NATIONAL GRAIN LEGUME PROGRAMME

LAND PREPARATION ON GUYANA COSTAL SOILS

SIMON BOLIVAR FUND

GEORGETOWN, GUYANA

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GENERAL TECNIQUES FOR LAND PREPARATION ON GUYANA COSTAL SOILS

BY
P.F. ROBINSON
R.E. PIERRE

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CONTENTS

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1. INTRODUCTION

The object of land preparation is to provide a suitable soil environment for a crop to be planted and grown satisfactorily. This soil environment is termed a "seed bed" and it should be produced with the minimum number of tillage operations to keep costs down. A good seed bed can normally be achieved by using the correct tools and equipment and timing the operations to take maximum advantage of weather conditions.

How much tillage is required and the equipment needed to produce a suitable seed bed will depend on:

(a) Type of soil.

(b) Drainage needs.

(c) Crop to be grown.

(d) Acreage to be cultivated.

(e) Timing of operations.

(f) Other elements.

/2. Guyana Soils .....

2. GUYANA SOILS

Soils on Guyana's coastland can be divided into the following three groups for the purposes of land preparation:

(a) Clay soils.

(b) Silty loams.

(c) Pegasse.

2.1 CLAY SOILS

These are very fine textured soils varying in colour from grey to brown. They are very difficult soils to cultivate, being very hard when dry and extremely sticky when wet. Timing of operations on this type of soil is vital if a seed bed has to be prepared with the minimum of operations and to obtain the best results. In addition, a suitable drainage system has to be installed to dispose of surface water.

2.2 SILTY LOAMS

These soils consist mainly of mixtures of sand and clay and the texture will vary depending on the proportion of the two major components. These soils dry out quicker

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than the clays and a seed bed can be prepared with less effort. Timing is still important for best results but it is not as crucial as with clays. These are free draining soils and there is generally some lateral movement of water. Drainage requirements will depend on the elevation of the land and the water table. Erosion is likely to present some problems.

2.3 PEGASSE

These soils can loosely be described as peat or decayed vegetation. The water table in areas where pegasse is present is very high and empoldering is necessary if drainage is to be controlled and the water table lowered to acceptable limits. Empoldering is an expensive operation and involves excavation of drainage canals that link up with a controlled outlet so that surplus water can be removed from the land to be cultivated.

Pegasse soils are highly organic, low in fertility in most cases, somewhat toxic due to high aluminium content and very acid.

Mechanical operations are always difficult on this soil. Ground pressure of the equipment used must usually be

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below 5 lbs. per square inch. This means that light tractors with either tracks or high flotation tyres are most suitable.

3. LAND PREPARATION PROCEDURE

3.1 SOIL TEST

It is always advisable to have a soil test before land preparation is commenced. This service is provided free by the Ministry of Agriculture and can be arranged through your local Agricultural Officer. The analysis will provide information on the fertilizer requirements, but most important for land preparation it will supply information on the structure of the soil. If the layer of top soil is shallow, deep cultivation is not recommended.

3.2 DRAINAGE NEEDS

Good drainage is necessary before preparing land forcultivation. Apart from the need to remove excess water from the soil, it helps in leaching out toxic substances and so improves the soil environment. Aeration of the soil is essential for good plant growth. This process is mainly

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brought about by the movement of water in and out of the soil. Rain water soaks into the soil filling the pore spaces and driving out the air. Then, as the water drains away, fresh air is drawn into the soil to refill these spaces. Aeration will vary from clays to sandy soils but good aeration is necessary for seed germination.

Most of Guyana's coastline is below sea level, and a net-work of wide drainage canals carry away water channelled into them from in-field drains. Pumps strategically placed along the coast are designed to cope with the average rainfall that is collected in the drainage canal system.

In-field drains will vary according to soil type and generally are two (2) feet open drains spaced at distances ranging from twelve (12) to sixty (60) feet. Open drains of this type are most effective on pegasse and loam soils. On clays a ridge and furrow lay-out can be installed running in the direction of slope. Either system should link up with a fairly deep open drain (referred to as a four-foot) to carry away all excess water. Mole drainage can also be used

/effectively .....

effectively on clays. This is a cheap drainage method. An implement known as a Mole Plough which has a torpedo or bullet shaped "mole" attached to a steel coulter and drawn through the fields to form cylindrical channels in the sub-soil.

It should be noted that drainage trenches considerably hamper the movement of machinery and care must be taken in their design.

Plan your drainage carefully to suit your needs; seek advice from your Agricultural Officer on this aspect. Remember effective drainage plays an important role in crop management.

<u>Poor drainage will result in the following:</u>

(1) Pools of water lying on surface.

(2) Excessive weed growth.

(3) Young plants are pale green or yellow in colour and are stunted.

(4) Machinery easily bogs down.

/Good drainage .....

Good drainage results in:

(a) Better weed control.

(b) Better soil aeration.

(c) Soil is easier to work.

(d) Inter-row cultivations and harvesting operations are easier to perform.

(e) More vigorous crop growth and better results from fertilizers.

3.3 CROPS TO BE GROWN

Tilth is a term used to describe the condition of the soil in a seed bed. For example, the soil may be in a finely divided state or may be lumpy. In general, small seeds require a finer tilth than large seeds.

The seed bed is the place where the seed germinates, and suitable conditions must be created to allow the seed to grow and produce a satisfactory crop.

3.4 Acreage to .....

3.4 ACREAGE TO BE CULTIVATED

The size of the area to be cultivated will have a bearing on the equipment to be used. For instance, a man with half acre or so of land will, in all probability, use hand tools - forks, cutlasses and shovels - to drain and prepare his land for cropping. Farmers, with say 7-15 acres, may well be equipped with light powered rotovators, etc., whereas large farms and state-owned agencies will be using tractors of 100 H.P. plus and six-row equipment. In other words, if the acreage to be cultivated is to be carried out economically, the selection of the right equipment is necessary.

3.5 TIMING OF OPERATIONS

Timing of operations in regard to weather conditions is of vital importance in land preparation, particularly on heavy clay soils. This is more of an art than a science and is largely based on experience. Considerable damage can occur if untimely land preparation operations are carried out and these invariably result in a poor seed bed, low yields and high land preparation costs.

/3.6 Other Factors .....

3.6 OTHER FACTORS

The state of the land will naturally have a great bearing on land preparation. For instance, it may be necessary to clear heavy forest before the land can be prepared for cropping. In such cases it takes several years before obstacles, such as tree trunks and roots, are disposed of to allow free movement of machinery.

4. DESCRIPTION OF TILLAGE OPERATIONS

4.1 PLOUGHING

Ploughing is the first operation in seed bed preparation and is likely to remain so for some time yet, although rotary cultivators, heavy cultivators with fixed or spring tines plus mechanically driven digging or pulverizing machines are being used as alternatives to ploughs in some countries. Good ploughing is probably the best method of burying weeds and exposes the soil in preparation for further refinement.

In Guyana, the disc plough is preferred. It requires less maintenance and on rough land will ride over

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obstructions and avoid damage. Under adverse conditions they show an improved performance over mould board and other types of ploughs.

Ground speed influences both the quality of work and the levelness of the finish. On heavy clay soils exposure of the ploughed land to the weather for about ten days is advisable. On lighter soils such as loams and pegasse exposure for a day or so is sufficient before proceeding with further refinement of the seed bed.

If limestone is needed, this should be applied as soon as the land is considered dry enough after ploughing and before further cultivation. This will ensure that the limestone will be well incorporated into the finished seed bed.

4.2 HARROWING

On heavy clay soils disc harrows are the most popular used piece of equipment after ploughing. The weight of the implement is matched with the size of its discs to achieve good penetration. By careful adjustment of the discs either a level surface or a camber can be obtained. The

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angling of the discs may be controlled hydraulically or manually. Apart from disc harrow, there is now available on the market a range of equipment such as spiked harrows, spring-tine harrows and power harrows, all of which are capable of preparing seed beds in varying soils and conditions.

4.3 CULTIVATING

This is another area where machinery manufacturers have been able to produce a wide range of equipment. The rigid tine cultivator is probably the most commonly used and as the name suggests it comprises a number of fixed or rigid tines mounted on a robust frame. The tines are staggered to achieve intensive cultivation and avoid choking by clods of soil or trash. These tines can sometimes be arranged in pairs for row-crop cultivation.

Other types of cultivators include the spring-tine and spring-loaded cultivators, which are designed for use in areas where hidden obstructions, such as roots or stones, are a problem. The powered rotary cultivator is commonly used, particularly in corn growing areas and is considered excellent

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for forcing a tilth in stubborn soil. It should also be realised that soil structure can be damaged by over-cultivation with a machine of this type.

4.4 OTHER EQUIPMENT

Under certain conditions it may be necessary to use land-levellers or graders for certain crops. These can range from very big towed machines which can only be operated on large acreages, to simple structures that can usually be made without much outlay. Levelling operation is particularly important on heavy clay soils where the crop to be grown is susceptable to water logging.

For particularly refined seed beds, there are available a range of light harrows that are often trailed behind cultivators or seeding drills. Zig-zag and chain harrows fall into this category.

/5. Summary .....

5. SUMMARY

In most cases land preparation represents the most costly single item in the budget of an arable farmer and is part of the business of farming that remains almost entirely an art. No definite rules can be laid down as to what implements are necessary to produce the best results because soils and conditions vary. Securing the best results depends on the farmer's ability to choose the right implement at the right time for his specific conditions. Machinery that has been properly serviced and well-maintained pay dividends and contribute considerably to good land preparation.

Table 1 RECOMMENDED PROCEDURES FOR LAND PREPARATION

OPERATION	TYPE OF SOILS		
	CLAYS	SILTY LOAMS	PEGASSE
1st Operation	Ploughing Clean land 1 cut Grassy land 2 cuts	Harrowing 2 passes	Harrowing 2-3 passes
2nd Operation	Harrowing 2 passes (one in each direction)	Chisel Plough preferably	
3rd Operation	Refinement by use of levelling equipment e.g. Clod Crushing land levellers	Refinement by use of levelling equipment e.g. Clod Crushing land levellers	

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