doctrine as a basis for intersectoral water relations;
- Strengthen regional bodies of ICWC along the lines of enhancing their rights, authorities and responsibilities, with mandatory inclusion in these organizations of not only representatives of water management from the countries of the region, but also hydro-energy, water-delivery specialists, ecologists, etc.; granting them diplomatic status and freeing them from the necessity of following decisions taken by the host country;
- Reliable financial support by the states of all water management agencies, various hydro-meteorological services, nature protection authorities in flow formation and delta zones;
- As a substitution for fuel/energy–water exchange, implement payments for flow regulation in reservoirs (over year, seasonal, etc.) and participation of all countries of the Aral Sea basin in covering expenses for flow formation, as well as delta protection;
- Set well-defined limits on water withdrawal from the basins, taking into account ecologically permissible volume of water in the river, and allocate them between the countries in an equitable and reasonable manner;
- Implement on the basis of these limits payments for exceeding the set limits on water withdrawal at the amount of the price for water as a resource, and utilize this money for development in the basin of joint water-saving activities;
- Conclude a set of agreements, strictly regulating procedures and interaction of the countries as to water resources management, use and protection (unfortunately, this process has been delayed for several years);
- Set well-defined regulations for operation of regional organizations under various conditions and in different situations (water scarcity, floods, etc.); make these activities equitable, multinational, in parity and transparent;
- Equip all headworks of BWOs with automatic control and management systems (SCADA), preventing any possibility of uncontrolled water withdrawal from the river;
- Lay down regulations for joint design, construction and operation of multiobjective works (similar to Kambarata, Ragun, etc.), which will ensure that it will be impossible for these complex hydro-structures to be in the interests of only one country;
- Develop the system of education, professional improvement and training, etc.;
- Work out regulations of setting limits for transboundary return water management.

Countries of the region have acquired a broad experience of work and interactions and they understand their own responsibility, and this combined with political will and abandoned ambitions could allow the region not only to survive, but become the world model of rational use of transboundary water resources on a large scale.

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