Plan Bleu/MEDITEP Regional Workshop

"Water, Energy and Climate Change in the Mediterranean"
Carthage, 17 December 2007

Energy for Irrigation Water in Egypt

Mohamed Nour El Din (Ain Shams University, Cairo)

Egypt; as a semi-arid country, is facing great challenges in managing its water resources to meet the progressive demand of irrigation water for food production. The Nile is the main source of water for Egypt which supplies the country with an annual amount of 55.5 km^3 of water, from which 85% is used for irrigation. Other sources of irrigation water also include about 1.5 km^3 of groundwater. Besides, the re-use of agricultural drainage water contributes by an amount of about 7 km^3 of water.

Under the current escalating energy costs, there is a need to estimate and conserve the energy required for irrigation in order to secure sustainability for the irrigation sector. The energy required for irrigation in Egypt can be estimated by knowledge of the pumped volumes of water and the corresponding lift. There is significant energy being used to lift water for irrigation in both the old lands; of the Nile Valley and delta, and those new reclaimed lands in the deserts and fringes of the Nile valley and delta. In addition to that, the energy needed for pumping drainage water for disposal or re-use. Finally, which can be relevant to the irrigation sector, is the energy used for recycling water from drains or canals for fish farms (fisheries).

The irrigation system in the old lands of Egypt is unique in such a way that water levels in the canals are lower than field levels by an average of about 1.5 to 2.0 meters. This was meant in the past in order to assure better control on water distribution. Lifting water depended on animal driven equipment (saqias) which are replaced during the last 20 years; almost completely now, by diesel driven pumps. This means that huge amounts of water for irrigation in the old lands of the Nile Valley and Delta being lift for a relatively small head using small diesel pumps. Most of these pumps have low efficiency and owned by individual farmers. The irrigation improvement projects are collecting these individual pumps by one pump station at the heads of some small canals. These improvements aim at raising water use efficiency and are also leading to some energy savings as well. Higher energy savings may be obtained if these pumps can be electrified. In fact, the issue of energy used by these small diesel pumps had not been monitored or evaluated in spite of its high consumption rates, and there is no accurate documentation (if available) to account for the energy consumed by these pumps.

On the other hand, irrigation of the reclaimed lands uses pressurized pipe systems and depends mainly on groundwater. Groundwater is pumped from deep and/or shallow aquifers. Water duties in these lands are relatively lower than those in the old lands, but lifting is needed for higher heads. Most pumps used for lifting groundwater are electric pumps connected to either main power supplies; whenever available, or to local generators driven by diesel engines. The power consumed for watering the reclaimed lands can be estimated more accurately than that for the old lands, although it is difficult to have full inventory of all lands.

In addition to that, there are large volumes of fresh Nile water also pumped for the reclamation projects in the high lands in many locations all over the country.

Agricultural drainage water is also lifted from drains and mixed officially with fresh water in some canals to supplement irrigation water requirements at peak demand times. According to the National Water Resources Plan, this amount is estimated as 7 km^3 with an average lift of about 4-5 meters. In addition to that, there is a considerable amount of non-official drainage water re-use is pumped by individual farmers to irrigate their fields during water shortage in summer.

Also, lifting water from drains (and some canals) for fisheries cannot be ignored as it represents a growing business due to its high returns. Water depth in typical fisheries is about 1.25 meters, and water is pumped from drains or canals to fisheries and then pumped back from fisheries to drains. The total water lift is about 4-5 meters, and water is usually circulated fully within 30 days in the average. Pumping for fisheries uses mainly diesel pumps. Again there is no accurate inventory for the areas occupied by fisheries in the whole country, and some efforts are needed to get realistic estimates. Seasonal operation of fisheries also must be considered

Pumping drainage water for disposal in drains along the network or for disposal in the Mediterranean consumes significant energy. Knowledge of pumped volumes and heads can be obtained from the mechanical and electrical department of the ministry of water resources and irrigation.

Current and future estimates for energy the needed for irrigation, drainage, and fisheries in the whole country can be estimated based on geographic locations and will be more accurate if seasonal variation of demands can be considered. The accuracy of these calculations depends on the available data and assumptions to be used.