THE TRUTH BEHIND WATER SHORTAGE AT LUNUGAMVEHERA

by
G.T. Dharmasena

Lunugamvehera Wewa is a reservoir constructed across Kirindi Oya below Thanamalvila to command 4000 Ha.(10,000 Acs.) of existing lands under old Ellagala anicut system and 8000 ha. (20,000 Acs.) of new lands. The reservoir was completed in 1986 with the financial assistance of Asian Development Bank at a cost of Rs. 2800 million. At present most of the work is completed except some down stream development works. Water was issued for cultivation for the first time in 1986, Yala Season. The design and construction of the reservoir head works were done by the Irrigation Department. All design and construction works were closely supervised by various foreign consultants appointed by Asian Development Bank, I.F.F.A.D. and K.F.W., the donor agencies at difference stages.

After observing the performance of the reservoir from 1986, even before the completion of full down stream development of 20,000 Acs. of new lands, there is agitation for more water for Lunugamvehera reservoir. This alleged water shortage at Lunugamvehera has gone up to the highest level of administration in the country. As a result of this, some are proposing "remedial" measures such as diversion of Uma Oya and Menik Ganga from adjoining basins to Kirindi Oya. This implies that we have already accepted the position of water shortage at Lunugamvehera. Then the obvious question is, who is responsible for this type of unwise planning? As this reservoir project was closely supervised by foreign experts from A.D.B., since its inception, are they not responsible for advising the Irrigation Department and the Government of Sri Lanka in creating this situation? Therefore it is timely to give an account of the situation in a true perspective to enhance the knowledge of experts who presently advice the Irrigation Department & Ministry of Mahaweli on this subject as they have little realisation and insight to the water shortage of Lunugamvehera Reservoir.

Estimation of availability of water to Lunugamvehera from its catchment

The reservoir has a catchment area of 914 sq.kms. (357 sq.miles) and the river originates from Ella and Koslanda mountain range in Bandarawela region. Hydrological data such as river flow of Kirindi Oya at the dam site for man years were available at the design stage. River flows were measured since 1944 and rainfall data were available even for a longer period than this. Based on these data, Irrigation Department estimated the average annual yield as 346 M.C.M. (280,000 ac.ft.) in 1977. From this quantity, only 205 M.C.M. (160,000 ac.ft) at 80% probability was recommended for impounding at Lunugamvehera, leaving 72,000 ac.ft. for consumption and 4000 ac.ft. for Ellagala existing system[1]. At this stage the proposal was to provide water for about 15,000 Acs. of new lands and 10,000 Acs of existing lands making a total of only 25,000 Acs. However, the A.D.B. consultants who came to study the proposal during the same year in 1977, estimated a safe annual yield of 393 M.C.M. (318,000 ac.ft), against 166,000 ac.ft. recommended by the Irrigation Department[2]. Basis of this over estimation is not exactly clear. At this point of time dam design had been finalised according to the original yield estimate of the department. It would have been possible to reduce the dam height as a result of this extra water found by the consultants, but instead of that they recommended to take up more lands with higher regulation capacity of the reservoir without reducing the dam height. Therefore total command area of 25,000 Acs was increased to 30,000 Acs. by adding 5000 Acs of new lands. Based on this, design was finalised and construction began in 1980.

The writer was asked to present a paper for a seminar to mark the completion of Kirindi Oya reservoir Head works, which was organised by the Irrigation Department in 1986. The paper was on the aspect of availability of water resources at Lunugamvehera, which was prepared for the Hydrological annual in 1984. In this paper the writer concluded that safe annual yield available at Lunugamvehera was only 240 M.C.M. (194,500 Ac.ft.), at 75% probability, and annual average yield was only 346 M.C.M. (280,000 ac.ft), which is 15% less than the A.D.B.

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estimate[3]. In this analysis 72,000 ac.ft. reserved by the department in 1977 estimate for consumption was disregarded. One important point in this regard in my estimate depends on the historical data available and not on any recent research done by me. Therefore this does not guarantee the accuracy or the reliability of the data. Subsequently A.D.B. figure was revised by their consultants (WAPCOS) in their review report in 1985, as 240 M.C.M. (180, 200 Ac.ft.), probably after seeing my report. By this time, the dam construction was almost completed and reservoir was ready to impound water. Then the question of over estimation of the catchment yield by 15% by the consultant has to be answered. It is also understood now that 60% of over estimation of water for Lunugamvehera has been reported by IMMI. However, no comments can be made on this as this report has not been made available to me.

The main reason for this over estimation was due to the inadequacy of data processing done by the consultants. The river flow data available in the Irrigation Department are the observed raw data from the field, and such data has to be properly processed before using for any detail design. In addition it is very necessary to carry out accurate flow measurements during the design stage to check the accuracy of historical data base and to make necessary adjustments. Consultants not realising this vital aspect of primary and secondary data processing went ahead, wrongly concluding this safe yield. Therefore what you can see in the field is probably an over-sized reservoir, which cannot be expected to fill up during a year with normal weather conditions. It should be noted that the capacity of the reservoir is 183,795 Ac.ft. (245 M.C.M.) which is almost the annual yield. This is one of the reasons to suspect a water shortage at Kirindi Oya by naked eye.

Regarding the estimation of yield of Lunugamvehera at different stages, it has to be mentioned that no one has satisfactorily solved this aspect so far including myself. The yield could be satisfactorily estimated by developing a mathematical model using recently measured data. Such a model will represent the characteristics of the catchment as now and will be free from any inconsistencies such as land use changes. Then stream flow data could be generated using historical rainfalls, instead of using measured historical flows for estimation of yield. It is my earnest desire to complete this task soon by using the best techniques available.

Variability of Rainfall :

Performance of a reservoir for a short period such as five years, is not sufficient to conclude a water shortage, because of variability of annual rainfall pattern. Variability of rainfall in Lunugamvehera reservoir catchment was studied by the writer and the Annex I, depicts this phenomena with a downward trend[4]. When one looks at the variability of rainfall since 1928, wet phases and dry phases during the last 60 years are evident. These dry and wet phases have cycles, ranging from 10 to 20 years. Even though a 60 year period shows a downward trend, it should not be misunderstood that rainfall in future is going to decline. It only shows what had happened during the past. It is obvious that we have gone through a dry phase of nearly 15 years, since 1975 but the important thing to remember is, wet phase of the cycle is yet to be seen. Therefore, it is not correct to come to a conclusion of water shortage of a project, which is designed by considering a longer period of records. Moreover the project is designed to have a useful life period of more than 100 years. Therefore while sitting in a dry phase, one cannot expect a reservoir to fill up. Conversely, it is unwise to talk of surplus water in a project, while sitting in a wet phase.

My point of view in this regard is to highlight that a time will come for those who are with narrow outlook to agitate even the raising of the Lunugamvehera dam to conserve more water during a wet phase. By that time experience during the dry phase is forgotten. A good example for this situation is Padaviya tank. A scheme where successful cultivation was done with tank full water for many years suffers a severe water shortage during last few years. Therefore diversion of Uma Oya and Menik Ganga has to be planned in the light of above after studying the climatic variability and overall planning objectives of the region. Certainly transbasin diversions have to be planned instead of looking at individual river basins. On the other hand water shortage at Lunugamvehera has to be first justified before undertaking any augmentations.

Water Management and Crop Development :

It should be noted that of the 20,000 Acs. of new lands under Lunugamvehera, two third of the area was proposed at the inception for cotton and certainly not for paddy[1]. This is because of well drained soil type in the project area, which is better suited for other crops like onions, chillies, grams etc. It is not correct to say that paddy cannot be grown in these well drained soils, but it requires two to three times the amount of water for other field crops. It can be seen from the water use in new lands during last three Maha seasons that sluice duties were 7.9 ft., 9.4 ft. and 10.4 ft.[5]. This is in contrast to the normal duty of 4.0 Ac.ft. in normal soils. Therefore it is not realistic and reasonable to raise the issue of shortage of water, while cultivating paddy in these areas. However, after realising the aspirations of Sri Lankan farmers to cultivate rice, the

A.D.B. recommended cultivation of "Up land paddy" in those well drained soils in subsequent reviews. However, technique of growing "Up land paddy" was not known to the expert who suggested this and never practiced anywhere near. Therefore "Up land paddy" was clearly an eye wash and an attempt to avoid the problem without facing it. Therefore, the important thing is to realise that, it was and it should not be the intention to grow 20,000 Acs. of paddy in new lands of Lunugamvehera. Even if additional water supply is brought from Uma Oya and Menik Ganga, an attempt to grow paddy in well drained soil with excessive water will raise the water table in the command area and it would create a problem such as salinity. This can be seen, if one goes to the area presently cultivated with paddy. Therefore, such irreversible situation should be avoided at all cost. If this trend is continued paddy cultivation will not be possible after several years due to problem of salinity and water logging, even if ample water is made available.

In order to implement an other field crops (O.F.C.) programme at Lunugamvehera, entire 20,000 Acs. of new lands have to be reblocked out according to soil type, while maintaining the same lay out of channel system. This will ensure a lot of paddy and lot of land for subsidiary crops for individuals at different locations. However, as a short term measure for farmers to be familiar with O.F.C., Bethma cultivation might be the only solution to commence O.F.C. in well drained soils and this programme should commence in Yala Season to start with.

Shortage of water at Badagiriya

From the time of construction of Badagiriya Tank, this scheme was considered as one of the schemes with severe shortages of water in certain years. First it was planned to drop the Left Bank channel of Udawalawe to augment the water supply. This has not materialsed as Walawe right bank was given priority probably due to "Chandrika" wewa. However, during the last 10 years, a minor tank restoration programme under NOARD Aid was undertaken in Hambantota district and about 20 minor tanks were restored in Badagiriya catchment, thus creating another "Mahakandarawa". This unplanned restoration in the catchment area prevented the in flow to Badagiriya Tank and worsened the shortage of water. Thereafter, right bank channel of Lunugamvehera was proposed and it was implemented and water was issued for the first time during last year.

Proposal to Divert Uma Oya and Menik Ganga to Kirindi Oya Basin :

Diversion of Uma Oya to Kirindi Oya, certainly might be a thinking in right direction, if Mahaweli Master Plan permits such changes. According to Mahaweli Master Plan, Uma Oya water is yet to be harnessed at Talawakanda reservoir, for generation of power. However, if this can be implemented this should not be treated as a proposal to augment Lunugamvehera, but diversion of water to left bank of Kirindi Oya to irrigate lands in Monaragala district. This plan fits into the overall development plan of South Eastern Dry Zone[6]. See the Annex 2.

However, the proposal to divert Menik Ganga does not deserve any merit and it is a clear example of gross violation of basic principles in water resources planning. Monaragala district, which was known as "Wellassa", sometime back was the granary of the East. This district is very much under-developed, but very rich in soil fertility, in comparison to Hambantota district. Deficiency of water in Menik Ganga, Kumbukkan Oya and Heda Oya increases as we go towards the East. Moreover no sensible planner will recommend water diversion from a dryer zone to a dry zone. The logical thing should be the diversion of water from wet zone to dry zone and this is clearly depicted in Southern Area Development Plan.

Regarding the development of water resources in Western part of the country, there are numerous allegations. Some of those are arising from implemented Gin Ganga, Nilwala Ganga Flood Protection Schemes. One of the allegations is releasing of water back to the sea, without making its fullest contribution for hydro-power and irrigation benefits. Similarly the location for Uda walawe and Lunugamvehera reservoir sites are being criticized. However, this type of controversial planning will give the opportunity of learning from past mistakes for future students in planning. In the light of above, this writer wishes to keep the following views on record for consideration by the planners.

1. It is premature to make conclusive remarks regarding the shortage of water at Lunugamvehera reservoir or estimated annual safe yield. Understanding of rainfall variability during the last 60 years will be useful. It is risky to estimate the safe yield from historical data base at this stage and a few years of accurate data will be required for such exercise.

2. Water shortage in the distribution system should be reviewed by considering the design objectives as against the practice of cultivation of paddy in well drained soils.

3. Action should be taken to commence other field crops (O.F.C.) during Yala with Bethma cultivation system in well drained soils in the new lands to start with. Action should be taken to reblock out lands according to soil type as a permanent solution without disturbing the channel system.

4. Diversion of Uma Oya to Kirindi Oya should be considered as a rational solution to develop Monaragala district, but not as a solution to Lunugamvehera water shortage.

5. Proposal for diversion of Menik Ganga should be abandoned as it does not fit into the overall planning of water resources in the South Eastern dry zone. Proposals of this nature will further erode the scope of the projected South Eastern area development by the diversion of Kalu Ganga, Gin Ganga and Nilwala Ganga. In this context, I would urge that augmenting supplies through non traditional engineering solutions should no longer be the sole dimension of water resources planning.

References

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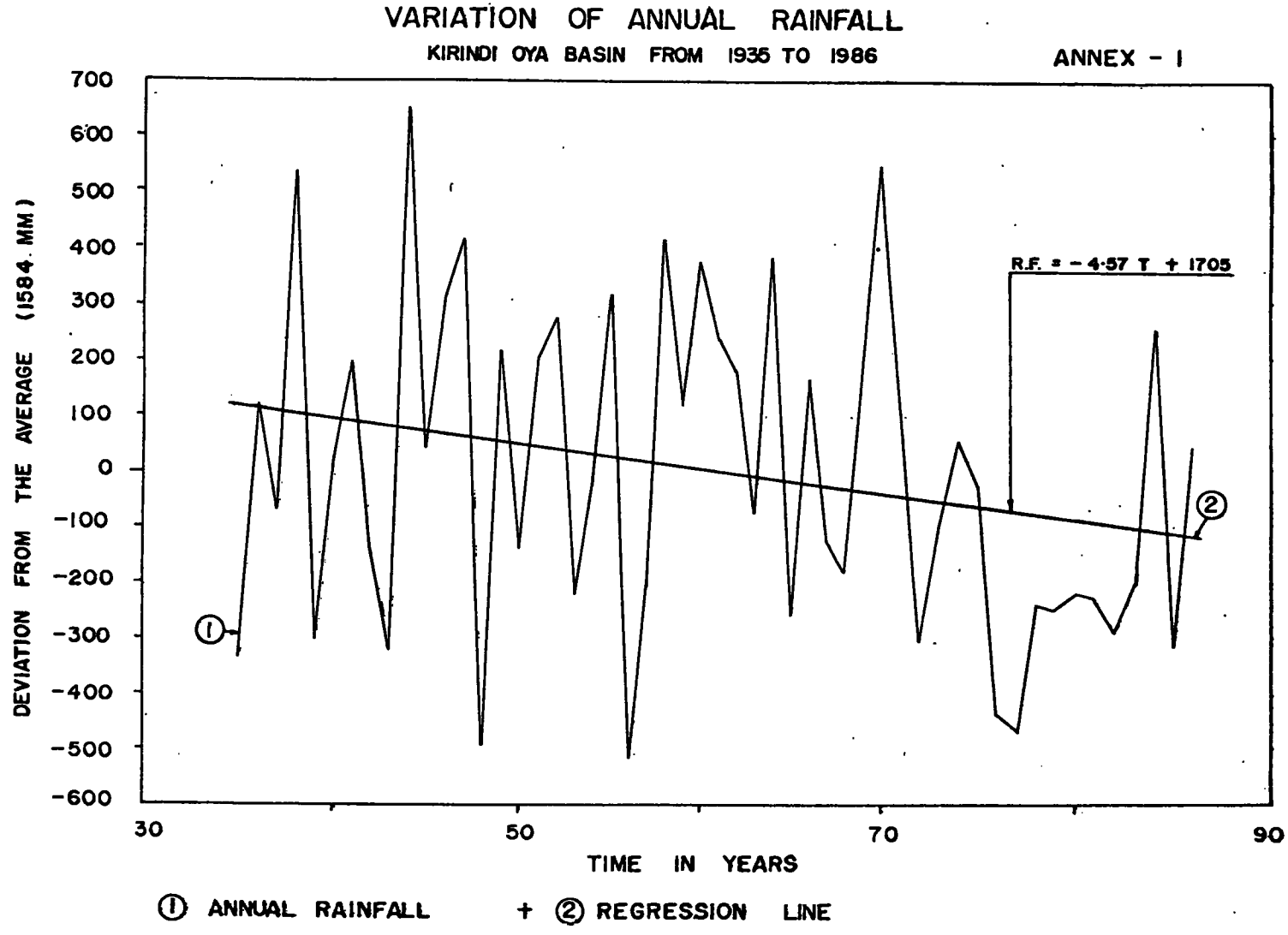
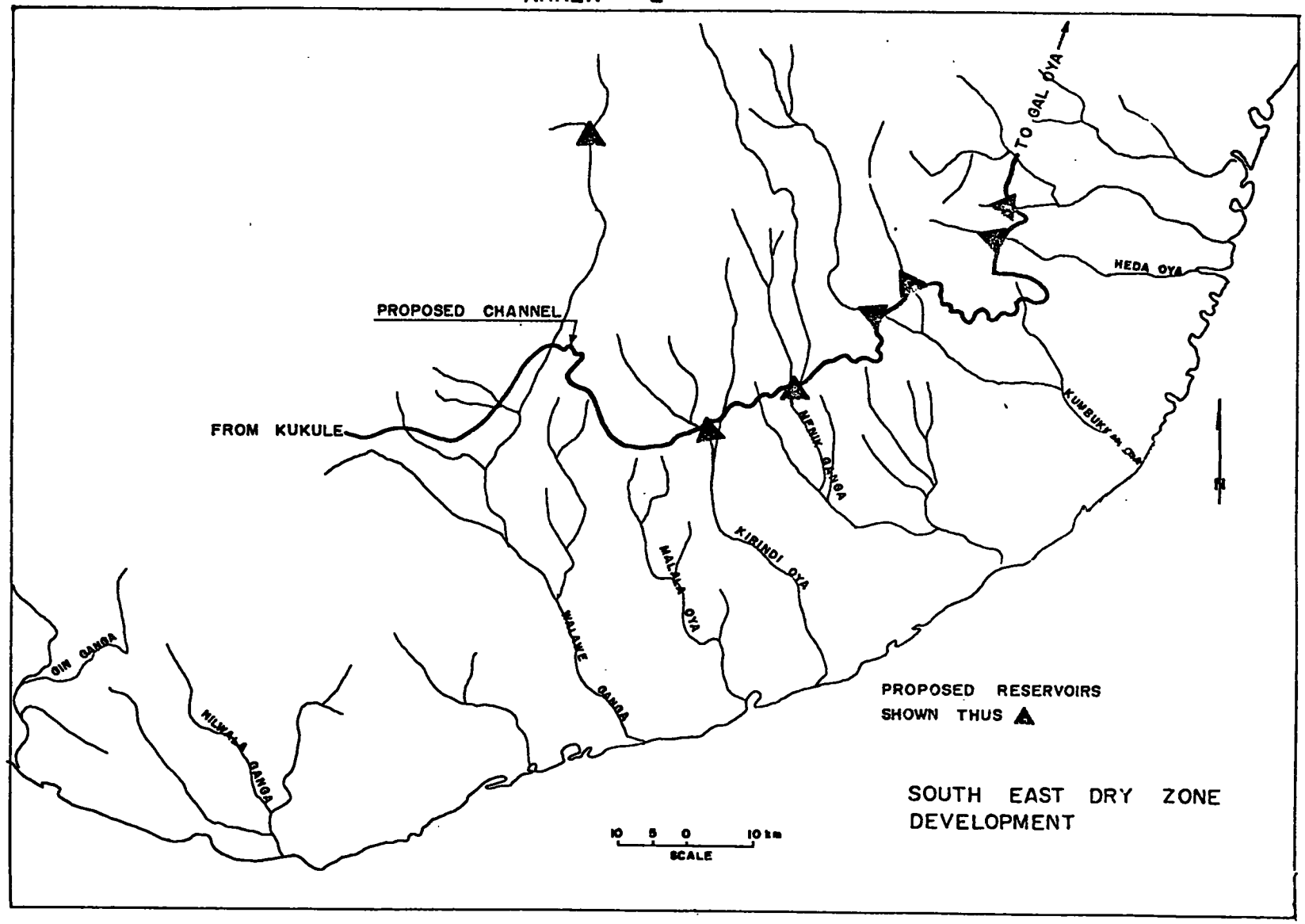

VARIATION OF ANNUAL RAINFALL
KIRINDI OYA BASIN FROM 1935 TO 1986
ANNEX - I
DEVIATION FROM THE AVERAGE (1584. MM.)
700
600
500
400
300
200
100
0
-100
-200
-300
-400
-500
-600
30
50
70
90
TIME IN YEARS
R.F. = - 4·57 T + 1705
①
②
① ANNUAL RAINFALL + ② REGRESSION LINE

ANNEX - 2


TO GAL OYA
HEDA OYA
PROPOSED CHANNEL
FROM KUKULE
KUMBUKKAN OYA
KIRINDI OYA
MALALA OYA
MALAWE GANGA
OIN GANGA
WILWALA GANGA
PROPOSED RESERVOIRS
SHOWN THUS
10 5 0 10 km
SCALE
SOUTH EAST DRY ZONE
DEVELOPMENT