Policy alternatives of the management of minor and medium irrigation schemes to develop groundwater system in restricted catchments for the improvement in food productivity in the dry zone of Sri Lanka.

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Abstract - Food scarcity is a pressing problem in many countries of the globe. The problem is, however, particularly serious in less developed countries with low agricultural production combined with a fast growing population. To meet food requirements, efforts should be made to increase the food production, at least several times over the present supply. This can be done by the use of better viable and vigour seeds, development and cultivation of new improved crop varieties, use of proper fertilizers, pesticides, and herbicides, better on-farm water management, better use of agricultural implements, provision of extension services, strengthening of the existing institutions and introduction of new socio-economic legal and organisational support to improve productivity. Proper management of water economically, however, is of overriding importance in the production of food. The success and efficiency of most other measures are dependent on the quantity, quality and timing of the irrigation water supply, the way it is used, and the degree of control over it.Many field experiments conducted by agronomists reveal that the increase in yield of a crop depends (in addition to other factors), on dissolved nitrogen in irrigation water supplied. More frequent and less intense irrigation tends to give a better crop yield due to reduced moisture stress, requires less water to fill the root zone to field capacity and reduces solute movement. General relationship between crop yield and water applied to the crop shows a trend to increase linearly up to about 50% of the full irrigation and then going in a convex curvature to the optimum yield and then reduce the yield with increase in applied water.Farmers whose sole objective is to get optimum net income, tends to irrigate their crop by spending minimum cost for their irrigation water to get optimum productivity of their crop, hence the main methodology to be adopted in any research regarding the optimum crop yield should be economizing the cost of the irrigation water and increasing the extent of cultivation per unit of irrigation water.A study was carried out for a catchment (around 185.23 km2) in Vavuniya to find out an operational policy of minor and medium irrigation scheme for conserving surface water by storage as groundwater by reducing the extent of cultivation using surface water and increasing the extent of cultivation using groundwater to achieve optimum crop yield under minor and medium irrigation schemes together with creation of an artificial boundary to lift the water table. This aquifer was divided into forty one polygons by connecting the perpendicular bisectors of adjoining observation wells. Seven year seasonal water levels and one year monthly water levels, tank storage, field issues and total withdrawal from agro and domestic wells for each polygon were taken for the water balance of each polygon. A regional aquifer simulation model in integrated finite difference method was formulated for this polygonal net work and calibrated using non-linear optimization method. The calibrated model was run to predict the water levels for boundary treatment to reduce the transmissibility in steps, change in operational policy of minor / medium irrigation schemes by keeping certain percentage of the storage at any time and combination of both. The economic feasibility was analyzed taking the energy saved in pumping of raised groundwater as return and boundary treatment cost and income loss due to change in operational policy of minor / medium irrigation schemes as cost. The present worth of benefit and cost for various interest rate and implementation period were calculated and compared. This leads to the conclusion as below.Change in operational policy of minor and medium irrigation schemes by keeping one fourth of the storage of minor and medium irrigation schemes at any time together with 40% - 50% reduction in boundary

permeability will recover an average of 60% to 70% of the loss of water table in any consecutive season in almost 95% of the area under consideration.