points (plant location problem); (c) from a finite set of possible sizes, determine the optimal *size* plant(s) at each location (plant size problem); and (d) given that (a), (b), and (c) have been solved for periods $1, 2, \ldots, T$, determine the adjustment that should occur from the current configuration of plants. Solution of (a), (b), and (c) constitutes a static plant location model. Solution (d) is an extension of the static model to a dynamic framework. In the next section, we focus on the static model.

Static Plant Models

The determination of optimal flow of fruit from the groves through packing plants and to demand points is a transshipment problem. It has two components. The flow of raw product from supply areas to a packing plant is called the assembly problem. The second component involves the flow of product from the plants to the comsumption areas and is called the distribution problem. The plants are viewed as transshipment points.

The extension of the transshipment model to a plant size and location model is straightforward. First, a finite number of possible plant locations are identified. Possible plant sites include existing plants and new locations (plant location problem). The identification of new sites may be based on several factors such as the intersection of major roadways or railways or availability of land and/or labor. The plant location problem is then solved by a constrained optimization technique such as mixed integer programming. Use of the simplex method to solve this problem does not insure an integer solution of plant numbers.

Much of the research published on plant location problems prior to 1980 focused on solution of the mixed integer program. Mixed integer solution algorithms were cumbersome and required extensive computer time. Recently more efficient ways have been developed along with the reduced cost of computer time. This has encouraged direct solution of the plant location problem.

Stollsteimer is generally credited with first proposing an integrated model for determining the optimal location of plants. His formulation only included assembly of raw product. The Stollsteimer model has been extended to include multiple products (Polopolus). King and Logan extended the Stollsteimer model to include assembly and distribution in the same model. Economies of size were incorporated by King and Logan, Chern and Polopolus, and Kloth and Blakely.

The solution method employed in these studies involved first assuming a fixed configuration of plants. Once plant location is determined, the mathematical programming model is a transshipment model (i.e., plant numbers are fixed and set to integer values) and can be solved via linear programming techniques. The optimal value of the objective function is