ENGINEERING THE CONTAINER -- Panel Discussion

Third of Nine Papers

THE JAPANESE PAPERPOT SYSTEM 1/

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The report describes the Japanese paperpot system, the construction of the container and the system available for processing the container plants from soil filling to out-planting. A table of production cost estimates is provided and a discussion follows outlining the relationship of the Japanese paperpot to other container systems.

THE CONTAINER

The biodegradable Japanese Paperpot Container is made from pulp and various quantities of the artificial fibre Vinylon. The break-down time of the paper can be varied by altering the artificial fibre content. A water-insoluble glue bonds individual tubes. A set of tubes laterally attached with water-soluble adhesive forms a "honeycomb". Sets of tubes are compressed as an accordion and cut into standard tube lengths of 4,5,6,8,10 and 15 centimeters.

The product as it comes from the manufacturer is a compressed set of paperpots, inexpensive to transport and convenient to store - one million containers of 4 x 8 centimeters can be stored in a space of approximately 3 cubic yards. The handling of sets processes about 350 containers simultaneously and individual pots can be separated from the sets as soon as initial irrigation is complete.

THE PAPERPOT SYSTEM

The paperpot container system is, at present, the only container system for which a full array of handling, filling, sowing and planting equipment is commercially available. The system is flexible enough to permit substantial savings, even in a small scale production with the emphasis on manual handling. A small manual, "Everyman's Filling Line", consists of a number of inexpensive tools - such as aluminum or cardboard filling trays, peat tamping brushes, transfer forks, a homemade filling bench and an inexpensive sowing machine, i.e., the Sator 1 or Sator 7. The capital outlay is small and manual processing of paperpots is economical up to the production level of t 1,000,000 plants. (Table 1.)

With increasing production levels, manual functions should be replaced by mechanized processing modules. All processing machines are commercially available and can be added one at a time or combined. A production level of 1.5 to 2 million seedlings justifies a completely mechanized system. A fully automated line consists of conveyor belts, filling machine, sowing machine and a topping machine. The daily output capacity is approximately 400,000 pots for six people.

The rugged plastic holding tray forms the backbone of the paperpot system. It is designed to hold paperpot sets throughout the entire growing cycle and doubles as a transport container. One truck hauls 56,000 seedlings in four racks, each holding 40 trays.

For out-planting, the paperpot system offers two planting tools, the Potti-putki, or pot tube, and the "motor mole". The Potti-putki is a hollow planting tool with moveable jaws. The operator dibbles the jaws into the ground and after opening a cavity with the foot pedal, he drops plant and container through the tube into the ground. The large production claims of 2,000-14,000 plants/man day can be attributed to the elimination of continual bending over. The other device, the "motor mole", simultaneously drills a hole into the ground and scarifies an area of ten inches around it. A planting team of one "motor mole" operator to two planters form the optimum combination. The tool is of particular advantage at sites with heavy undergrowth of grasses and other ground cover.

1/Paper presented at North American Containerized Forest Tree Seedling Symposium, Denver, Colorado, August 26 - 29, 1974.

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Table 1.--Production cost estimates of Paperpot Seedlings

	$ Cost/M			
	Fully Automated (production level/yr.)			Semi Automated (production level/yr.)
	1MM	5MM	10MM	1MM
Capital Costs				
Machinery (5 yr. writeoff)	$ 3.00	$ .60	$ .30	$ .17
Polyhouses (5 yr. writeoff)	3.20	3.20	3.20	3.20
Plastic trays (3 yr. writeoff)	3.45	3.45	3.45	3.45
Sub Total:	$ 9.65	$ 7.25	$ 6.95	$ 6.82
Operating Costs				
Paperpot	$ 6.40	$ 6.40	$ 6.40	$ 6.40
Labour - sowing and filling	.42	.42	.42	1.25
Seed	.66	.66	.66	.66
Peat	1.24	1.24	1.24	1.24
Fertilizing and Protection	.06	.06	.06	.06
Transporting Containers	3.63	3.63	3.63	3.63
Polyethylene covering	.50	.50	.50	.50
General nursery costs	22.56	20.16	19.86	20.56
Sub Total:	$ 45.12	$ 40.32	$ 39.72	$ 41.12
Transportation cost	$ 5.10	$ 5.10	$ 5.10	$ 5.10
Planting cost @ 60/M	60.00	60.00	60.00	60.00
Grand Total:	$110.22	$105.42	$104.82	$106.22

DISCUSSION

A container system has to meet two criteria to be successful. The container has to enhance the development of the planting stock and the system has to show definite economic advantages over the conventional production of bare root seedlings. The development of the hard plastic container satisfies the economic requirement as it lends itself to mechanization and mass-production techniques. Especially, planting guns vastly reduce the overall cost of planted seedlings. Problems with the survival after a number of years have caused the systems to be largely abandoned.

In the concept of the plug seedling, a plastic container is used only throughout nursery production. Prior to outplanting, seedlings are removed from the container and the container is either discarded or reclaimed. The plug seedlings have obvious biological advantages. After planting, no barriers stand in the way of root development. Disadvantages are the extra handling required in the removal of the seedlings from the container and the cost of disposal or reclamation and reprocessing of the containers. Some species will not produce solid root plugs in the standard growing time.

The paperpot system is a compromise between the two ideas. It incorporates advantages of both the hard plastic container and the biologically superior plug. Production in the paperpot container can be mechanized to a high degree, the cost per cavity ranges from .49 cents to .67 cents for the two most popular sizes used. The paper envelope forms a supportive shield around the root plug during greenhouse cultivation but does not hinder plant development after outplanting. The proper cultivating factors such as temperature, humidity and fertilization control root egress. A possible disadvantage is that a paperpot is less rigid than the plastic container. More care is needed during handling and parameters of cultivation have to be kept within strict limits to ensure root egress at a proper time. These parameters have been worked out and are successfully controlled in many countries of the world. The overall saving and cost per planted seedling far outweighs the cost of the extra care.

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