Wood flow analysis supporting an efficient wood productivity system in plantation forestry

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Since the last decade the paper and cellulose branch is in spite of some fluctuations very stable. Hence, the majority of the companies decided last years to increase their productivity. But e.g. in Brazil the companies have to face a serious problem in the near future: a lack of sufficient raw material. Due to this fact the companies keep on expanding their plantations in remote areas, although the distances from new plantations to the factory become far and farer and information concerning the roads are partly missing or not existent, respectively. Longer transports in terms of more kilometres mean higher costs for the company. The companies that are aware of this problem have to minimise the costs in order to secure the wood supply and to be still competitive in the future.

To achieve this goal various possible solutions are proposed: The classical solution is calculating and optimising the wood flow by applying the methods of linear programming. Many authors like WEINTRAUB spent a lot of time answering this kind of questions. These methods are very sophisticated, complex to develop and to apply and in addition they are very expansive. Another way offers the heuristics methods, e.g. the wood exchange between the companies. This helps to minimise the transport costs and the wood supply quantitatively, but not the predominantly demand of the cellulose production because these requires a special wood with particular wood density. A further possibility to calculate the wood flow on a road network is given by the Software ArcGIS/ESRI in special with the Extension Network Analyst implemented in a Geographical Information System. This tool calculates based on a modified algorithm from DIJKSTRA (1959) the optimal route, according to the transport costs, the distance and/or the time. This method was developed and applied to an eucalypt plantation company in the southeast of Brazil. Applying this method revealed that satisfactory results can be obtained very quickly and with this single program it is possible to calculate the wood flow for the entire company. Once a pre calculation is done the companies can react on unforeseen problems by developing sophisticated linear programming.