Irrigation water supply for non-irrigation purposes in Uda Walawe; policy and effects

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Abstract

Water released for irrigation is not only used for irrigation, in many cases it is also used for other purposes like washing, bathing and drinking. In some areas water released for irrigation is even the main source of water for these purposes. When different organizations are responsible for water supply for both irrigation and non-irrigation purposes, coordination is very important, but often lacking.

The research question for this research is:
What are the linkages between water releases for irrigation and releases for other purposes in the Uda Walawe irrigation scheme?

To answer the research question the present situation in the Uda Walawe irrigation scheme and the effects of irrigation water releases taking into account water needs for other purposes are analyzed. Partly, water needs for other purposes than irrigation are already taken into account, but there is no clear policy.

One can expect that the availability of water for non-irrigation purposes will be positively affected if these needs are taken into account in decisions related to the allocation of water. Dependent on the priorities in water allocation and on total water availability, water distribution for irrigation might be negatively influenced. Optimal water allocation requires a clear policy and coordination by management. A clear policy involves, among other things, setting priorities for the allocation of water, taking into consideration the different interests in water allocation.

Preface

Sri Lanka has a long history concerning irrigation. In the Uda Walawe irrigation scheme, where I conducted my research, there was already some irrigation infrastructure dating back to the period between BC200 to AD1200. Some of the irrigation reservoirs used in this period are again used nowadays. And irrigation is still of major importance for the inhabitants of Sri Lanka.

IWMI, the International Water Management Institute, where I worked during my internship has already many years of experience in research with regard tot the subject of irrigation.

It will be no surprise, that the combination of IWMI and Sri Lanka was a perfect location for my internship concerning irrigation. It took a long period of preparation because in the Netherlands I followed some extra courses in irrigation in the Netherlands and my internship had to be postponed once. Fortunately I was able to start in March 2002. I am very glad I could do so, because I experienced that Sri Lanka is a great country to live in, with wonderful people around and the opportunity to conduct research on irrigation made Sri Lanka very interesting for me.

This report is the result of my internship. This would not have been possible without the help of my supervisors; Eline Boelee in Sri Lanka (IWMI) and Irna van der Molen in The Netherlands (University Twente). During the whole period they assisted me, from finding a subject to writing this report. And of course the field assistants in Embilipitiya who took care of transport, translating and lots of fun in the field, especially Gamage and Sarath. Also thanks to everybody I spoke to in the office and in the field about my research with special thanks for Mr. Ariyaratne, who also showed me round in the field. For all of you: thanks a lot for helping me!

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1 Introduction

1.1 Background

There is often a lack of water for domestic uses in the arid and semi-arid areas in the world (Hoek, W. van der, F. Konradsen, W.A. Jehangir, 1999). If there is no groundwater available or if the groundwater is brackish and there is no separate domestic water supply system, people in these areas are dependent on other sources of water for their domestic water supply. Recent studies (Shortt, R.L., 2001) have shown that irrigation water can be an important source of domestic water in rural areas; for consumptive uses like drinking and cooking and non-consumptive uses like washing and bathing. Besides, irrigation water can also be the source for municipal water supply and other small industries.

Recognizing the role of domestic water use in the irrigation system is important to arrive at optimum water allocation for all uses. IWMI conducts research on the question how the benefits of irrigation can be increased, not only for irrigation purposes but also for domestic purposes.

Agricultural and domestic water supply are, quite often, the responsibility of agencies in different sectors, which not always coordinate planning and implementation of water supply. This may lead to a situation in which the two sectors compete for the same scarce water resources without any collaboration. For the population in rural areas, there is no such division between water for agricultural and domestic use. If there is a shortage of drinking water supply, if the drinking water supply is unreliable, not safe for drinking or if the sources are too far away, people may decide to use water from irrigation systems for domestic uses. They make judgements based on their own perceptions; water from tube wells may be used to water gardens or water from irrigation canals for drinking.

In (semi) arid areas, people may depend entirely on the irrigation system to provide them with the water they need for different purposes. This implies that when there are no irrigation water releases, e.g. between the cropping seasons, water shortage can become absolute, causing severe health problems, which are related to the lack of water for personal and domestic hygiene and which are directly related to the quality of drinking water (Hoek, W. van der, F. Konradsen, W.A. Jehangir, 1999). This problem can be solved by issuing extra water between the cropping seasons.

1.2 Problem definition

If the domestic use of irrigation water is seriously taken into account, e.g. by additional water releases, by changing the intervals and timing of additional amounts of water, this is likely to affect water management, system maintenance and allocation decisions in times of water scarcity. Until now it is not clear to what extend such water releases for other purposes actually take place, what the actual policy is, and what the effects of these releases are for the availability of water for irrigation. These questions will be subject of this study and applied to the Uda Walawe irrigation scheme in Sri Lanka.

Research question

What are the linkages between water releases for irrigation and releases for other purposes in the Uda Walawe irrigation scheme?

1.3 Definitions

Non-irrigation purposes (After Yoder, R., 1981): all irrigation water uses, other than irrigation, for which irrigation water is used. This covers domestic purposes such as drinking, washing and

bathing, but also watering of home gardens, sewage disposal, small industries, animal requirements, power generation, transportation and religious purposes. Of these uses, the emphasis will be on domestic uses, although other non-irrigation purposes might be taken up as well.

Uda Walawe irrigation scheme: in this report, unless described in another way, the Uda Walawe irrigation scheme is defined as the whole area irrigated by the Right bank main canal and the Left bank main canal, under authority of the Mahaweli Authority of Sri Lanka (MASL).

The abbreviations and definitions in this report are briefly explained in Appendix I.

1.4 Outline of report

In chapter 2 the methodology is described; this concerns a description of the study area in paragraph 2.1 and of the used sources and methods of data collection in paragraph 2.2. Chapter 3 gives the results. Due to the character of research this mainly concerns a description of the policy and procedures concerning irrigation in the Uda Walawe irrigation scheme. Besides some irrigation data are analyzed. Some important or interesting practices affecting irrigation, observed during research, are mentioned in the discussion in chapter 4. Finally, in chapter 5 the conclusions are drawn and recommendations are given.

2 Methodology

2.1 Study area

This study has been performed in the Uda Walawe river basin in Sri Lanka. The Walawe river basin is located in the south of Sri Lanka (figure 1) (Japan International Cooperation Agency, 1993). This area was, during BC200-AD1200 one of the most densely populated areas in Sri Lanka. To provide the area with water, lots of small dams and reservoirs (in South Asia often referred to as "tanks") were constructed. After this period the area was abandoned and the water tanks deteriorated. Until 1960 there hardly lived any people in the Uda Walawe area due to severe water shortages.

Nowadays (Sapi team for Japanese Bank for International Coorporation (JBIC), 2000), the Uda Walawe area has special government attention. It is the aim of the government to develop 32,000 ha of irrigated fields and resettle people in the southern dry zone of the country as a solution to poverty, unemployment and landlessness. To provide the area with enough water during the whole year, the Uda Walawe reservoir, which has a capacity of 268 000 000 m^3, was finished in 1967. The reservoir receives water from the Walawe ganga. The catchment area of the Uda Walawe reservoir is 2,442 km^2. The system also generates hydropower.

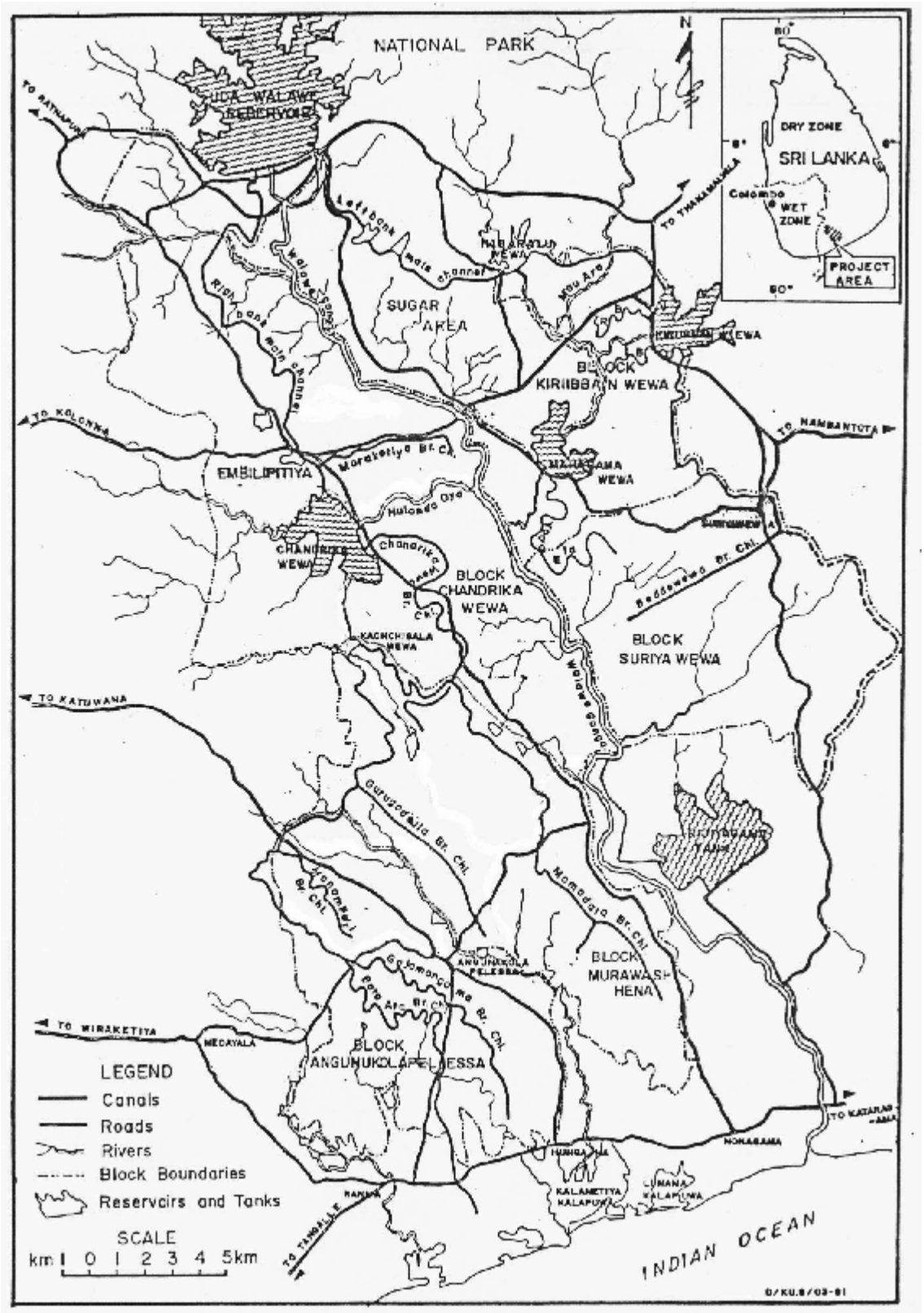
From the reservoir water is released into two irrigation canals: the Right bank main canal (RBMC) and the Left bank main canal (LBMC), which serve irrigation. The Uda Walawe irrigation scheme is divided in five blocks. On the Right Bank Chandrikawewa, Murawasihena and Angunakolapelessa and on the Left Bank Kiriibanwewa and Suriyawewa (figure 1). The Right Bank is already fully developed. There is 12000 ha of irrigable land (from which 9700 ha was cultivated in 2000) and approximately 10 000 families live in this area. The Left Bank is developed upto Suriyawewa, this area covers 6744 ha of irrigated land. For the development of the downstream area there is an extension project, which aims to increase the command area with another 5340 ha. In 2000, the upgrading and extension project (phase 2) was scheduled to be finished at the end of 2003 (Sapi team for Japanese Bank for International Coorporation (JBIC), 2000). Different studies, based on different scenarios do not agree yet whether there will be enough water to irrigate the whole area.

Angunakolapelessa is the most downstream block on the Right Bank of the Uda Walawe irrigation scheme. The distributary canals and field canals are all lined. Approximately 15 000 people live in Angunakolapelessa. Angunakolapelessa covers about 4000 ha, of which 3700 ha is irrigated. In Maha season 2001/2002 3200 ha was really cultivated. Irrigation water is provided by the Right bank main canal, but the Angunakolapelessa area does not drain on the Walawe ganga. Therefore, this area is sometimes not considered as a part of the Walawe basin, but as a separate basin: Kachchigala.

Climate

The Uda Walawe irrigation scheme is situated on the boundary between the wet and dry zone in Sri Lanka (Japan International Cooperation Agency, 1993). The northern and western parts of the Uda Walawe system are situated in the wet zone, the eastern and southern parts in the dry zone. Angunakolapelessa is situated in the wet zone. The dry zone is defined as the area in which annual rainfall is less than 1905 mm or less than 508 mm during the southwest monsoon. According to Koeppen's climate classification the wet zone in Sri Lanka is defined as a complex of tropical rain forest and monsoonal climate and the dry zone is defined as tropical savanna.

Figure 1: Uda Walawe irrigation scheme



In Sri Lanka, four rainfall seasons occur (Statkraft Groner, 2000c). There are two monsoon periods, the southwest monsoon and the northeast monsoon. The southwest monsoon occurs from late May to mid September. During this period there is much rainfall in the wet zone and a dry and hot wind strikes the dry region. The northeast monsoon is from mid December till early March. The amount and duration of rain are less than during the southwest monsoon, but the rain is more widespread. The inter-monsoonal seasons from mid March to mid May and from late September to early December bring rains which cover the whole country. Even within the Uda Walawe irrigation scheme rainfall greatly differs from region to region. Besides, there is a large variation in year-to-year rainfall. This means the reliability of the rainfall is very low. In some years there is enough rain, in other years there is water scarcity. Because the rainfall is hard to predict however, water use is not optimized.

The average temperature in the Walawe river basin is about 28ºC (Shortt, R.L., 2001).

Crops

The construction of the irrigation system has enabled farmers to cultivate both during Maha, from October till February, and Yala season, from April till August. The irrigated fields serve mainly for cultivation of cash crops. The main crop grown is paddy. Since 1986 there is a crop diversification project in which the authorities try convince farmers to change partly to bananas which will save them water. From 1986 till 2001, land cultivated with other crops than rice increased from five percent to fourty percent. Sixty percent of the fields are nowadays cultivated with paddy, thirty percent with bananas and ten percent with other crops. In Angunakolapelessa also sixty percent of the fields is cultivated with paddy, eighteen percent is however cultivated with bananas and twenty-two percent with other crops. In the home gardens fruits and vegetables are grown for own consumption.

2.2 Data collection

Data are collected for the whole Uda Walawe irrigation scheme, more detailed information is collected on block level for Angunakolapelessa. The data collection consisted of three stages. First, the collection of secondary data; second, verification of these data in the field; and finally, the collection of additional data.

In the first stage, the sources were mainly literature, unpublished reports, databases and information from colleagues at IWMI. In the second and third stage the most important sources were interviews in the field and datafiles. Interviews were held with key informants such as (former) staff of the MASL in Embilipitiya, Suriyawewa, Chandrikawewa and Angunakolapelessa and with staff of the NWSDB in Suriyawewa and Eraminiyaya/Angunakolapelessa. Informal interviews were held with farmers in different areas in Angunakolapelessa. Although the number of interviews is too small to draw general conclusions, the results give some insight in the water supply situation in Angunakolapelessa. Additional data were acquired by direct observations.

3 Results

Most information in this chapter is based on personal communication with the Mahaweli Authority of Sri Lanka, the National Water Supply and Drainage Board and farmers. If other sources are used, references are made.

3.1 Irrigation

3.1.1 Institutions involved in irrigation

The Mahaweli Authority of Sri Lanka (MASL) is responsible for irrigation water supply in the Uda Walawe irrigation scheme since 1981 (Statkraft Groner, 2000a). Additionally, the MASL is also responsible for agriculture development and settlement of people in this region. The internal structure within the MASL is highly hierarchic. All employees perform a task as a small part of a long chain and often have limited insight into their contribution to the eventual goal. Within the MASL, there are handbooks available for operation at different levels. These handbooks deal with responsibilities, communication and procedures and contain forms.

In the Mahaweli basin, in the East of Sri Lanka, the MASL is also in charge, and here they have become basin manager, probably this will also happen in the Uda Walawe irrigation scheme as soon as other tasks are finished. At the moment the extension project of the Left Bank still takes much effort. Basin management compromises all the water management in the basin.

MASL

The MASL is, together with the Central Electricity Board (CEB) and head works operation (responsible for operating irrigation structures Uda Walawe reservoir) responsible for water releases from the Uda Walawe reservoir. The project office of MASL for the Uda Walawe irrigation scheme is situated in Embilipitiya. The Resident Project Manager , is responsible for the whole Uda Walawe area. He is assisted by three Deputy Resident Project Managers, one of which is responsible for irrigation. This includes decisions about irrigation scheduling and the adjustment of the structures in the Right bank main canal. The others are responsible for agriculture and land.

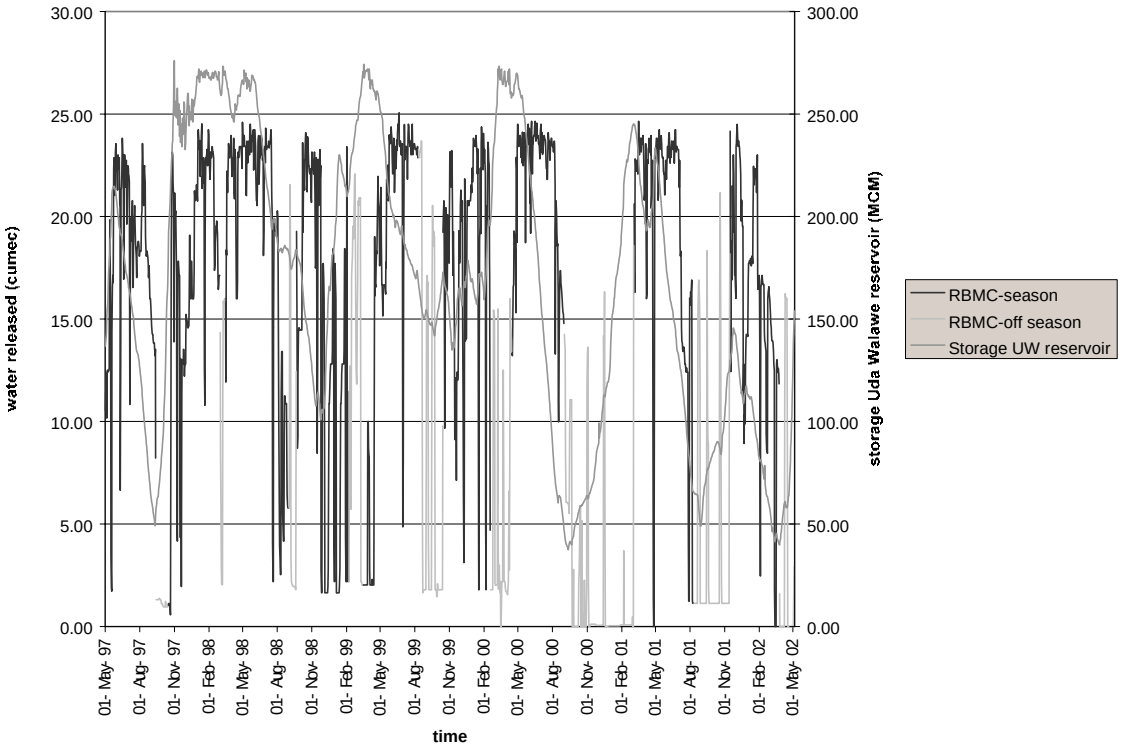
Water management panel and water management secretariat

The water management panel and water management secretariat advise the MASL in their decisions. They represent the CEB, the irrigation department and government agents. The water management panel has been established by the MASL with the assistance of the other agencies and ministers involved as the decision making body responsible for setting water management policies in the Mahaweli system. The water management secretariat was set up by the MASL to provide technical advice to water management panel, and to co-ordinate operation throughout the Mahaweli system. Every Friday there is a meeting in which the plans are reviewed.

Block offices

On block level activities are coordinated by the block offices. The block offices take care of the adjustment of the structures in the branch, distributary and field canals. The block office in Angunakolapelessa is managed by the block manager. In the block office there is one irrigation engineer with two assistants and there are three technical officers who each are responsible for operation and maintenance of one branch canal. Eleven field officers take care of maintenance and adjust the structures. The total number of staff at the block office is 75 people, 4 of whom are women.

Figure 2: Water releases Right bank main canal and water stored in Uda Walawe reservoir



The field officers of the MASL, who are daily in the field to adjust the structures or for maintenance, also have the duty to report problems in the field to the block offices. The MASL also provides a car to control illegal water tapping during the night. The block office representatives: the block manager or irrigation engineer report weekly on the situation in the field to the project office.

Farmer organizations

Farmers are organized in farmer organizations, these are roughly organized per distributary canal. The farmer organizations manage the local system and represent the farmers towards the MASL. They coordinate irrigation water turns and maintenance and settle disputes within the organization. The farmers directly choose their representatives. After the elections of the national government, the representatives also change according to the results of the elections, this makes it easier for farmers to achieve their goals. Representatives of farmer organizations who support the government have more influence on government institutions in favor of their own situation. The office bearers of the farmer organizations meet the MASL officially only on a meeting before the beginning of the irrigation season. Besides these meetings, there is contact if there are problems or if extra water is required.

3.1.2 Water supply for irrigation purposes

The Walawe Right Bank and Left Bank area are provided with water by the Uda Walawe reservoir. From the reservoir water is released into the Right bank main canal and the Left bank main canal. Figure 2 shows the water releases from the Uda Walawe reservoir into the Right bank main canal during cropping season, and during off-season from 1997-2002 and the water stored in the Uda Walawe reservoir. The irrigation periods are clearly distinguishable. During the cropping seasons more water is provided at higher frequencies than during the off-season. At the end of the irrigation season the released amount of water is usually reduced to enhance ripening

of the rice. The beginning and end of the irrigation season are not always very clear. Besides, sometimes actual irrigation seems slightly different from the official cropping season.

Storage greatly differs in time. From January 1998 till May 2000, there was relatively much water available. From May 2000 till May 2001 however, storage was relatively low. In Maha season 2000-2001 there was hardly any water released, this period was used to recharge the reservoir. In periods of relative low storage, especially during off-season, water is released less frequent and also the minimum amount of water released is reduced.

The Right bank main canal has seven branch canals. Three of which are situated in Angunakolapelessa; Manamperigama branch canal, Gajamangama branch canal and Bata Ata branch canal (figure 1). Besides the branch canals there are also distributary canals and field canals which divert water directly from the main canal. During the cropping seasons, water is released in the Right bank main canal and branch canals almost continuously, only at the end of the season there are some short interruptions. For the distributary canals and field canals there is a rotation schedule most of the time. During off-season water is released once in 15 days for perennial crops.

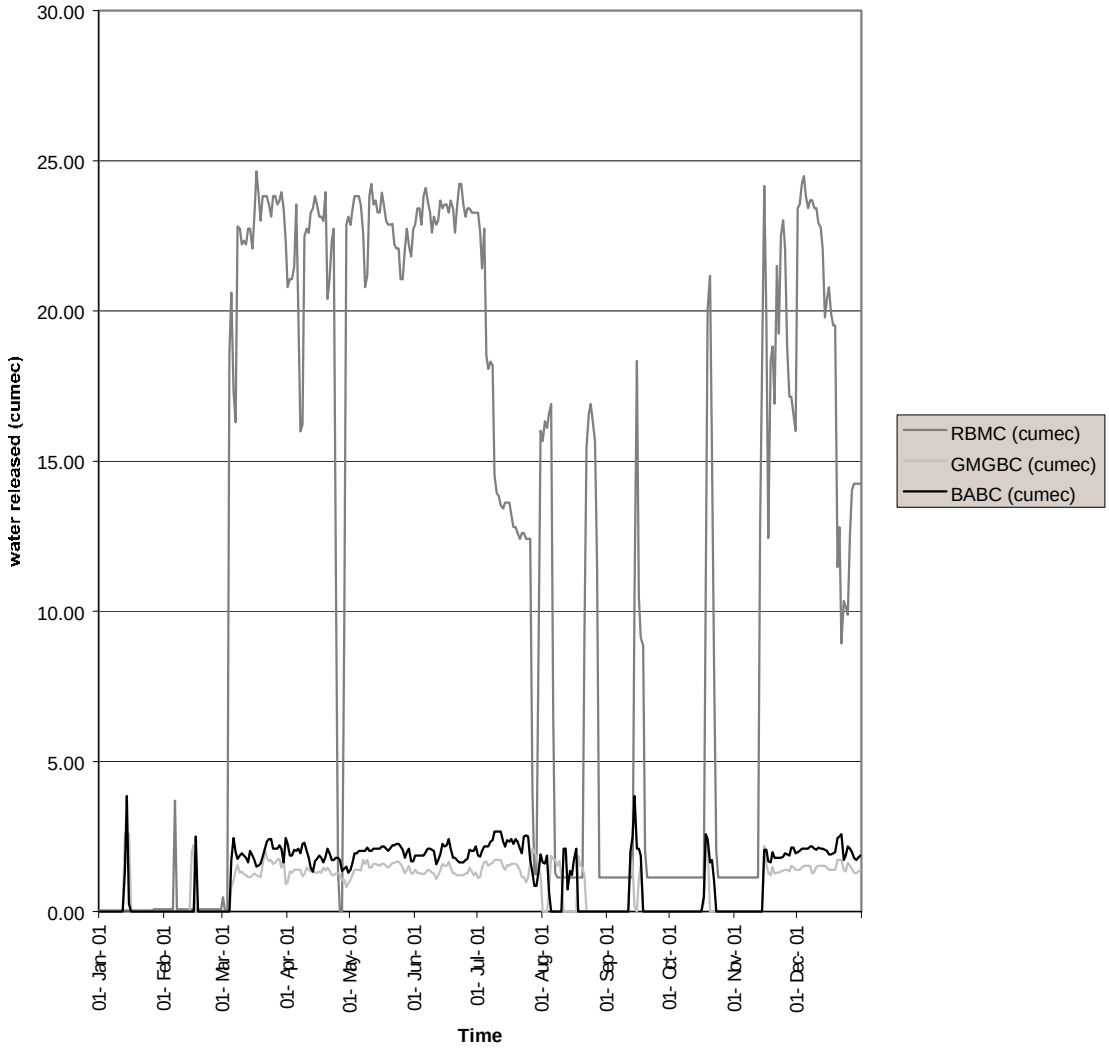
Figure 3 shows the relation between the water released in the Right bank main canal and two of the branch canals in Angunakolapelessa: the Gajamangama branch canal and Bata Ata branch canal in 2001. Because Maha season 2000-2001 was cancelled there were no big water releases in the beginning of the year. Water releases from the Uda Walawe reservoir in this period were minimal, water for the branch canals is probably provided by stored water in the Chandrikawewa reservoir. The rest of the year water releases for the branch canals are supported by water releases from the Uda Walawe reservoir.

For water from Chandrikawewa to reach Angunakolapelessa does not take long, requesting a few days in advance is enough to decide about the request and to transport the water. But if Chandrikawewa is empty and water has to come from Uda Walawe, it will take two weeks before the water reaches Angunakolapelessa.

The words cropping season and off-season may be a bit confusing. Water needs for rice are strictly seasonal, but bananas, which are nowadays promoted, need water during the whole year. As a result, irrigation has changed to more year round irrigation but still water supply is highly seasonal due to the high water needs for rice cultivation and out of habit. Although the cropping season for bananas is year round, the cropping season is still referred to as the cropping season for rice.

Most data on water released in all the canals is available for the cropping seasons for rice. For the off-season however, data availability is very limited. The off-season seems only of minor importance to the irrigation engineers. Water releases in the Right bank main canal and the branch canals are documented, but there are no details on water releases in distributary and field canals. Although water is released into the branch canals, it is not always sufficient to reach the tail end of the canal. According to the project office, the water losses on the Uda Walawe-Chandrikawewa and Chandrikawewa- Angunakolapelessa tracks are twenty-five percent due to seepage, evaporation, leaks and illegal tapping. This means that only half (sixty-five percent) of the amount of water released from the Uda Walawe reservoir reaches Angunakolapelessa. For the branch canals in Angunakolapelessa losses have been estimated at eight percent for Manamperigama branch canal, seven percent for Gajamangama branch canal and twelve percent for Bata Ata branch canal, for the distributary canals losses are six percent.

Figure 3: Water releases Right bank main canal and two branch canals 2001



In Uda Walawe only 42% of the soils are suitable for paddy cultivation (Piyathilake, M.D., 2001). On all other fields paddy cultivation causes huge water losses due to moderately or well-drained soils. Farmers in the region generally have a preference for rice and may grow this even on the less suitable, well drained soils. Using basin irrigation (flooding the fields), this leads to high water losses. The drainage water or return flow can sometimes be used for irrigation downstream but often the better drained soils are close to the river, so the percolation water is lost for irrigation. The Uda Walawe irrigation scheme is characterized by a relatively fast returnflow to the Uda Walawe river.

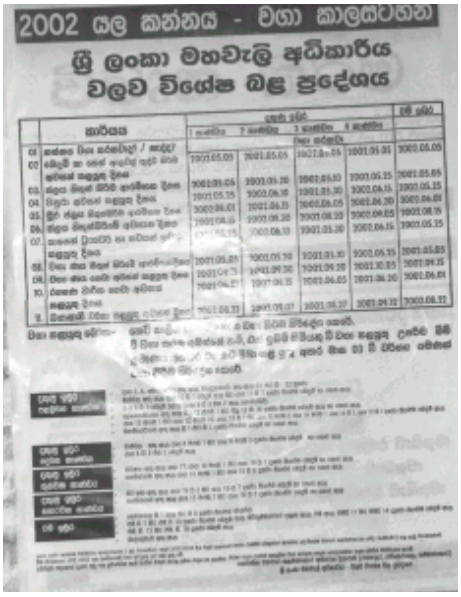
Within the Uda Walawe irrigation scheme there are big differences in water availability. In general, in the upstream areas there is more water available than in the downstream areas. The upstream areas are the first which are provided with water after interruptions and also water for downstream areas passes through these areas which means that at least in the Right bank main canal there is water available. Seepage water contributes to the water availability and besides that, water is stolen. This contributes to water availability upstream at the cost of water availability downstream. By the time the water arrives downstream the amount of water is not always

sufficient. Besides, it is easier to supply in the needs of the upstream areas because the time between the decision and actual water allocation is shorter and there are less uncertain circumstances. On a smaller scale the differences between head end and tail end also exist on branch canal, distributary canal and field canal level. In general crops cultivated are adapted to the situation. In the tail end there is usually no rice cultivation. Local circumstances may differ due to other water sources like water tanks, which recharge groundwater. In very dry areas in the Uda Walawe irrigation scheme the MASL has installed agro wells to provide irrigation water.

3.1.3 Irrigation scheduling

The irrigation water releases are concentrated in the cropping seasons. Before the beginning of the cropping season the MASL makes a schedule, based on the grown crops in last season and the available water. The block offices provide the necessary information to the project office, where the schedule is made. Before the beginning of the irrigation season, there is a meeting of the project office, the block offices, the farmer organizations and the farmers to inform everybody and provide the opportunity to ask questions. Besides a schedule for irrigation water releases, there is a schedule for canal cleaning, land preparation, sowing, harvesting, paying, etc (figure 4). The irrigation schedule is a rotation scheme of two weeks, in which water is provided to each field canal for one or more following days. During the first month of the irritation season, water is provided for land preparation. In this period there is continuously water available. The beginning of land preparation is scattered. This means that two weeks after the first fields were irrigated, the other fields start irrigation. As land preparation requires large amounts of water the staggered timing prevents excessive water demand at scheme level. It also facilitates access to land preparation machinery and labor. One month after the beginning of irrigation, irrigation becomes rotational. The irrigation scheme is adjusted every week according to the recent findings and rainfall.

Figure 4: Schedule for irrigation, canal cleaning, land preparation, sowing, harvesting and paying



The project office tries to save some water during the cropping season for irrigation once in 15 days during off-season and for emergencies. There is however no strict policy how much water to conserve. In case of water scarcity the project office will decide about the best strategy for each case separately. If, at the end of the season, the choice is between saving the crops by providing the last water or saving water, priority is given to the crops. The farmers agree on this policy, if there is no more water available, other water sources are used (section 3.2.2). In 2000/2001 there was no water released for crop cultivation in the Maha season because of lack of water stored in the reservoirs. During this period there were water releases for municipal water supply and domestic purposes. In Yala 2002 each farmer was only allowed to cultivate 0.4 hectare of land out of the hectare they own and the land preparation period was reduced to 15 days.

3.2 Other water uses

3.2.1 Involved institutions for other water uses

The Ministry of Urban Development Housing and Construction is responsible for water supply. The National Water supply and drainage board and Community Water Supply and Sanitation Project Unit are under the administrative set up of the ministry. The national water supply and drainage board is responsible for municipal water supply. The community water supply and drainage board is responsible for providing potable water and basic sanitation to the rural communities throughout the country (Statkraft Groner, 2000b). The water source depends on the local situation. In case of water scarcity the national government, local government, NGO's, media persons, private political persons, MASL and NWSDB might all be involved in ad hoc projects to provide water.

3.2.2 Water sources for non irrigation purposes

The government objective is to provide the entire nation with safe drinking water in 2010 (Statkraft Groner, 2000b). Safe drinking water is defined as: the water extracts from a safe water source; a protected dug well with a protected wall with a covered net and with a proper drainage basin, rope and bucket, a tube well or a treated pipe borne system.

In Uda Walawe about 30% of the population consumes water from unprotected sources (Statkraft Groner, 2000b). Water quality standards for potable water in Sri Lanka, used in water treatment plants are based on WHO standards. In NWSDB schemes, water quality monitoring systems and the treatment methods are at a satisfactory state (Statkraft Groner, 2000b).

The NWSDB extracts water from four places in the Uda Walawe irrigation scheme. This water is mainly for the towns and partly transported by tanker trucks, to the rural areas (figure 5). According to the MASL the water issues by the Uda Walawe reservoir for municipal water supply are 3000 m^3 per day for Uda Walawe (water from Right bank main canal, in future probably straight from reservoir), 1200 m^3 for Suriyawewa (Suriyawewa reservoir), 4000 m^3 for Embilipitiya (Chandrikawewa reservoir) and 2000m^3 for Eraminiyaya and Angunakolapelessa (Eraminiyaya reservoir). Unfortunately, exact data are not available because water supply for municipal use is not monitored on a regular basis. For example for the Eraminiyaya reservoir, which provides municipal water, nobody measures the actual inflow into the reservoir.

Figure 5: Tanker truck

The villagers of the two main towns in the Angunakolapelessa block, Angunakolapelessa and Eraminiyaya, have access to piped municipal water supply. This water is provided and treated by the NWSDB in Eraminiyaya. The source of their water is the Eraminiyaya reservoir. This reservoir is filled by rainfall and the irrigation scheme; there is an 0.3 meter diameter pipe from Gajamangama branch banal into the reservoir. If there is water in the canal, the reservoir is automatically recharged. The reservoir has a capacity of 90000 m^3.

The treated water is distributed to two water towers, from where it is distributed to the towns. The NWSDB only provides treated water from this site since May 2001. At the moment the project is

not running on full supply yet. The project aims at 1800m^3 water supply per day for 8000 people (1200 families) in a few years. In May 2002 566 families were connected and 600 m^3 was supplied per day, one third of the total capacity. In case of rainfall the consumed amount of water reduces to 400 m^3. Because the water supply is not on full capacity yet, the daily power cuts from 2001-2002 did not result in problems. There are however no arrangements to prevent water shortages in the future in case of power cuts.

Besides water for municipal water supply, some organizations get water with their own tanker trucks, for their own use or to provide rural areas with water from the water treatment plant. In March 2002 about 3% of the total produced amount of water in Eraminiyaya was supplied for private use by the local government, divisional secretary, navy camp, police and prison. About 4.5% was supplied for distribution to the rural areas. Only in case of water scarcity, water is transported to the rural areas by tanker trucks. Most structural are the water supplies by PLAN International, an Australian NGO and the local government at municipality and district level, who provide water to the rural areas by tanker trucks in case of water scarcity. In case of severe water scarcity water is also provided by other organizations. In 2002, water from Eraminiyaya was also provided to the Tangalle area by a special government program because of serious water shortages in this region.

In Suriyawewa, on the Uda Walawe left bank, the MASL does provide water to the rural areas by tanker trucks. Suriyawewa is a recently developed area by the MASL. As soon as the development of this area is established however, the water supply by the tanker trucks will be quitted and the rural people will have to get their own water.

There are different tariffs for water provided by NWSDB. Domestic water is cheapest. The tariff increases when more units are used. The first 1 to 10 m^3 used per month costs 1 SLR[1] per m^3. For water provided by tanker trucks the commercial tariff is charged, 35 RS per m^3. Some people, who have access to municipal water supply, still limit the use of this water as much as possible and use water from wells or canals instead because of the costs.

People in the rural areas, who have no access to piped water supply depend on natural streams, canals, reservoirs, shallow wells, tube wells and sometimes tanker trucks for their water. For drinking and cooking in general preference is given to the water from shallow wells, research on water quality confirms these valuations (Shortt, R.L., 2001). Many families own their own shallow wells, which they share with other people in the neighborhood. In some cases water from tube wells is preferred for drinking and cooking. More than 60% of the region has poor quality deep groundwater. Salinity, fluoride and iron are the main polluters. There is about one tube well in each village. In one case, the villagers did not consider water provided by the tanker trucks clean enough for drinking purposes. For washing and bathing purposes, the population uses water from the main canal, branch canals or tanks and sometimes water from wells. The canals are equipped with steps to access the water, to prevent damage to the canal bank and to enable easy access.

Except for tube wells and tanker trucks, which usually are indirectly also dependent on irrigation water, all the water sources are directly influenced by irrigation water supply. As long as there is irrigation, there is enough water available for domestic purposes. If there is no irrigation for a long period however, people face water shortages. Canals, reservoirs and also many shallow wells fall dry according to the local people. Very often shallow wells are situated along the irrigation canals. Most of these shallow wells get dry about two weeks after the last water releases in the

[1] One US dollar is 96.30 Sri Lanka Rupee (SLR) (June 2002)

canal. In some cases there is some water left for drinking and cooking, but not enough for all purposes. After about three days of irrigation the wells are fully recharged again.

If there is no irrigation, other sources of water have to be found. For drinking and cooking, tube wells are the most frequently used alternatives, although the quality and taste of tubewell water is often considered to be poor. In some areas the government warns for the poor quality of the water from the tube wells due to high fluoride concentrations, but without better alternatives, the water is also used for drinking and cooking. For washing and bathing purposes the remaining water in canals and tanks is used but washing and bathing is limited as much as possible. There is no structural water supply by tanker trucks, in case of water shortages ad hoc projects are sometimes initiated to provide water.

3.2.3 Water supply for non irrigation purposes

Water is released into the irrigation canals according to crop water requirements. But also other water uses are dependent on water released for irrigation. During the cropping seasons there is always irrigation water available for all purposes. During the off-season water is supplied for perennial crops once in 15 days. In case of water scarcity however, these water releases are usually the fist to be cancelled, which causes water problems.

The off-season is the most critical period for most water uses. Figure 6 till 8 show the water releases during the off-season in 2000, 2001 and the beginning of 2002 for Gajamangama branch canal and Bata Ata branch canal, combined with precipitation in Angunakolapelessa measured at the blockoffice by the irrigation officer. Be aware that the duration of the inter cropping seasons greatly differ; the period between two gridlines is one week. In the season prior to Yala season 2000 there was still enough storage in the Uda Walawe reservoir (figure 2). This is clearly visible in the irrigation water releases in this period (figure 6). The irrigation season seems to be extended and also starts early. There are only 4 weeks real off-season and also in the middle of this period there was one water release. There was no irrigation during the Maha season 2000-2001. The “off-season” prior to Yala season 2001 is therefore very long (figure 7). In the first 6 weeks there was no irrigation at all. Probably because in this period there was hardly any water available in the Uda Walawe reservoir. Besides, there was some rain in this period. After this period there were water releases once in three weeks except if there was much rainfall. After Yala 2002, in the period before Maha 2001-2002, storage in the Uda Walawe reservoir was minimal again, and water was roughly provided once in four weeks with some days with rain in between (figure 8).

Before 1986 water was released during the off-season approximately once in 10 or 15 days specifically for domestic purposes. During that time, there was more irrigation water available per hectare since the total irrigated area was much smaller which might explain the farmers complains about reduced water availability. In 1986, banana cultivation was introduced. Since this is a perennial crop, year-round water supply is necessary and releases are scheduled for the period between rice cultivation.

Figure 6: Water releases Angunakolapelessa pre Yala 2000

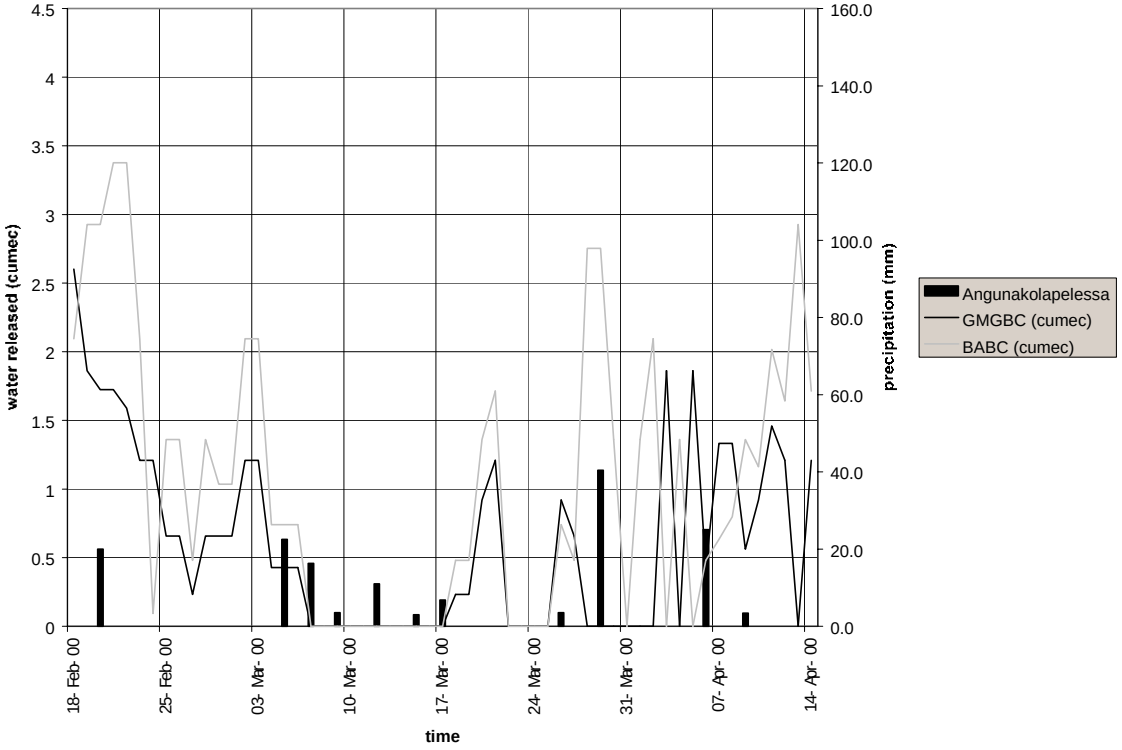


Figure 7: Water releases Angunakolapelessa pre Yala 2001

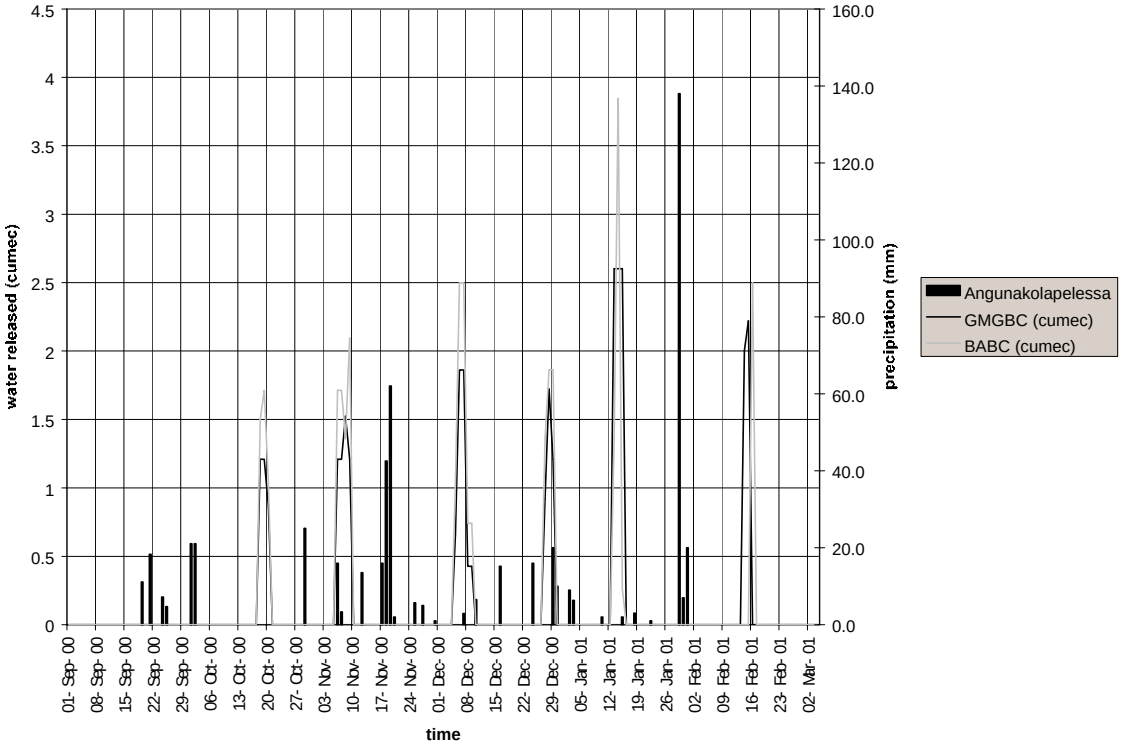
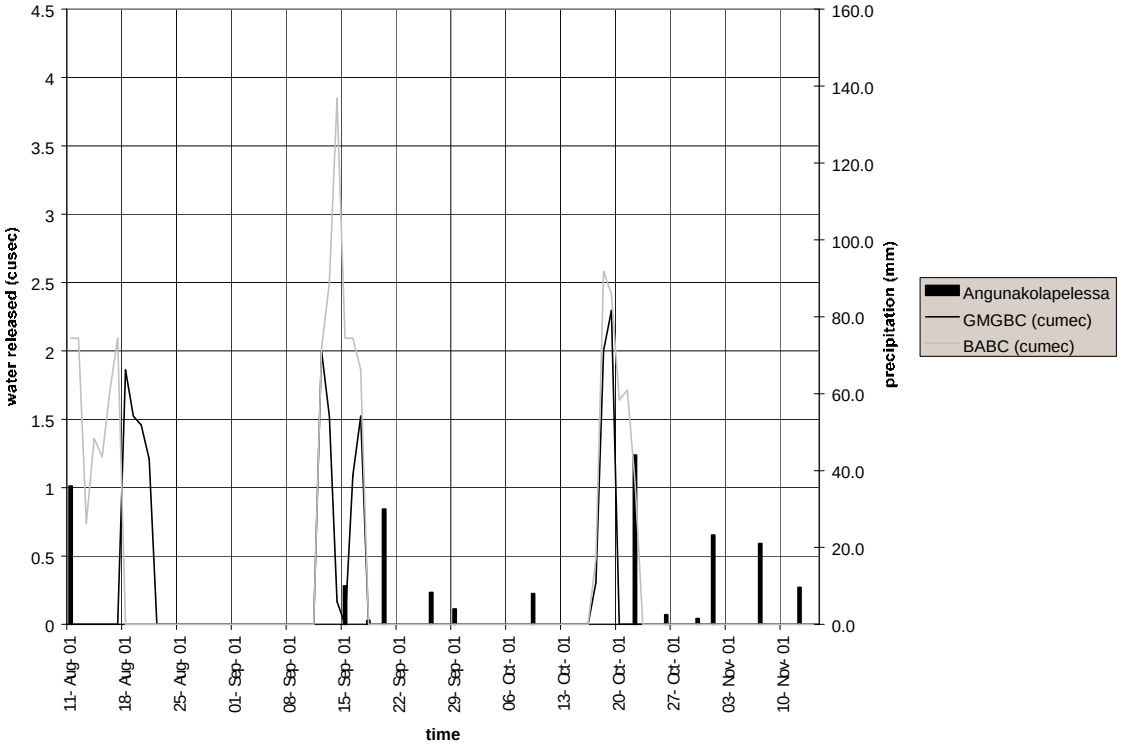


Figure 8: Water releases Angunakolapelessa pre Maha 2001-2002



The MASL does not only release water for irrigation. This is shown in table 1, which summarizes water issues for industrial and domestic purposes from the Uda Walawe reservoir. Although the data are from 1991 and most figures have probably changed over time, the table is still widely used. Almost 30 million m^3 (MCM) is released into the Right bank main canal on an annual basis for domestic and industrial purposes. This is six percent of the total amount of water released into the Right bank main canal. The national paper corporation has priority in water supply. The sugar factory and the rice mill have a seasonal character, so during off-season there will be no special water releases for these purposes. The water consumption of the research agriculture training center is on a yearly average basis 2000 m^3 a day, water needs are however seasonal.

In 1991, a total quantity of 6.48 MCM, being 1,5% of the total water releases into the Right bank main canal, was destined at domestic purposes. This consists of 1% for municipal water supply and 0.5% for domestic supply for farmers. Since then, water releases for municipal water supply for the different towns have slightly changed. In the current policy of the MASL there is no evidence of domestic supply for farmers probably because of the very regular year-round supply for bananas.

The water for industrial and domestic purposes is released together with water for irrigation. If there is no water available for irrigation, there is also no water for other purposes. The Eraminiyaya reservoir is partly recharged by rain and runoff and partly by irrigation water. Since the start of its operation in 2001 there has been sufficient water for municipal water supply.

In April 2002, there was a special water gift in Uda Walawe for Sinhala and Tamil New Year. In other years, land preparation had already started by that time and no extra water was released.

This special water gift in 2002 was very special because the water released was not for irrigation but for religious and domestic purposes. The water gift was also bigger than usual for bananas and other crops during the off-season under the same circumstances of drought. And instead of 4 days water was released in the Right bank main canal during 6 days. In minor canals water turns were rotated. The special water releases for New Year 2002 were recorded at Uda Walawe system level, but not at Angunakolapelessa although there was water released. Farmers at the head end of Angunakolapelessa received water for approximately two days, at the tail end there was no water available at all.

Table 1: Water issues for industrial and domestic purposes by Uda Walawe reservoir

	User	Right Bank m^3/day	Left Bank m^3/day	Total m^3/day
A	Industry purpose			
	1 National paper corporation	13,543		13,543
	2 Sugar research station	2,450		2,450
	3 Brick and tile factory	54		54
	4 Rice mill (Kachchigala)	82		82
	5 Rice mill (Morakatiya)	90		90
	6 Inland fishery	1,225		1,225
	7 A'pelessa (NYSC, Research agri. Training center)	25,000		25,000
	8 C'wewa (Army camp, coconut nursery)	11,250		11,250
	9 Sevanagala sugar factory		148,565	148,565
	10 Other department	5,000		5,000
	Sub-total (A)	58,694	148,565	207,259
	Monthly (MCM)	1.76	4.46	6.22
	Discharge (m^3/s)	0.68	1.72	2.40
B	Domestic purpose			
	1 Embilipitiya town	4,000		4,000
	2 A'pelessa town	2,000		2,000
	3 Uda Walawe town	2,500		2,500
	4 Suriyawewa town		2,000	2,000
	5 Domestic supply for farmers (total 14,000 farmers)	9,500	3,175	12,675
	Sub-total (B)	18,000	5,175	23,175
	Monthly (MCM)	0.54	0.16	0.70
	Discharge (m^3/s)	0.21	0.06	0.27
C	Total (A+B)	76,694	153,740	230,434
	Monthly (MCM)	2.30	4.61	6.91
	Discharge (m^3/s)	0.89	1.78	2.67

Source: O&M Division of Walawe special area, MEA- MASL, 1991 (Japan International Cooperation Agency, 1993)

4 Discussion

The policy of the MASL for water allocation to different sectors is not very clear. According to the SAPI report 2000 (Sapi team for Japanese Bank for International Coorporation (JBIC), 2000), water supply for municipal and industrial purposes have priority. So do other close sources to the MASL. In daily operation of the MASL this is not observed. This confusion is probably stimulated by the frequent changes of staff positions within the MASL. After two years most staff is circulated. This results in losses of knowledge. Also national elections cause many changes within institutions.

The MASL has traditionally been primarily responsible for irrigation water supply, which is their major task. Besides irrigation, water is released for other purposes. Some of these other water uses are closely interwoven with irrigation water supply. Water released for irrigation recharges shallow wells and is used for washing and bathing. These uses hardly affect irrigation but are of vital importance to the people in rural areas. So far these relations are mostly ignored or unrecognized. Some non-irrigation purposes however are taken into account by the MASL although there are no clear guidelines for water allocation for these purposes. Clearly there is no basin water management yet. If the MASL becomes a basin water manager in the future, for a proper management, policy should be changed.

With the introduction of irrigation for perennial crops, there is year round irrigation. This has positive effects on water availability for non-irrigation purposes. Since the water supply for non-irrigation purposes seems not to be considered as separate issue since the introduction of perennial crops, the specific water needs in time and space for non-irrigation purposes may be overlooked. This could cause failures in industrial or domestic water supply. Furthermore, if the present assumptions about water availibility for irrigation purposes are not correct, this can result in water shortages for irrigation, especially downstream, or unnecessarily water losses. Although water is officially released for perennial crops during off-season once in 15 days, in case of water scarcity these water releases are usually the first to be cancelled. The Maha and Yala cropping seasons get priority. To make year round irrigation possible water supply during the cropping seasons has to change, some water has to be saved. This is an important task for the MASL; less water should be released during the cropping seasons and the farmers have to adopt their water needs to the new situation.

Many farmers complain about reduced water availability since the Samanalawewa power generation is in use. This argument is however not clear because the water used for hydropower generation eventually all flows into the Uda Walawe reservoir.

Sinhala and Tamil New Year appears to be the only event for which water was issued specific for domestic and religious purposes. No separate water gift is issued at the monthly full moon poya days, important Buddhist religious celebrations. However, extra water is sometimes released from Chandrikawewa, on special request. This does not seem to happen frequently, but there are no clear criteria or records of these events.

About 6% of the water released from the Uda Walawe reservoir is for non-irrigation purposes, this amount of water for non-irrigation purposes is also mentioned by the SAPI study 2000 (Sapi team for Japanese Bank for International Coorporation (JBIC), 2000). No adaptations to the irrigation schedule are made to provide water for non-irrigation purposes; the irrigation schedule is based on crop water needs, maintenance has priority above water supply for non-irrigation purposes and management takes primarily irrigation water needs into account, also in case of

water scarcity. Compared to 94% water releases for irrigation purposes, the effect of 6% water releases for non-irrigation purposes on irrigation is negligible. Besides, the extra value of this water has to be considered. About 1% of the water released provides water for municipal water supply, which is indispensable for the population in the towns. The released water provides the people in the rural areas with bathing and washing water and recharges their wells, which provide them with drinking water. Although these uses are very important for the people in the rural areas, these water uses do not reduce water availability for irrigation.

In Angunakolapelessa there has so far always been enough water for municipal water supply. The plant does however not work on full supply yet and there are no arrangements with the MASL to provide water in case of water scarcity. There are also no arrangements to cope with power cuts. Water shortages or power cuts seem to be dangers for municipal water supply.

This report mainly concentrates on Angunakolapelessa. It is expected that in other blocks of the Uda Walawe irrigation scheme, the situation will be quite similar, as the main constraints for all blocks are water supply from the main system.

5 Conclusions and recommendations

5.1 Conclusions

The research question to be answered in this research is:
What are the linkages between water releases for irrigation and releases for other purposes in the Uda Walawe irrigation scheme?

Many studies have been, and still are, conducted in relation to water supply for irrigation and for non-irrigation purposes. The link between these two however, is less studied while there are many interactions. Under the Water, Health and Environment theme of the International Water Management Institute, this is an important research priority and studies have been carried out on the multiple use of water in Pakistan, Morocco and Sri Lanka (Hoek, W. Van der et al., 2002 and E. Boelee, W. Van der Hoek, 2002).

First, if the need for water for non-irrigation purposes is taken into account in the scheduling of releases of water for irrigation, this is likely to have a positive effect on the availability of water for non-irrigation purposes. This will be even more the case in those areas where water released for irrigation is the main water source for non-irrigation purposes.

However, if the needs for other purposes are taken into account, this will probably affect the availability of water for irrigation. The main effect will be reduced water availability for irrigation purposes, especially in periods of drought, due to a needed storage capacity to ensure water for other purposes than irrigation. If there is enough water available, water releases for non irrigation purposes according to their needs is easy to combine with year round irrigation for crops like bananas. This corresponds to the policy in the Uda Walawe irrigation scheme, promoting year round crops.

Secondly, for a successful combination of water supply for irrigation purposes and for other purposes support of management is necessary, to coordinate activities, maintain policy and set priorities. Nowadays in general irrigation has priority and if there is enough water available there is also water released for other purposes, but a clear policy is lacking, especially concerning water supply for industrial purposes. If the MASL becomes a basin manager in the Uda Walawe irrigation scheme in the future, a clear policy is needed and should be adhered to.

The decision making related to water releases is a complex process and, because of uncertainty about availability of water, flexible management is required. Clear priority setting in water supply would make decision making more straightforward. Such priority-setting is, at this moment, still lacking.

5.2 Recommendations for future research

Water theft causes many problems in the irrigation system, the exact situation is however not known. Therefore, more research is necessary to map the situation concerning illegal tapping of water and the consequences of such illegal tapping for the overall availability of water.

Special water releases for non-irrigation purposes are uncommon, but even so, water released for irrigation is still used for non-irrigation purposes; for washing and bathing and to recharge wells. It would be interesting assess how much water has to be supplied to fulfill these purposes properly. This can also contribute to future irrigation related research, for example on drip

irrigation. In decision making, not only irrigation should be taken into account, but also these other water uses.

As indicated in table 1, the industry is a relatively large consumer of irrigation water released for non-irrigation purposes. Unfortunately, this information is somewhat dated, detailed information concerning these water releases has not been collected recently. Information about exact procedures and amounts of water released throughout the year for industrial purposes will increase insight in water allocation procedures. The situation is slightly different for the left bank, because a larger amount of water is allocated for industry while the total discharge into the left bank main canal is smaller. This will probably affect irrigation more than in the right bank. More research is needed to value these effects. It would also be interesting to compare the water allocation for other uses than irrigation in Uda Walawe with another area.

Nowadays the MASL in the Uda Walawe irrigation scheme is primarily responsible for irrigation, in the future they will become basin manager. It will be a challenge for this organization to deal with this responsibility and especially how to set priorities based on the interests of different water users. They will also be confronted with the government aim to provide the whole nation with safe drinking water in 2010. This will require extensive investigation in local water supply and the best suitable water source. All involved institutions should cooperate if one wants to optimize water allocation. At present this is not the case, the exact responsibilities, activities and interactions are not very clear. Insight in the present practices can serve as a starting point to improve collaboration between the different involved institutions.

Clear priorities in water supply make allocation decisions more straightforward. Therefore it is necessary to value the different water uses and also to take into account the different opinions about priorities.

If water supply for other purposes than irrigation is given higher priority, there has to be made a decision about the means of water supply. This also depends on the purposes for which priority is given. If water for domestic supply, in case of drought, is provided by the irrigation canals water theft is inevitable and there are huge losses due to seepage, evaporation and leaks. An alternative is water supply by tanker trucks. More research is necessary to decide about the optimal means, also considering the availability of materials.

Finally, this report only deals with the Uda Walawe irrigation scheme, activities within this scheme however have also effects outside the scheme. Especially the downstream areas are directly dependent on the Uda Walawe irrigation scheme for their water supply. These relations should also be taken in consideration.

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Appendices

Appendix 1: Abbreviations and definitions

BABC:	Bata Ata branch canal
BC:	Branch canal: secondary canal which distributes mostly water to DC
CEB:	Central Electricity Board
Cropping season:	Period in which irrigation water is provided for paddy cultivation (about 4 months)
Cumec:	m^3/sec
DC:	Distributary canal: branch from BC, distributes water to FC
FC:	Field Canal: distributes water to fields
Ganga:	Singalese for a large and perennial river
GMGBC:	Gajamangama branch canal
Maha:	cultivation season, about October to February
MASL:	Mahaweli Authority of Sri Lanka
MC:	Main Canal: main distribution canal from the Uda Walawe reservoir
MCM:	million cubic metres (1 000 000 m^3)
NGO:	Non Governmental Organization
Off-season:	periods between cropping seasons
Project office:	MASL office in Embilipitiya
Uda:	Singalese for upper
Water board:	National water supply and drainage board
Wewa:	Singalese for a water tank
WMP:	Water Management Panel
WMS:	Water Management Secretariat
Yala:	cultivation season, about April to August