PLAN
Q-9731

PASSIVE SOLAR SHOP HEATING

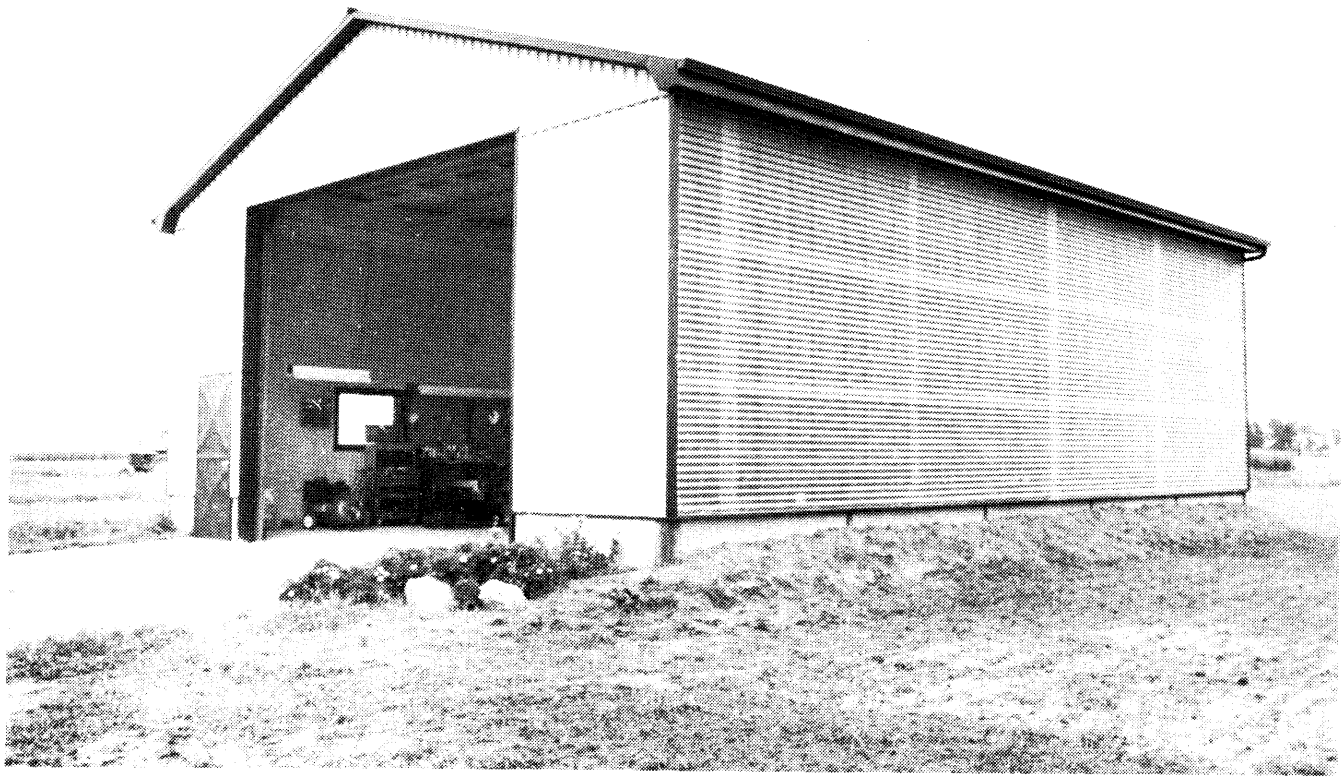

Figure 1. Farm workshop showing a passive solar collector on the south facing wall. Natural air movement circulates the absorbed heat into the shop area.

CANADA
PLAN SERVICE

The Canada Plan Service prepares detailed plans showing how to construct modern farm buildings, livestock housing systems, storages and equipment for Canadian Agriculture.

This leaflet gives management information and describes one of these detailed plans. To obtain a copy of the Canada Plan Service detailed plan, contact your local provincial agricultural engineer or extension advisor.

PASSIVE SOLAR SHOP HEATING

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INTRODUCTION Farmers are presently looking for ways to use solar energy. Here is one system in which no fans are used to move air through the solar collector. It is a passive solar collector installed on a south wall, to provide heat for a farm workshop.

ORIENTATION For best performance, the collector wall should face due south. However, variations of up to 15° will decrease its overall performance only slightly. The solar collector can be installed either on a side wall or end wall, whichever faces south.

COLLECTOR CONSTRUCTION The shop should be well insulated, at least RSI 3.5 in the walls and ceiling. A metal surface that acts as the solar absorber is installed on the exterior surface of the south wall with the corrugations running vertically. This surface may be new roofing steel, salvaged steel or aluminum roofing, painted flat black. Run continuous opening 150 to 300 mm wide horizontally along the inside of the south wall near the floor. Near the ceiling, leave another 150 mm continuous opening to let air out off the collector. For clarification and construction detail, refer to CPS Plan Q-9731.
To support the fiberglass glazing, install 38 x 38 mm strapping vertically on the metal absorber, on 400 mm centers. The strapping should also be painted flat black. Corrugated fiberglass glazing is then screwnailed onto the vertical strapping, forming the collector. The corrugations of the fiberglass should run horizontally to create turbulence in the air as it moves through the collector.

FIBERGLASS GLAZING The corrugated fiberglass glazing used in solar collectors must be protected from the ultraviolet portion of sunlight. Otherwise, it turns yellow reducing its light transmission. One product which can be used to protect the fiberglass is a brush-on ultraviolet filtering lacquer; this must be applied every 5 to 8 years. Use fiberglass sealant, available from fiberglass glazing suppliers, to seal the overlapping seams, and foam closure strips and silicone sealant to seal any cracks between the glazing and the building.

PERFORMANCE When sunlight strikes the collector, the air in the 38 mm cavity between the absorber and the glazing heats, rises, and exhausts into the shop through the continuous opening near the ceiling. Simultaneously, cool shop air from near the floor is drawn into the collector through the lower continuous opening. When the sun is shining during the fall, winter and spring, this thermosiphon principle heats the shop. During the summer, no heat is produced because most of the sunlight is reflected off the glazing due to the shallow angle of incidence.

The quantity of heat collected with this system depends on the availability of sunlight. Figures 2 and 3 illustrate temperatures in an actual passive solarheated shop on 2 sunny winter days.

COST When the solar collector is built as an integral part of a new farm workshop, the cost is lower than for a retrofit. The cost of an integral collector, over and above the cost of a conventional wall, is approximately $13-14/m^2.

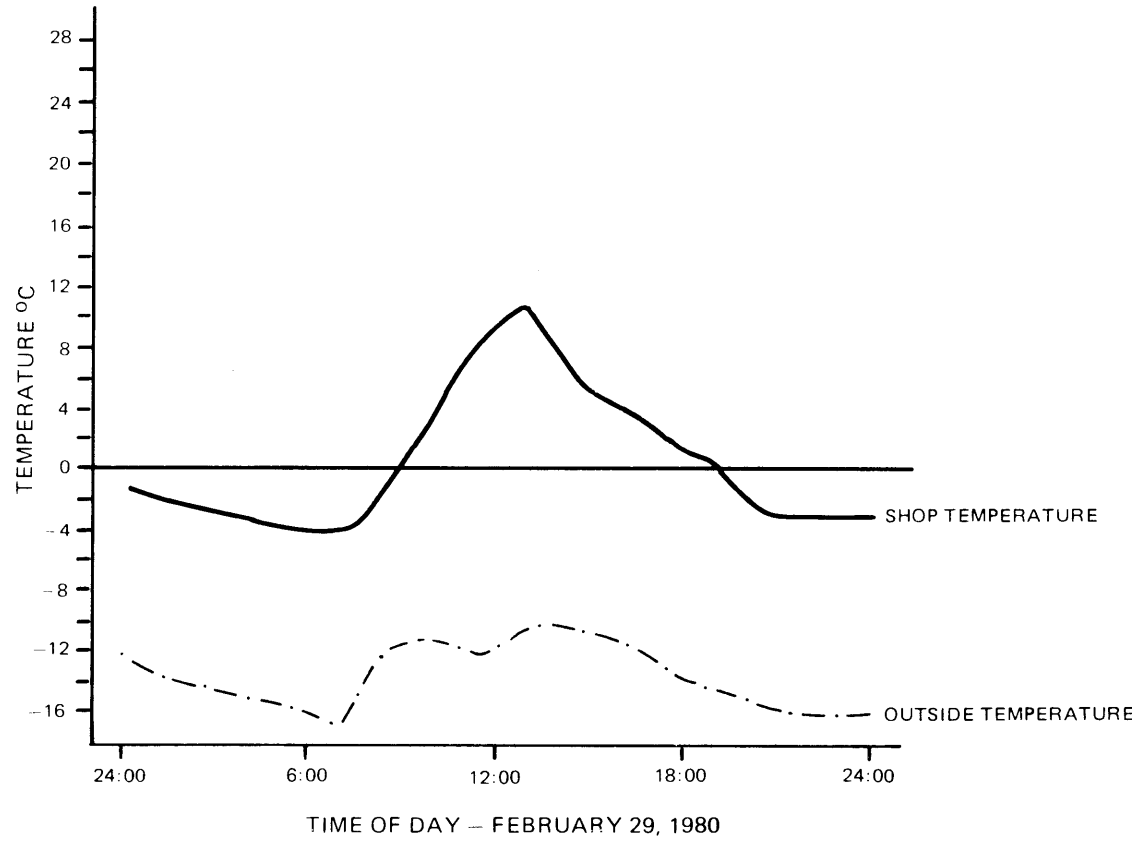

Figure 2. Temperature profile vs time of day,

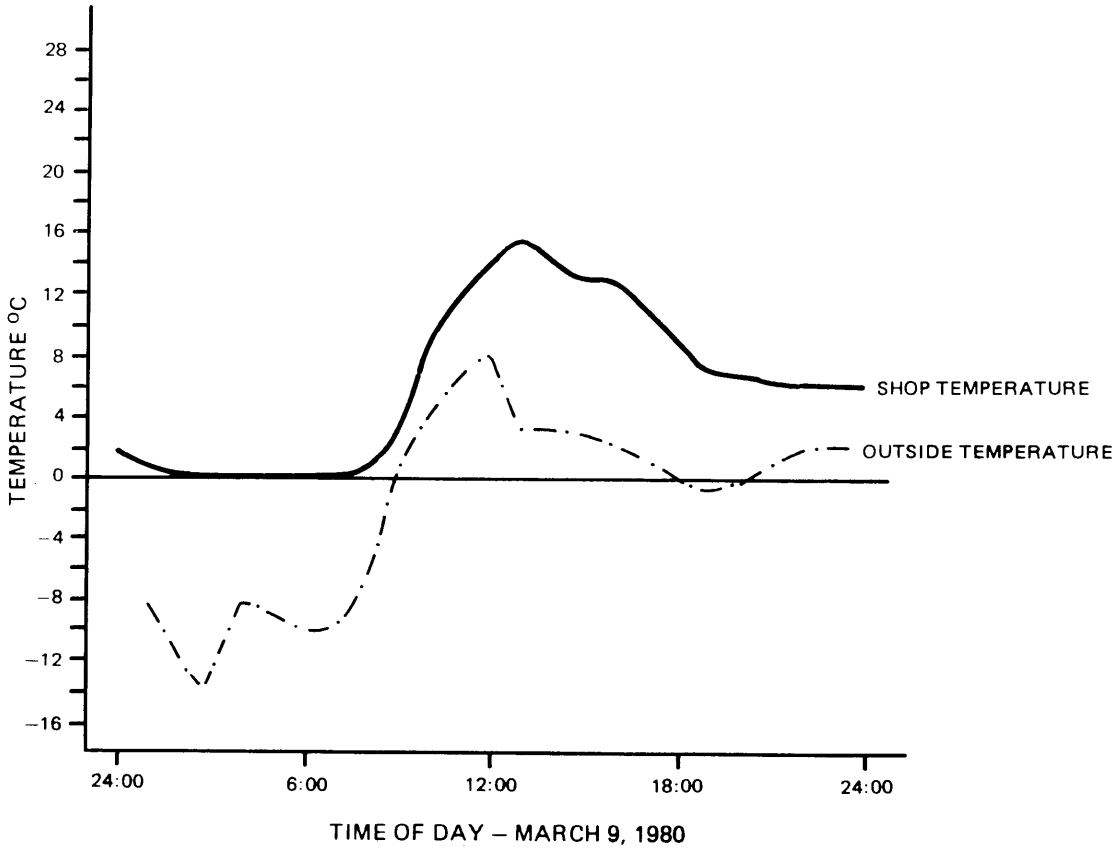

Figure 3. Temperature profile vs time of day,