Google Earth Evaluation of the Perspective Habbaniyah Irrigation Command Area

R.L. Tinsley[1]
Inma Irrigation, Water Management,
& Soil Reclamation Specialist

Introduction

The Habbaniyah area in Anbar Province is currently being used as part of the Surge Maize production program and thus has good prospects of being designated as one of the Irrigation Command Area (ICA) for the Livestock and Feed commodity cluster. Thus, this is a quick evaluation of the perspective command area based on available Google Earth Imagery. The evaluation was done to illustrate how, in the absence of extensive field visits, Google Earth or other remote imagery can be utilized for an initial evaluation of the prospects of any proposed ICA and show some of the irrigation and land use problems that may have to be addressed by Inma.

Al Habbaniyah Irrigation Command Area

Main Canal

The command area is located across the Euphrates River and northwest of the city of Habbaniyah. It receives irrigation water from the main canal coming from the Tharthar Lake and connecting Tharthar Lake with the Euphrates River (Fig. 1). From the main canal water is pumped into the secondary canal serving the ICA. This pumping station is some 31km from Tharthar Lake (Fig. 2). It is not possible from the imagery available to determine the lift between the canal and the secondary canal. It does not appear to be more than 1 or 2 meters at most. However, there is a control structure on the main canal some 5.5 km above the pump station (Fig. 3). The control structure divides the canal water between the main canal and a gravity feed secondary canal going east. Depending upon the lift potential of the control structure it might be possible to build a < 6 km canal from the control structure to the secondary canal serving the ICA that would allow gravity flow or water into the ICA and avoid pumps costs as well as the uncertainty of water because of the power stoppage causing pump stoppages.

Secondary Canal

The secondary canal extends west from the pumping station for a total of some 26.5 km, if not longer (Fig. 4). However, the ICA is at most concerned with the first 13.5 km. The ICA being the area between the canal, as designated in the image, and the river. As shown it consists of some 7,364 ha. This will need to be adjusted to accommodate several villages and other built up areas within the ICA. It could be further adjusted to remove the Eastern

[1] The ideas contained in this paper are strictly the author who is solely responsible for the content. Some of these ideas may and probably are in contradiction to other Inma and USAID opinions. In such cases it hope they rational behind the opinions will be appreciated and lead to more comprehensive discussions and better overall programs.

section and be more consistent with the diagrams provided by Bill Gibbons, who is assisting Inma with the maize production demonstration. It should also be noted that there are two Google Earth images covering the area of markedly different resolution. The Eastern section has good imagery that will allow zooming in to a height of approximately 1000 ft and scale of approximately 1:1000. The Western section is considerable poorer and cannot provide the good quality images needed for detailed remote evaluation. These two different resolutions of Google Earth imagery appear common throughout Google Earth coverage of Iraq in what is basically a random pattern.

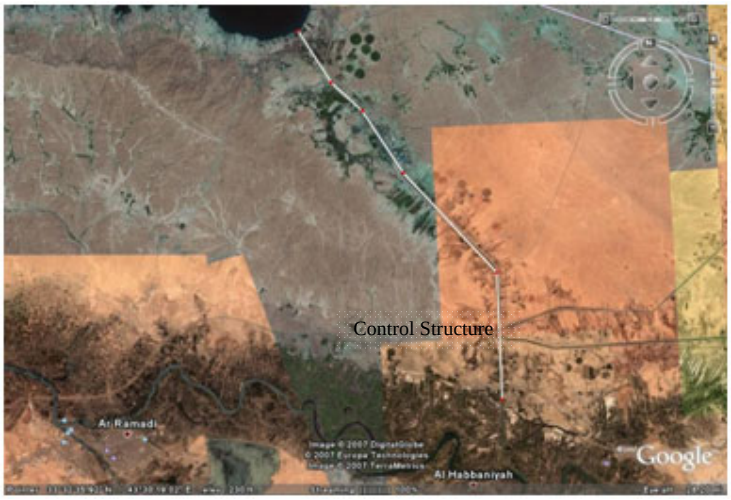

Fig. 1. Overview of the Habbaniyah Irrigation Area showing the canal going from Tharthar Lake to the pumping station serving the secondary canal

Fig. 2 & 3. The control structure in the main canal and pumping station lifting water into the secondary canal for the ICA.

Within the stretch of secondary canal defining the ICA there appears to be several informal bridges or causeways across the canal that appear more like culverts than actual bridges (Fig. 5). If this is correct they are most likely restricting the flow of water and need some attention. It would probably be in the Project best interest to recognize the need for cross canal communication at this point, but not the restrictive type of bridge/causeway informally

built. This might be an excellent place to put some World War II style prefabricated Bailey Bridges or the modern equivalent. The span at the line in the figure is only 37 m. There is also one large obstruction in the canal with a by-pass canal of an unknown nature, possible a fish pond (Fig. 6). Why would someone want to block the canal for a fishpond that could just as easily be placed beside the canal? How can they get away with this? This will need some substantial attention to get it removed.

Fig. 4. The section of the secondary canal that defines the ICA. The ICA is the area south of the secondary canal and above the river.

Fig. 5 & 6. Impromptu bridge/causeway across the secondary canal and an apparent fish pond in the middle of the canal.

In addition there are several water pirates pumping water from the canal to irrigate field above the canal and thus out of the designated command area. Most likely these are politically influential people for which it would be difficult to curtail their presumed right to pirate water. In one case the water pirate is using one full circle center pivot and one partial circle center pivot (Fig. 7). He even has holding ponds beside each center pivot unit. A small canal is clearly visible leading from the secondary canal to the holding ponds. The amount of water diverted by these pirate water users will most likely have a negligible impact on the

ICA, but could have substantial impact on the water supply in the secondary canal beyond the ICA.

Fig. 7. Two center pivots pirating water from the secondary canal.

Field Canals

The ICA is then served by numerous field canals coming off the secondary canal Fig. 8). These appear to be gravity operated through some type of water control device at the beginning. These devices appear to be mostly just a pipe of a specific diameter depending on the areas commanded by an individual field canal. Since there are no apparent control gates and the water appears to run under the road beside the secondary canal, it most likely represents a free flowing situation. The whole operation appears to be similar to Egypt, particularly the Nile Delta. Both cases may owe their original design to British influence as they appear to have been developed when England had considerable influence in both countries. Since I spent 4 years working and learning irrigation in Egypt most of my extrapolations in this evaluation are based on Egypt. There are approximately 100 or more such field canals within the ICA with varying length from 500 m to 2km. Thus they collectively represent more than 100 km of field canals to rehabilitate. The field canals are typically spaced 300 to 350 m apart and run as parallel to each other as possible and still fit the overall variation in terrain mostly associated with distance from the secondary canal to the meandering river. At times there will be two set of field canals with a feeder canal serving the lower set closest to the river. Also, some field canals may be branched. There do not appear to be any drain in the area, but I cannot be certain of this.

From the resolution of the imagery it is impossible to determine if water from the field canals to the fields is gravity or lift. If it is lift then the canals can serve dual purpose as drains, for removing excess surface water as well as, to a limited extent, subsurface seepage. Most of these field canals terminate at the river so any excess water will quickly returns to the river and would be readily available for reallocation. This is contradictory to what was originally anticipated as, before recognizing the canal at the top of the ICA, it was thought the river was the main water supply with farmers individually pumping directly from the river to the

their field canals. This could still be the case and provide supplemental water at time when the canal supply is disrupted. A practice that is common in many irrigation schemes such as this. From our perspective, it means we do not have to place a major concentration of irrigation scheduling and other precise practices as the extra water will quickly be recovered and reallocated. This could be very location specific and not hold true for other ICAs in Iraq.

Fig. 8. Layout of field canals in the eastern section of the ICA. The line in the main canal is 4 km and included for scale.

In a situation like this it is possible to allow considerable extra water be diverted through the system. In the worst case the water will make an approximately 30 km loop to return to river and the point where the main canal converges with the river. This should take at most one day. Allowing extra water into the area might enhance the overall irrigation efficiency of the area by providing the farmers more water for each irrigation. This will allow them to irrigate their fields faster, and apply less total water.

Also, there are some impromptu bridges across some of the field canal with culverts to allow the water to pass. However, if the culvert is of equal or larger diameter than the inlet pipe they will not interfere with the flow and can be left, or upgraded to the size of the inlet pipe.

Rehabilitation

The primary rehabilitation of the canal system in this ICA would be similar to that outlined in the LOP work plan, as this was the basic model for developing the work plan. The need is to remove the obstruction in the secondary canal. This replaces any control structures requirements as there are no control structures in the secondary canal. It would be necessary to make certain the pumping station is operational or possible construct a 6 km canal from the control structure in the main canal to allow gravity flow into the secondary canal. Then the need is to rehabilitate the field canal outlets, install individual farm or field outlets and install or rehabilitate the tail escapes back to the river. After this is completed work with the farmers on the operation and maintenance of the field canals.

It should be noticed that main access to the areas is via roads or paths along the canal banks. Also, the primary restrictions in the roads are associated with erosion around the

outlet from the canals and thus when the canals are improved the access to the area will also be improved almost by default.

Field Size

Most of the actual fields appear to be in the order of 0.5 ha or less (Fig.9). These are then divided into smaller basins of perhaps as small as 10 x 15 m. These small basins are needed to compensate for any limited leveling in the field as well as limited discharge of water necessary to rapidly push a wetting front across the field. Most likely these basins are temporary and constructed each season after the initial land preparation and prior to planting. They are then broken down during harvest. They will, however, hinder any mechanization most noticeable would be seed drilling as envisioned for winter feed grains.

Fig. 9. Field layout showing field of less than one hectare further divided into small irrigation basins. The line represents 57 m.

Saline Areas

There appear to be some isolated areas of salinity, perhaps no more than 10% of the total area. This is illustrated by the whiteness of portions of some fields with the distinct salinity pattern (Fig. 10). Most likely this salinity represents small within field mounds that do not receive enough water to effectively leach the salts. This should be relatively easily reclaimed if the fields can be leveled and sufficient water made available to assure a good leaching irrigation.

Fig. 10. Saline affected soils with characteristic salt visible on the surface.

Summary

This quick analysis illustrates how during the process of identifying potential ICAs it is possible to use the Google Earth imagery to make a preliminary evaluation of the area and the issues that may have to be resolved. Naturally, these need to be confirmed with more up-to-date imagery and eventually ground visit. I would expect the issues highlighted in this evaluation would be common in varying degree to most canal based ICA. I have certainly encountered similar problems in most of the developing world irrigations systems I have been associated with.