ABSTRACT

In the current study, an integrated command area planning approach is developed for the Mahanadi Delta of Orissa, India, where over 86,ØØØ ha of culturable command area out of 3,ØØ,ØØØ ha is suffering from drainage congestion. The traditional practice of supplying canal water during the entire rainy season at full supply level has been under severe criticism since 197Ø when the problem of waterlogging cropped up in the region. Based on the water requirement of crops grown in the command, a study was undertaken to determine whether to run the canal system (i) continuously for the entire base period or (ii) intermittently in every alternate weeks or (iii) during only peak water requirement period or (iv) not to operate of canal system with a view to obtaining maximum benefit and production in the command. The study indicated that a total disbanding of the canal operation during kharif (rainy) season is not advisable. However, if the canal system operates for some specified periods i.e., from 24th to 29th week only, the net benefit and production value remain unaltered.

Such a concept incorporates factors which invoke micro-level planning. A linear programming allocation model was formulated considering five objectives i.e., (i) maximization of net return (ii) maximization of production (iii) minimization of the investment (iv) maximization of the labour employment and (v) minimization of labour employment, subject to constraints such as irrigation water release policy, labour, fertilizer, area restriction of individual crop, nutrient, food, affinity to grow certain crops like paddy, agro-industry, capital and a host of others depending upon their requirement and availability. To present a plan for each model, fourteen combinations involving five objective functions in single objective linear programming

model, one multi-objective function in fuzzy model and eight multi objective functions in goal programming model were used to develop the alternate plans. Based on these, results obtained from the single objective planning, the fuzzy programming model and the goal programming model were analyzed. The study revealed that the benefit cost ratio of the existing system is extremely low (Ø.36). Also the' single objective benefit maximization alternative produced identical results with that of multi-objective goal program considering benefit as top priority (Goal1). Both the alternatives estimated the highest B.C. ratio of 1.Ø7. Though maximum benefit was obtained from these two alternatives followed by labor maximization objective alternative, the latter alternative gave B.C. ratio of 1.Ø4. Except the alternative considering labor minimization objectives, all other alternative plans considered for the study gave B.C. ratio more than unity. It is to be recalled that the time period of achieving this result is one year. Though results of the alternative plans obtained from the benefit maximization objectives and from benefit top priority goal program (Goal1) are same, Fuzzy solution appears to be more compromising and beneficial to both farmers and the Planners. In fact, the alternative plan using Fuzzy technique provided about 1ØØ per cent land use both in kharif and in rabi season with the highest cropping intensity of 239 per cent and a benefit cost ratio of 1.Ø5. No doubt, the farming community will be at some financial loss (by 14 per cent); but this would reduce the investment cost by 13 per cent and also labour requirement by 1Ø per cent maintaining, however, the same production level as that of benefit maximization (single objective or Goal1.)

Key Words : Culturable command area, Delta, Drainage congestion, Full supply level, Waterlogging, Peak water requirement, Benefit/production maximization, Micro-level, Single objective linear programming, Multi-objective programming, Fuzzy, Goal, B.C ratio, Alternate plan, cropping intensity.