Food and Agriculture Organization of the United Nations

Hedgerows/alley cropping to control soil erosion, Jamaica

Source	FAO Strategic Objective 5 – Resilience, in FAO
Keywords	Soil erosion, Soil conservation, Deforestation, Nitrogen fixation, *Calliandra*, Alley cropping, risk management, disaster preparedness, conservation agriculture
Country of first practice	Jamaica
ID and publishing year	4645 and 2008
Sustainable Development Goals	Climate action and life on land

Summary

Jamaican small farmers implement hedgerow/alley cropping to mitigate the impacts of hydro-meteorological hazards. The hedgerows/alley cropping system is the growing of crops, usually food crops, in an alley formed by trees or woody shrubs that are cut back at crop planting and maintained as hedgerows by frequent trimming during cropping.

Farmers in Jamaica showed high acceptance of this technology because it is easy to implement, low financial cost and effective to compact soil erosion.

Description

The use of the hedgerow/alley system has been advocated by conservationists because it is effective in minimizing soil erosion by reducing surface runoff velocities and prolonging infiltration rates. Hedgerows are also a good source of organic matter, nitrogen, phosphorous, potassium, and other micro-nutrients. The practice of hedgerows/alley cropping is currently being promoted in Southern Trelawny, Jamaica.

Benefits of alley cropping include:

- minimization of soil erosion;
- reduction of rainfall run-off velocity;
- prolonged infiltration rate;
- provision of organic matter to improve soil structure;
- nitrogen fixation where leguminous plants are used; and
- source of phosphorous, potassium and other micro-nutrients.

1. Implementation of the technology

On gentle slopes hedgerows are established about 2 to 6 m apart. On steeper slopes, the hedgerows should be about 2 m apart along the contour of the land. Within the rows, the distance between the trees varies, but may be as close as 5 to 10 cm on steep slopes.

At the seedling stage, temporary stakes are placed into the ground close to the young hedges and farm trash is placed on the up-slope side of the stakes to form barriers that control soil erosion. The stakes hold the barriers until the plants are mature enough to hold the barriers by themselves. As the hedges grow, they are periodically pruned to prevent the shading of crops in the alleys, and the pruning debris are used to further build up the trash barrier or as mulch on the farmed area between the hedgerows.

In southern Trelawny, hedgerows are also being managed to produce yam sticks by leaving individual

trees to grow at intervals of 2 m. When the trees mature, the sturdy stems are cut and used as yam sticks. A variety of leguminous species can be used for nitrogen fixation. These include *Leucaena leucocophala, Tephrosia candida, Desmodium rensonii, Flemingia macrophylla, Alnus nepalensis*, and *Calliandra calothyrsus*.

The hedgerow/alley system of vegetative soil conservation is currently being promoted in Southern Trelawney, in Jamaica, part of the Cockpit Country buffer zone and one of the foremost regions in Jamaica for commercial yam production. The *Calliandra calothyrsus*, the hedgerow plant that is being promoted, does not occupy much farm space and its vertical root system penetrates deep into the soil where it provides support for the upper soil horizons and does not interfere with the root systems of cultivated crops. This allows farmers to plant food crops in close proximity to the *Calliandra* plants.

Further advantages of the species are that the *Calliandra* tree grows well on a wide variety of soil types, with its rooting system stabilizing banks and ridges, its leaves can be used as animal fodder and enhances soil fertility through nitrogen fixation. Given the high level of interest expressed in this technology by small farmers, similar acceptance levels are likely in yam growing communities elsewhere, especially where soil loss from steep slopes is a problem.

A key factor in ensuring similar level of success elsewhere lies in the promotion and management of the technology.

2. Monitoring of the demonstration

Although there is no quantitative assessment of the impact of the project, qualitative assessment indicates positive physical and socio-economic impacts.

2.1 Physical impacts

Accumulation of soil behind the barriers is a good indicator of the extent of reduced soil loss. Observation made of treated plots towards the end of the project indicated significant levels of soil accumulation behind the hedgerows while soil loss continued unabated on untreated plots.

One farmer whose plot was used as a demonstration site explained that before the treatment of his land, soil-wash from his farm posed a hazard to traffic on the road below, but this is no longer the case since the treatment of his land. The hedgerow/alley technique was regarded by farmers as a vast improvement on their traditional use of contour drains, because although these drains reduced water velocity on the slopes they nevertheless channelled away substantial quantities of soil. Additionally, it also resulted in improved water infiltration on slopes, which can enhance ground water discharge.

2.2 Socio-economic impacts

Farmers who utilized the hedgerow/alley technique reported that when daily labour costs for maintenance of hedgerows are considered, the overall costs of establishing and maintaining the new technique was substantially less than those associated with contour trenches as a soil conservation measure. In this regard, the production cost for yam farmers who adopted the technique were reduced.

At the community level, reduced inconveniences related to road blockage owing to erosion from farms and the related cost of clearing roads was yet another positive effect of the hedgerow/alley technique. In addition, reduced turbidity of streams has implications for

reduction in the cost of water treatment for communities. At the time of the final evaluation of the project, 393 farmers had been exposed to detailed information regarding the use of the technique. This served to improve the level of environmental awareness among farmers in southern Trelawny and as such the technique holds great promise for the promotion of sustainable use of land resources by farmers.

3. Relevance of the proposed FAO intervention

At the end of South Trelawny Soil Conservation Project a large number of non-targeted farmers in southern Trelawny expressed interest and desires to adopt the hedgerow/alley technique but were unable to benefit due to unavailability of STEA's resources to continue expansion of the intervention when the project ended.

A stakeholder meeting held in May 2007 between the FAO Resident Representative in Jamaica, the National Consultant for the FAO project, the Director of STEA and community representatives from southern Trelawny, indicated the desire of farmers to continue adaptation of the hedgerow/alley technique.

In this regard, it was proposed that the funds available for fine-tuning and promoting good practice(s) identified in the first phase of the project should be allocated to the revival of the hedgerow/alley technique of vegetative soil conservation in southern Trelawny for the following reasons:

- Past evaluation of the technique indicates that it not only has the potential to reduce soil-loss associated with intense rainfall, but also include a wide range of environmental benefits.
- Farmers in southern Trelawny are extremely receptive to the innovation, but currently lack the resources for the implementation. Only a small proportion of the farmers in the area have benefited from the previous initiative and thus outreach and impact of the proposed FAO intervention is large.

Given the range of environmental and social benefits that can be derived from the intervention, there are good prospects for collaboration with other development partners.

Being resilient, one of the key components of FAO´s strategic objectives, this intervention with hedge rows is in line with the type of measures that enhance the resilience of the agrosystem against natural hazards, in this case against soil losses derived from intense rainfall. The conservation of soil properties and better water infiltration are factors that can help increase yield and thus, farmer´s food security and income.

Figure 1. Alley cropping in Jamaica

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4. Validation of the practice

The Southern Trelawny Environmental Agency (STEA), an NGO which has been technically supporting the hedgerow system, has reported a high acceptance level of this technology, due to the ease of implementation, its effectiveness in

controlling soil erosion and the low financial cost.

5. Further reading

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5.1 Websites

- www.centerforagroforestry.org
- www.fao.org
- www.nrcs.usda.gov

5.2 For more information please contact

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6. Agro-ecological zones

- Tropics, warm

7. Objectives fulfilled by the project

7.1 Resource use efficiency

The hedgerow/alley system uses land and resources in an efficient way in that it improves soil structure and minimizes soil erosion by reducing surface runoff velocities and prolonging infiltration rates.

7.2 Pro-poor technology

The system is pro-poor due to the ease of its implementation, its effectiveness in controlling soil erosion and its low financial cost.