CHAPTER 9

CONCLUSIONS AND SCOPE FOR FUTURE WORKS

9.1. Conclusions

(I) The average rainfall in the Gomti basin having an area of 30,934 sq. km, consisting a whole or part of districts namely, Pilibhit, Khiri, Shahajahanpur, Hardoi, Sitapur, Unnao, Lucknow, Raiberelli, Barabanki, Faizabad, Pratapgarh, Sultanpur, Jaunpur, Allahabad and Varanasi of Uttar Pradesh, has declined to about 800 mm in the year 2012-13, as against 1050 mm in the year 1971-72, during a period of 43 years. However if we analyze at district level, it predicts that average rainfall figures in the basin are more or less constant to about 920 mm.

(II) In Gomti basin having an area of 30,934 sq. km, during a period of 30 years (1984 to 2014) the area in pre monsoon periods, where the ground water is available up to 5m below ground has reduced to 39.26% as against to 57.99 % and the areas where ground water is available below 5m has increased from 42.01% to 60.75 %.Similarly for the post monsoon periods the area where the ground water is available up to 5m below ground has reduced to 65.31% as

against to 90.80 % and the areas where ground water is available below 5m has increased from 9.20% to 34.69 %.

(III) In modeling area of Ramganj distributaries command, having a command able area of 66939 ha, and present canal command area of 39861 ha, in pre monsoon periods of 2013, the area where the ground water is available up to 5m is about 20% in canal command area and it is near about negligible in present non canal command areas. It predicts that the depletion of ground water levels in non canal command areas is at much faster rate and the canal network plays a major role in providing an additional recharge to ground water in canal commands.

(IV) Groundwater modeling framework has been developed through Visual Modflow for Ramganj distributaries command able area, a part of Indo-Gangatic alluvial plains of Uttar Pradesh in northern India. The simulated model predicts that if conjunctive use is opted the cropping intensity may be increased to 222 percent from the existing intensity of only 163.1 percent. It also shows an overall increase in ground water sustainable area and decrease in groundwater depletion area. The sustainable area may increase to 92 percent at percent cropping intensity of 163.1, with implementation of conjunctive use, against the sustainable area of only 65 percent with existing irrigation practices. Water logged area will also reduce to 1 percent as against to present 5 percent. Groundwater withdrawal may add additional cost for lifting groundwater through electric/diesel driven private borings. However, there is saving in terms of

overall additional gain in terms of bringing prevailing waterlogged and barren areas crops under cultivation, thereby increasing gross margin to farmers. At the same time simulation of model for a period of ten year from june 2011 to june 2020 shows that the ground water levels in pre monsoon and post monsoon periods will remain sustainable.

(V) An integrated model developed using GIS based Icrop model for Ramganj distributaries command , predicts that with the implementation of conjunctive use at 75% dependable rainfall of 1007.2 mm, canal supply of 403.6 mm with existing Cropping Pattern of 105.81% of polygon area, an overall recharge of 35.9 mm will be seen. It further predicts that even for proposed cropped area of 166.74% (82.97% kharif, 82.97 % rabi, 0.56% zaid and 0.23 % sugarcane) of polygon area or 256.52% cropping intensity can be achieved at 75% dependable rainfall and designed canal supplies with an overall net recharge of 9.9mm per year. The cropped area and gross margin to farmers can even be doubled, by bringing additional area under cultivation.

(VI) An integrated model developed using GIS based Icrop model for daulatpur disributaury system, having a smaller area of 3755 ha, with field survey at kulawa level, was developed to see the impact of different management scenarios. The developed model runs predict that the canal water use efficiency will increase with decrease in rainfall or canal water supply, resulting in increased ground water use or depletion in ground water reservoir for the same

cropping pattern and intensity. At the same time with the increase in rainfall or canal water supply, the canal water use efficiency will decrease but the ground water depletion will also be reduced. By opting conjunctive use of surface and groundwater in Daualatpur distributaries command, the water use efficiency of canal water may increase up to 58%.

Model run also predicts that with lining, canal water use efficiency increases, but at the same time, ground water depletion is also increased, that mean if conjunctive use is opted, lining is not beneficial.

Model runs clearly indicate that depletion in ground water levels is directly related to proposed cropping pattern/cropping intensity and it reduces with increase in rainfall or increase in canal water supply or with the proposal of less water requiring crops. However this depletion in ground water level can be reduced or maintained at constant levels more effectively at Kulawa command level with the support of water users association.

Gross margin to the cultivators may be increased to Rs 12.04 crore with a return of Rs 24030.48/ha by opting conjunctive use under current cropping intensity of 130% based on field survey (of command area) and the ground water depletion may be restricted to 9.88 cm during the year in place of depletion of even more than 3.0 m during the year in selected areas for the normal rainfall sequence.

With the increase in cropping intensity of 159%(of command area) the gross margin may be increased to Rs 14.28 crore with the return of Rs 23432.73 per ha and the

ground water depletion may be restricted to 12.18 cm during the year against the increased depletion of even more than 3m during the year in selected areas for the normal rainfall sequence.

With the further increase in cropping intensity to 230%(of command area) the gross margin may be further increased to Rs 24.10 crore with the return of Rs 27379.90 per ha and the ground water depletion may be restricted to 13.75cm against the increased depletion of much more than 3m during the year in the case of present scenario.

Developed dual roster at kulawa command level on weekly basis for the scenario decided by Cultivators can keep ground water sustainable with optimization of land and water resources.

9.2. Limitations

More detailed site-specific investigation of input parameters such as specific yield, saturated infiltration, canal seepage, canal capacities etc is required for accurate estimation of parameters;

The model predictions can be made even more realistic by use of most up-to-date groundwater, rainfall and canal discharge dat.

9.3. Scope for future work

Real time linkage with daily climate data, canal roster, canal and drain flow along with field wise soil parameters and irrigation requirement depending upon crop, as required by Water Users Associations.