QUEENSLAND DEPARTMENT OF PRIMARY INDUSTRIES
DIVISION OF PLANT INDUSTRY BULLETIN No. 734

A MOTORIZED SIEVE FOR SAMPLING SOIL-DWELLING LARVAE

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I. INTRODUCTION

The techniques developed for the sampling of soil dwelling larvae mainly employ sieving, hand sorting, washing or floatation as the method of extraction of the larvae from the sampled unit of soil. (Southwood, 1966). A high labour input is required for these methods. The present paper describes a simple motorized sieve (cf. Lange *et al.,* 1955) which was developed to reduce the amount of labour required to sample scarab larvae in cultivated and pastured areas.

II. DESCRIPTION OF MACHINE

The machine (plates 1 and 2) consists essentially of an oscillating sieving table, powered by a small motor, on a wheel mounted chassis. The overall dimensions of the machine, 900 mm wide x 1 500 mm long x 1 150 mm high, allow transportation in a utility vehicle and towing by hand in the field.

The sieving tray consists of a 44 x 44 mm angle-iron frame sized to support a 44 x 44 mm angle-iron framed, mesh bottomed sieve, 750 x 900 mm. The mesh is held in place by a removable 1·6 mm thick, 130 mm high metal frame, which also serves to increase the capacity of the seive. The base frame is supported by strips of rubber belting at one end and by springs at the other.

The unit is powered by a 2·1 kW petrol motor fitted with a 6:1 ratio, reduction gearbox. The motor is connected via vee-belting to a 130 mm diameter pressure plate clutch unit, which, when engaged, oscillates the sieve through a crank and connecting rod.

The chassis is constructed from both 27 and 33 mm outside diameter steel piping and is mounted on automobile wheels fitted with pneumatic tyres. Pivoting of the front axle allows two dimensional movement. Brakes are fitted to the rear wheels to allow easier control of the machine on steeply sloping land. The angle of incline of a sloping metal slide, fitted below the sieve tray to convey soil to the rear of the machine, is adjustable allowing control of the rate of travel of the soil.

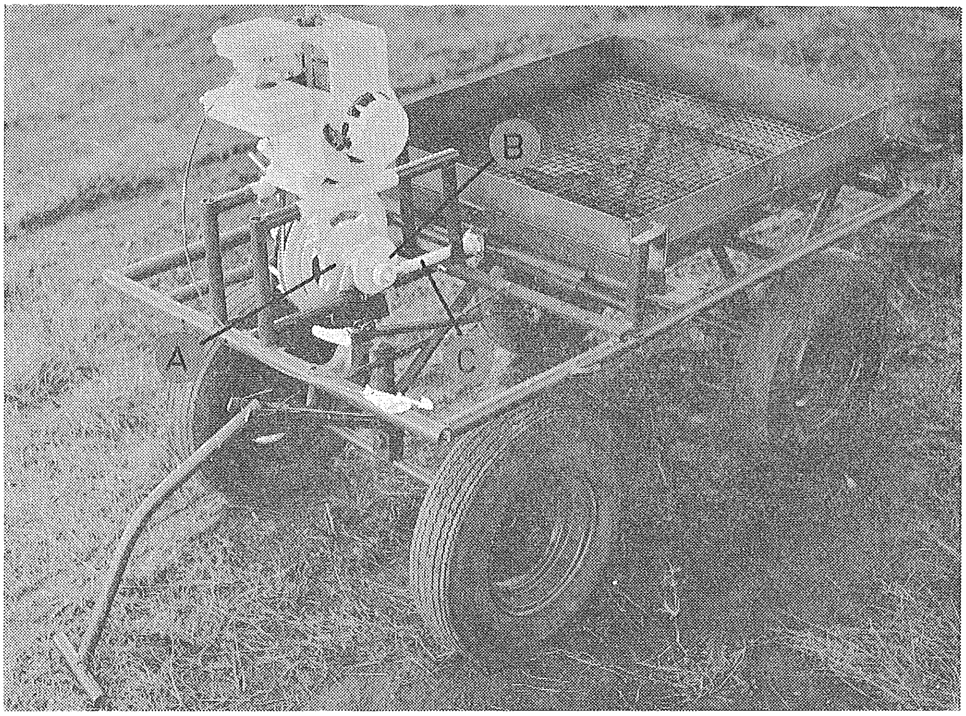

Plate 1.—The soil sieve fitted with one tray and mesh. A. Clutch B. Crank C. Connecting rod.

A range of mesh sizes is desirable to allow varying degrees of dispersal of the soil, dependent upon the size of the species being sampled. Provision is made for the superimposing of a second sieve on the base sieve so that the species to be assessed can be retained in the base sieve. The horizontal displacement of the sieve can be controlled by adjusting the position of the offset crank while the vertical displacement can be adjusted by changing the length of the sieve supports. The rate of oscillation of the sieve can be controlled by varying the motor speed or by changing the drive pulleys.

III. THE SIEVE AS A SAMPLING TOOL

Pasture and cultivated red clay loam and self-mulching clay soils have been sieved in the field. It is not possible to give precise guidelines as to the sievability of soils as this varied with soil type, cultural practices, soil moisture and sieve mesh. The machine worked efficiently with clay loam soils at moisture contents below field capacity. However, as the moisture content approached field capacity, the efficiency of sieving decreased with the increasing adhesion of the soil to the sieve. The range of moisture content, which allowed the successful sieving of self-mulching soils, was much narrower. Again, increasing problems with soil adhering to the sieve were encountered as the moisture content approached field capacity. The increasing strength of the bonding of material into the peds and clods as the moisture content decreased below the desirable level made sieving more difficult.

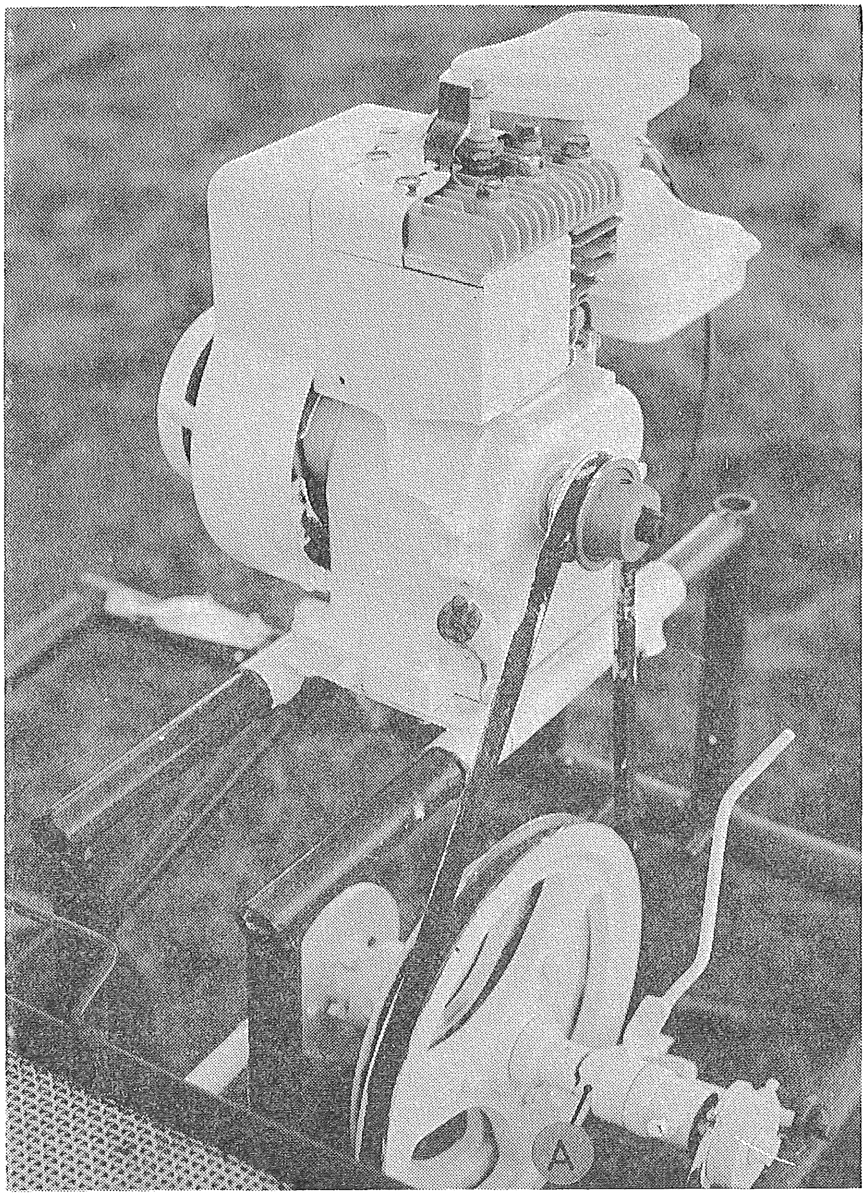

Plate 2.—Detail of motor and drive mechanism. A. Cam for engagement of clutch.

The machine was developed for sampling populations of scarab larvae. Soil samples were passed through the sieve and larvae were removed or counted as the dispersed soil passed down the rear slide. The technique was successful and allowed to taking of between 5 to 15 samples (380 x 380 x 120 mm) per hour by two men. The rate of sampling depended on soil type, soil conditions and the topography of the sampling area. While the rate of sampling is not as great as that achieved by Roberts and Ridsdill Smith (1972) in the sampling of scarabs in pastures, the sieve has the advantage of being applicable to sampling in cultivated soil. The rate of through-put of material increases as the degree of structure of the soil decreases and the machine is most applicable for use with soils in the range from clay loams to sands.

Funds for construction of this machine were provided under the Australian Meat Research Fund (D.A.Q.7) and this assistance is gratefully acknowledged.

REFERENCES

Lange, W. H., Akesson, N. B., and Carlson, E. C. (1955).—A power-driven self-propelled soil sifter for subterranean insects. In *Soil Zoology,* ed. by D. K. Kevan. Pp. 351-5.

Roberts, R. J., and Ridsdill Smith, T. J. (1972).—A Plough Technique for Sampling Soil Insects. *J. appl. Ecol.* 9:427-30.

Southwood, T. R. E. (1966).—*Ecological methods with particular reference to insect populations.* (Methuen:London.)

(Received for publication 12 May 1975)

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