



**BOOKLET FOUR**

Spreadmark Code of Practice:

# **Spread Pattern Testing & Certificaton for Fixed Wing Aerial Application of Solid Nutrients**

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# Introduction

This booklet is one of four booklets containing information that supports the Spreadmark Code of Practice for the Application of Nutrients in New Zealand.

The Spreadmark Code of Practice can be found [here](#).

This booklet forms part of the Code and all information related to copyright, document control, acknowledgements and glossary contained in the main Code apply equally to the information in this booklet.

Other booklets containing support information for the Spreadmark Code of Practice are:

- **Booklet 1:** Spreadmark Procedures, Protocols, Policies and Codes.
- **Booklet 2:** Technical Specifications for the Testing and Certification of Solid Nutrient Application Units.

- **Booklet 3:** Technical Specifications for the Testing and Certification of Conventional Boom Sprayers Applying Liquid Nutrient.

These booklets are supported by two technical documents listed below and found here:

<https://fertqual.co.nz/spreadmark/>

- Nutrient Application Specifications; and
- Nutrient Physical Properties - General Information.

Note: For solid products spread by helicopters and UAVs, refer to booklet two.

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# 1. PRINCIPLES

## Scope

In order to ensure that products are spread according to the requirements of the Spreadmark programme the following principles shall be followed with regard to the testing of nutrient applicator units. Operational matters are covered in the Code of Practice for Fertiliser Nutrient Management. <https://www.fertiliser.org.nz/Site/code-of-practice/>

## 1.1 Principles

- a. The spreader test procedure allows each spreader to be characterised so it can be set to accommodate variable product characteristics. The test procedure has been linked to international methods and practice, adapted to New Zealand conditions.
- b. Both indoor and outdoor testing is permitted for ground spreading units. For outdoor testing, requirements for wind speed and direction, angle of slope and nature of surface shall be set. Outdoor testing shall be carried out in a way that does not cause environmental contamination by overloading the test site. For indoor testing the test facility shall be of such a size as to not interfere with the test result.
- c. The evenness of product spreading shall be expressed as a Coefficient of Variation. The evenness of spread both across and along the direction of spreader travel is important. Application rate at the time of test and application rate calibration settings shall be recorded.
- d. To be Spreadmark Registered, application units must satisfy the performance standard for transverse CV% of 15% for nitrogenous nutrients and 25% for all other products.
- e. The spreadability of product depends on its physical characteristics, usually described by their bulk density (BD); uniformity index (UI); and size guide number (SGN). Spreading units shall be tested on a sufficiently wide range of products to provide a guide to the maximum safe bout width for the range of products the spreader distributes.

- f. Spreader certification testing shall be done at frequencies described in Section 3.4 (c) – (e) of the Spreadmark System Standard by Approved Spreading Unit Testers, who shall test spreaders in accordance with Spreadmark Technical Specifications for testing spreaders (refer Booklets 2-4). Testers shall prepare Spreader Performance Certificates and forward them to the company and to the Auditor.
- g. Spreader operators should use simple field tools (sieve box and bulk density measure) to estimate these parameters in the field and adjust the spreading units accordingly.
- h. Every certified spreader shall have, a unique identification number. For Groundspread vehicles spreader certification lapses if the bin changes to another vehicle.
- i. When spreaders are sold from a Spreadmark registered company to another Spreadmark registered company, the current Spreadmark Test Certificates can be transferred to the new owner. When spreaders are sold from a Spreadmark registered company to a non-Spreadmark registered company then the certificates lapse.

## 1.2 Testing

- a. There are two primary factors that determine whether nutrient is applied evenly and at the correct rate: the performance of the spreading unit; and the nutrient flow rate to that spreading unit.
- b. The performance of the spreading unit is determined by measuring the evenness of transverse and longitudinal distribution.
- c. The nutrient flow rate has two components; the average flow, which determines the application rate, and the momentary flow, which determines the longitudinal variation. The average flow rate is measured either directly when calibrating the spreader computer or can be determined by experience – the amount of product spread per unit area. Variations in momentary flow can be measured directly or indirectly by measuring the evenness of the longitudinal distribution.
- d. The interaction of these factors is complex and momentary changes in flow may affect transverse as well as longitudinal distribution.
- e. These two primary factors also interact with the operational conditions under which they are measured. It is necessary therefore to define the conditions under which they are measured. These are defined in the facilities section.





## 2. DATA COLLECTION

### General

- 2.1 The principal piece of information required is the spread pattern achieved. A spread pattern shall be available for a representative sample of baseline product for each application configuration. The spread pattern shall be established at one application rate that is typical or average for that used for the product.
- 2.2 Pattern test data for a fixed wing aircraft distribution system shall include:
- A graph of the swath pattern from a single pass;
  - A graph of the bout width vs. the CV% for evenness of application;
  - A record of maximum swath width; and
  - Wind speed and direction at the test site (relative to the flight path or the line of collectors)
  - Product physical properties, including SGN, UI and Bulk Density.
  - Application rate (intended and achieved, kg per ha)
  - Flight path (centreline collector)
  - Application height (estimated + or - 15ft)
  - Ground speed (knots/hr)
  - Collector size, spacing and number.
  - Weight of product per collector (gm)
  - Application unit type.
- 2.3 Collectors used shall comply with the Spreadmark specifications which are:
- Size shall be no less than 500mm x 500mm x 140mm deep;
  - Have suitable anti-bounce systems; or
  - As approved by the Fertiliser Quality Council.



# 3. DATA COLLECTION

## Application Unit

SPREADER UNIT TYPE	DATA	REPORT
<b>None</b>	Dimensions of outlet	.....mm long .....mm wide
	Type of outlet (clamshell/louvre/other)	
	Fairings (describe)	
	Front (inlet) dimensions	.....mm
<b>Ram Air</b>	Rear (outlet) dimensions	.....mm
	Number of vanes	



## 4. DATA COLLECTION and Reporting

4.1 A spread pattern is determined by flying the aircraft over a line of approved collectors, then retrieving and weighing the amount of nutrient retained in each collector. The data are used to plot a graph of the basic swath pattern from a single pass of the aircraft.

4.2 The following conditions must be met when measuring the transverse distribution pattern for an Approved Aerial Pattern Test Certificate. Wind speed and direction are particularly important along with the need to identify the flight path of the aircraft in relation to the line of collectors.

ITEM	REQUIREMENT
<b>Application unit</b>	Clean and sound working condition
<b>Hopper loading</b>	Hopper content to be not less than one quarter full at the conclusion of a pattern test
<b>Application rate</b>	The application rate measured at the nominated BW shall be within 30% of the nominated application rate
<b>Speed over collectors</b>	Normal operating speed
<b>Height above ground level</b>	Between 100 and 120 feet
<b>Number of passes over collectors</b>	One per spread pattern test
<b>Wind speed and direction</b>	Not greater than 15km/hr and not more than 15 degrees in direction of travel. Tests can be into or downwind but the ground speed of the aircraft shall be recorded.



## 5. REPORTING

5.1 Approved Aerial Spreading Unit Testers will, at the conclusion of the test, produce an Approved Aerial Pattern Test Certificate. An Aerial Pattern Test is approved by the Executive Director, Fertiliser Quality Council or their nominee.

5.2 The Certificate must show the data collected and include:

- a. The operators name and aircraft identification
- b. The Certified Bout Width for each nutrient tested –see Note below.
- c. The maximum spread width achieved (if required).

d. A description of the physical characteristics of the product used in the test including product name, bulk density (BD), uniformity index (UI), size guide number (SGN) and a graph of the particle size distribution.

e. The date of the test.

5.3 Refer to retesting requirements for fixed wing aerial spreaders in Section 3.4(f) of the Code of Practice.

*Note:* The Spreadmark Certified Bout Width is the maximum bout width where the CV is 15% or less for nitrogenous nutrients and 25% or less for non-nitrogenous nutrients.



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