Water Allocation including On-the-fly Adjusting the Plans of Water Use

N.N. Mirzaev, A.I. Tuchin, A. Alimdjanov, H. Manthrithilake

Establishing Canal Administrations, Canal Water Users Unions, and Canal Water Committees on the pilot SFC, AAC and KBC in the frame of the IWRM-Fergana Project created the background for solving organizational problems of water distribution. However, establishing of these institutional frameworks is not an end in itself. They are needed for creating the environment (openness, transparency etc.) for achieving another key objective – ensuring equitable (uniform), sustainable and effective water distribution. Analyzing the traditional systems of water distribution has shown that not only organizational and technical problems but also technological issues can be mentioned due to the following constraints:

- Lack of proper methods for drawing up the plans of water use (PWU);
- Lack of developed procedures for adjusting the plans of water use;
- Questionable baseline information;
- Lack of the effective process of drawing up the plans of water use; and
- Lack of proper procedures for implementing the plans of water use.

Thereby, the need in the alternative water distribution management system (AWDMS) has arisen [38]. In the broader sense, the AWDMS means the water distribution management system based on the IWRM principles. In the narrow sense, the AWDMS is the system of organizational and technological procedures of water distribution management aimed at observance of the principles of equity, sustainability and efficiency.

The principle of equity should be observed at the stage of planning and adjusting the water use plans, when the key tasks of the CA and CWC are the following:

- to draw up plans of water use and distribution correctly reflecting the water needs of water users;
- to establish the limits (quotas) of water use in the equitable manner taking into consideration available water resources and water users' applications.

The principles of sustainability, uniformity, flexibility and efficiency must be observed at the stage of implementing the water use plans. At this stage, during the growing season, the key tasks of the CA and CWC are the following:

- Enhancing the stability of water delivery from the canal and streamlining operation of pumping stations;
- Providing the uniform irrigation water supply to water users (WUAs and collective farms) and to laterals (groups of laterals) according to established limits during the irrigation season;

- To allow water users to adjust efficiently ten-day water consumption from their canals, in reasonable limits;

- To minimize operational and organizational water losses within the irrigation system.

Organizational aspects of the AWDMS

1. Governance of water distribution is implemented with participation of water users through the CWC;

2. The CWC creates the environment of openness and transparency for ensuring the principles of equitable (uniform), sustainable and effective water distribution;

3. Seasonal and ten-day plans of water use are developed and approved by the CA after co-ordination with the CWC;

4. All conflicts and disputes between water users and the CA are discussed and settled by the members of the CWC (Arbitration Board) or with their participation;

5. All information on conflicts and disputes between water users and the CA, as well as water users' proposals on improving the system of water use and distribution should be collected and documented in the CWC;

6. The CWC has to work in close cooperation with the Water Inspection;

7. CWC sessions should be organized both in the CWC office and directly at sites of the irrigation system to rise awareness of water professionals and water users and to discuss topical issues of water distribution;

8. The CWC informs stakeholders and the general public about its activity results.

9. Basic tasks of the CA and CWC:

a) at the stage of planning and adjusting the water use plans:

- to draw up the water use plan (correctly as much as possible);

- to establish the limits of water use in the equitable manner.

b) at the stage of implementing the water use plan:

- Enhancing the stability of water delivery from the canal (streamlining ten-day irrigation water supply and operation of pumping stations);

- Providing uniform irrigation water supply to water users and to laterals (groups of laterals) according to established limits during ten-day periods and over the irrigation season as a whole;

- To provide the flexibility of water distribution; and

- To minimize operational and organizational water losses within the irrigation system by introducing different kinds of water rotation, if expedient.

Technological aspects of the AWDMS

1. The following types of managing the irrigation systems are existing:

- Tactical management (running, seasonal and annual);
- Day-to-day management (ten-day period management and daily management);

2. Tactical management of the on-farm irrigation system includes:

- Drawing up the water use plan (for growing and dormant seasons);
- Seasonal adjusting the water use plan.

3. Day-to-day management of the on-farm irrigation system includes:

- Adjusting the water use plan for the next ten-day period (calculation of ten-day water limits and adjusting irrigation water supply);
- Day-to-day adjusting the water use plan (adjusting the planned limits and water delivery into the canal or a group of canals);
- Implementing the modified water use plan.

4. Main canals, laterals and on-farm distribution canals and their groups are the objects of management;

5. Grouping the irrigation canals. Canals are grouped according to their belonging to water users within one irrigation unit (a water-balance site).

Planning and adjusting the water use plans (schedulining)

Seasonal planning

- Water use plans are drafted for different options of water availability in water sources (wet year, average year, dry year) and various weather conditions during the growing season (a rainy spring, hot summer etc.);
- Under seasonal planning, water demand (planned water delivery) of water users (a canal, group of canals etc.) is established for the growing season (April to September) or for dormant season (October to March) taking into account the irrigation schedule and technical parameters of the irrigation system;
- Seasonal planning of water distribution is carried out based on detailed and specified data on:
- water losses within the irrigation system and on a field;
- a carrying capacity of irrigation canals;

- crop pattern and areas (taking into consideration interim and secondary crops);
- availability of internal water resources (return water, irrigation tube-wells, springs etc.);
- an irrigation schedule;
- crop water requirement zoning;
- An option of the water use plan for the coming season is chosen based on the refined forecast of annual water availability.

Seasonal adjustment

- Under conditions of water deficit the water use plan may be adjusted for the irrigation season, ten-day period and on the daily base. Non-agricultural water users (the needs of public utilities, industry, nature etc.) exercise a privilege and their water supply rates can not be reduced;
- Adjusting the water use plan should be made due to the following reasons:
  - Changes in irrigated area or crop pattern (based on actual data on areas under crops);
  - Stable difference between water availability in the water sources and planned amounts estimated based on monthly forecasts regarding water availability; and
  - Stable difference between actual weather characteristics and mean annual weather data (abundant rainfalls, higher temperatures etc.).
- Planned quotas for laterals (group of secondary laterals) for a coming season are specified in the process of seasonal adjustment, taking into account the planned quota established by a superior water management organization for the main canal. A quota is an amount of irrigation water (in absolute or relative values) that is prescribed to a water user (canal, group of canals etc.). It is necessary to distinguish a planned quota for the estimated period (a season, ten-day period) and an actual quota. Limits that are established by the ministry for the SFC or "water allocation percentages" that are used for the KBC are essentially the planned quotas for irrigation water supply;
- A planned quota for the SFC is a seasonal or ten-day limit established by the ministry; for the AAC – a ten-day water withdrawal according to the plan of water allocation; and for the KBC – an estimated (expected) flow during a ten-day period under consideration that is calculated taking into consideration a mean annual discharge of the Khodjibakirgan River and water diversion by Kyrgyz water users;
- A planned quotas for laterals should be specified applying one of two approaches:
  - An approach based on the principle of uniform irrigation water supply (the traditional principle of proportionality when the planned quotas for main canals and their laterals are adjusted for ten-day periods using a single proportionality factor established for the whole irrigation system);
  - An approach based on the principle of equal general water availability (the alternative principle when the quotas are differentially established taking into account a share of industry, water withdrawal from internal water sources and use of groundwater by crops).
- Choice of an approach of calculating the planned quotas for each canal is also the competence of

the CWC.

Adjustment of the Water Use Plan for a Ten-Day Period

- Initial adjusting the planned quota taking into account the actual irrigation water supply during the previous period;

- Calculation of the planned quotas for laterals (group of secondary laterals) in coordination with applications for a coming ten-day period;

- Secondary adjusting the planned quota when a total irrigation water limit for the main canal is less than the planned quota plus an amount of water according to applications;

- Iterative calculation of the planned quotas in coordination with the secondary adjusted (increased) planned quota with applications for a coming ten-day period for laterals (group of secondary laterals). An application is a planned irrigation water demand of a water user (lateral, secondary laterals etc.) depending on current natural and economic conditions. An application can cover a ten-day period or its part (intra- ten-day period).

- Applications for the following ten-day period should be submitted by water users to the CA three days before the beginning of the following ten-day period, and applications for an intra- ten-day period – one day before changes in water delivery into the canal;

- Lack of an application can be interpreted in two ways: a) as lack of water demand; and b) as compliance with the planned quota. In the first case, submitting of an application is the rule, and the lack of an application is an exception to the rule. This approach is acceptable for the SFC and AAC. In the second case, submitting of an application is an exception to the rule, and the lack of an application is the rule. This approach is acceptable for the KBC;

- After termination of the estimated ten-day period, an actual quota and actual water limit for the canal is specified based on actual data. A limit is an amount of irrigation water (in absolute or relative values) which the CA has to delivery to lateral (a group of secondary laterals) during a ten-day period. It is necessary to distinguish a planned limit for the estimated period (a ten-day period) and actual irrigation water limit.

Adjusting the Water Use Plan within a Ten-Day Period

- Redistribution of irrigation water among laterals within a group of laterals in the range of planned limits established for a group of laterals is permissible during a ten-day period. The redistribution is implemented in coordination with downstream subdivisions of the CA (hydro-operational sites) based on the secondary applications (for intra-ten-day periods);

- The possibility to redistribute irrigation water among laterals within a group of laterals complicates the water distribution process but rises the flexibility of water management and water productivity;

- The need of adjusting during a ten-day period can be caused by natural factors (rainfalls, return water) and on-farm production factors (for example, fields are not ready for water application because furrows were not cut or missing of fertilizers took place).

Implementation of the water use plan

- At the stage of implementing the modified water use plans, the key task of water managers is to minimize deviations actual irrigation water supply from the planned limits during a ten-day period; and

- A role of the CWC that has to facilitate the compliance with principles of sustainability, uniformity and efficiency of water distribution is especially important.