

Pacharaon Kaeocharean 2014: Development of Harvesting and Transportation Plan to Supply the Field-based Residue Biomass to Bioenergy Plant (A Case Study of Sugarcane Trash). Master of Science (Agricultural Systems Technology), Major Field: Agricultural Systems Technology, Department of Farm Mechanics. Thesis Advisor: Assistant Professor Kriengkri Kaewtrakulpong, Ph.D. 144 pages.

In this study, harvesting and transportation plan to supply the field-based residue biomass to bioenergy plant was designed and developed in attempt to reduce the logistics cost of such biomass that has relatively huge potential for the second generation of biofuel production, which does not involve the use of human food. Then the logistics structure of such process including collecting, baling, and handling operations of cane trash biomass was studied. The field test and time studies were conducted in order to find out the field capacity of the agricultural machinery used in the processes. Also, the operating cost and investment analysis in baling process of sugarcane trash were studied. Consequently, two plans for routing the moving of baling machine were designed. In attempt to get the route that minimize the total travelling distance of the baling machine, the Vehicle Routing Problem (VRP) and the Travelling Salesman Problem (TSP) concepts were used for developing the first and the second plans, respectively. Genetic Algorithm (GA), a search heuristic that mimics the process of natural selection, was used to generate to get the optimal solutions to such problems in proper calculating time.

The results shown that the VRP plan is suitable to route the moving of baling machine in case that the baling machines have to return to starting points after finish their daily operations. When the machines have to work on number of 50 plots or greater, clustering the plots is necessary to be done prior to use the VRP plan. In case of the machines finish their daily works and have not come back to starting points, the TSP plan is suitable to route the moving of the machines. When the TSP plan used to get the optimal routes for one day, the minimized total travelling distance obtained was shorter but spent longer calculating time when compared with the TSP plan used for one week. In order to get the minimized total travelling distance of all machines operating for one week, the mutation rated should be changed in range of 0.20 to 0.99.

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Student's signature

Thesis Advisor's signature