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05925

ID

Distr.
LIMITED

ID/WG.184/7
5 December 1974

Original: ENGLISH

United Nations Industrial Development Organization

Symposium on the Development of the
Plastics Industry in Latin America

Buenos Aires, Argentina, 8 - 17 September 1974

LOW COST FARM BUILDINGS CLAD WITH POLYETHYLENE FILM1/

by

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LOW COST FARM BUILDINGS AND ANCILLARY EQUIPMENT

Almost 20 years ago Hopland Field Station of the University of California reported favourably on black polyethylene film as a covering for sheep shelters. Such low cost buildings offered rain protection to newly born lambs and survival rates improved following their use.

Many farms, and particularly those in developing countries, are short of farm buildings for storage of produce and equipment, or for the accommodation of stock. This paper illustrates some types of plastic-covered structures which have proved satisfactory and discusses buildings ranging from simple shelters to sophisticated (but still relatively inexpensive) controlled-environment houses.

Why use plastic films ?

With such a wide range of conventional building materials available why should plastic films be considered as cladding for agricultural buildings ? Some answers to this question can conveniently be tabulated.

1. Extremely low cost. Plastic films of between 125-400 microns thickness are cheaper per unit area than any other possible covering material. They are likely to remain so in spite of the recent increase in oil prices.

2. Because plastic film is light in weight, supporting structures need not be as substantial as those designed for conventional building materials.
3. Polyethylene sheeting in seamless widths up to 11-12 metres is available in many countries. This means that a whole building, semi-cylindrical in shape and covering a ground area of over 200 square metres, can be completely covered with a single seamless sheet of polyethylene weighing only some 50 kilograms.
4. Because of the flexible nature of plastic film, it will conform to an irregularly-shaped supporting structure more readily than most manufactured materials.

Farm buildings for stock, crops and growing.

The author has knowledge of the housing of poultry, cattle, sheep and mink in plastics-clad farm buildings, and also the use of insulated plastic buildings for growing mushrooms and forcing chicory. Other applications have been reported, e.g. their use for curing tobacco. It is interesting to note that buildings for growing mushrooms and for forcing chicory, bulbs or rhubarb need to be built to a higher standard, and in particular to be better insulated, than those intended for the accommodation of farm animals.

Types of plastic cladding.

Many types of plastic materials can be used for cladding domestic and industrial buildings but here we are

considering only low-cost plastics in the form of thin flexible sheeting - and of these polyethylene is the most important. On a world scale polyethylene film is the plastic most widely used on greenhouses and a very considerable amount of expertise is available on methods of fixing films to a wide variety of supporting structures which, while usually of steel or timber, can be made from materials as diverse as concrete or rigid plastic.

A disadvantage of clear polyethylene film is that even if ultra-violet-light absorbers have been added during manufacture it is still slowly weakened on prolonged exposure to an ultra-violet-light fraction of the sun's energy. Well made black polyethylene films, containing about 2% of very finely divided carbon, are very durable even in very high light conditions, and for this reason black films are most commonly employed for covering farm buildings. A minor disadvantage of black polyethylene is that in sunshine it becomes hot and expands at the rate of 1½" for an increase of 5° centigrade degrees, and this expansion can cause it to sag between supports when the sun shines, although it will contract again in dull conditions and at night. Black film is often painted with aluminium or white paint in order to moderate temperatures inside the building.

A material approaching the ideal for covering single-skin farm buildings is a black (and therefore durable) polyethylene film to which is laminated a white (and therefore reflective) one. The white side is, of course, used on the

outer surface of the structure. Laminated films of this kind are, however, not normally manufactured in widths greater than about 2 metres.

Costs of film increase in direct proportion to thickness and there is no great advantage in using films thicker than 200 - 250 microns. Most of the buildings used to illustrate this paper have made use of films only 125 microns thick.

Insulated buildings.

Some farm buildings can be considered simply as rain or sun shelters and temperature control inside such buildings is of little consequence. A single sheet of polyethylene of whatever colour or thickness has poor heat-insulation properties.

Still air is an excellent heat-insulant and there is currently a trend, in heated greenhouses, towards using two plastic films which are kept apart by air pressure from a small electric fan. Heat-insulating materials such as glass-fibre, mineral wool, sawdust or foam plastic are good insulants because of the amount of air they contain. Very well insulated buildings can be made by trapping such materials between two sheets of plastic and using this 'sandwich' as a cover for farm structures, as shown in the illustrations. In England several growers are now using buildings of this kind for growing mushrooms, where precise temperature control is vital.

Some considerations affecting design of farm buildings.

The flexible nature and "drape" quality of plastic sheeting enables it to be used to cover a wide range of structures, which need not be made to very accurate standards.

The size, shape and type of structure may be decided by what materials are locally available, and round-pole (as distinct from sawn) timber may be chosen as a cost-saving measure.

The framework of any structure needs to be robust enough to be stable in wind and must have a roof pitch which will shed rain and snow.

Steel tubing is an excellent structural material but its relatively high cost may mean that the steel supports need to be widely spaced. Wire or synthetic netting, or even strands of high-tensile wire, or polypropylene string can be stretched tautly between steel members to give extra support to the plastic sheeting.

Less movement of plastic sheeting in wind occurs if the outside profile of a building is curved rather than flat; the plastic will conform to the curve of the supporting structure. An ideal shape is a semi-cylinder or 'tunnel' - the shape chosen by many plastic greenhouse growers. If the width of a semi-cylindrical building is no greater than about 7 metres the whole building can be covered with

one single seamless sheet of film (of about 11 metres width), which needs only to be secured at ground level along the length of the 'tunnel', and at the ends.

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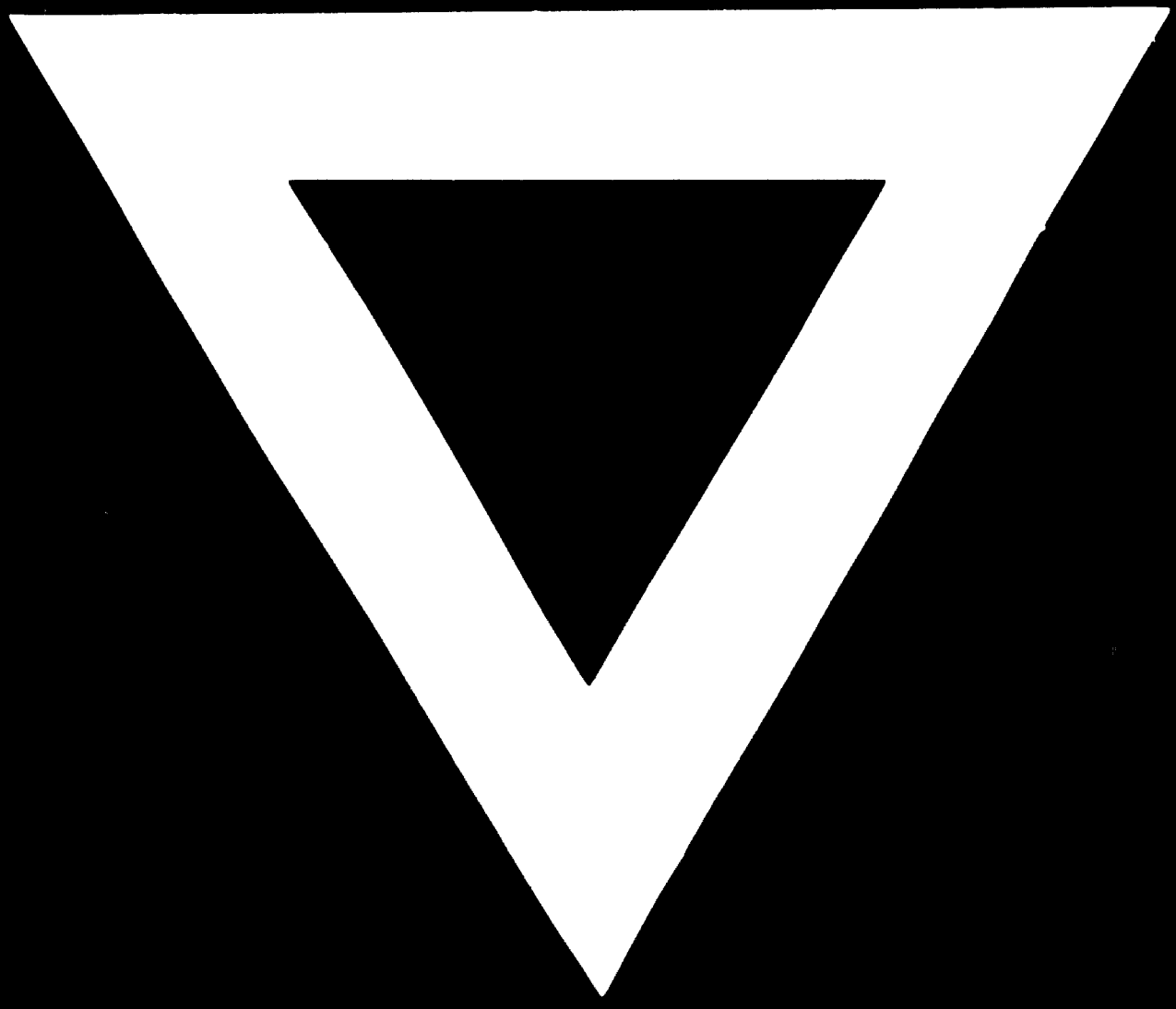

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