

C-02: Achieving energy savings from an Open Hearth without the use of cooking stoves

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The 3 stone (or brick) open hearth fire used extensively in the domestic sector has a very low thermal efficiency (10 - 15%). To increase the efficiency of the use of firewood several different designs of cooking stoves have been made and tested under laboratory and field conditions, around the world.

We have investigated the reasons for the low efficiency of the open hearth fire and concluded that this is because of: (a) Heat loss from the open sides of an open hearth from radiation and convection, (b) Uncontrolled flame size resulting from

unregulated flame size resulting from unregulated air flow from all sides of an open hearth fire.

To rectify these problems, we introduced 2 bricks to block heat losses from 2 of the 3 open sides of the hearth fire. This arrangement would also restrict the flame size and provide for entry of air flow from only one entrance. We tested this brick arrangement for thermal efficiency, and compared the use of firewood with (a) open hearth fire, (b) cooking stove made by the National Engineering Research & Development Centre.

We again tested this 5 brick arrangement for different 'pot sizes'. The findings are reported here.

We conclude that the efficiency improvements (30%) of a cooking stove, may be achieved, by introducing such a 5 brick arrangement and furthermore that this arrangement of bricks has the advantage of; (a) almost zero cost & maintenance, (b) may be adjusted to different pot sizes, thereby is likely to achieve higher fuel savings under field conditions, (c) initiating the fire when a greater airflow is necessary may be achieved by simply reverting to the 3 brick arrangement.

Thus the 5 brick arrangement achieved thermal efficiency improvements while retaining flexibility of the open hearth fire.

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