OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

06916

United Nations Industrial Development Organization

Distr.
LIMITED
ID/WG.
Original: ENGLISH

Workshop on Fertilizer [illegible]
New Zealand, [illegible]

FINAL REPORT

id.70-447

CONTENTS

Annexes

INTRODUCTION

Organization of the Workshop

In accordance with resolutions of the Industrial Development Board, which has stressed the need for training national personnel for industrial development, UNIDO has carried out in-plant training programmes and workshops in the fertilizer field for the last three years in Europe. This was the first Workshop to take place in the Pacific Area.

The Workshop was organized by the New Zealand Fertiliser Manufacturers' Research Association (NZFMRA) with the support of the Government of New Zealand and of UNIDO. The principal objective was to give a group of selected persons from developing countries a concentrated course in fertilizer technology, which would otherwise require a long period of training in industry. The course was designed to emphasize modern methods for the production of fertilizers, processes, equipment design, distribution and materials handling.

The Workshop was convened at NZFMRA Research Station at Otara. Eleven participants were invited from eight developing countries; eleven observers attended from New Zealand and Australia. D. G. Will was assigned as liaison officer by the Foreign Office of the Government of New Zealand.

The Workshop included the following activities by the participants:

(a) Field trips to nine fertilizer manufacturing facilities, co-operatives and distribution centres located on the New Zealand South and North Islands;

(b) Visits to five academic, research and development and agricultural institutions;

(c) Attendance at the Fifteenth Technical Conference of NZFMRA for a two-day session at Auckland.

The programme of the Workshop was planned in close co-operation with the NZFMRA Director, J. Rogers and M. C. Verghese, Chief of the Fertilizers, Pesticides and Petrochemicals Industries Section of UNIDO. C. Keleti of UNIDO acted as Officer-in-Charge and J. Rogers was elected as Chairman. Rapporteurs for the the meeting were Mario Jarri (Johnson) of Chile, Raynaldo G. Lombarda of the Philippines and Harold E. Ng Kwing King of Mauritius.

I. FIELD TRIPS

The field trips organized for participants in the Workshop included:

(a) Visits to fertilizer-producing plants;

(b) Visits to fertilizer storage and distribution centres and to farmers' co-operatives, including also a visit to an aviation company specialising in the application of fertilizers by aerial methods as well as bulk handling and storage for distribution of fertilizer in the country;

(c) Inspection of agricultural research centres and fertilizer quality-control laboratories;

(d) Visit to a university agricultural engineering faculty.

In each case the time was made available for lectures by staff members, followed by a discussion period, to familiarize participants with the plant or research institution. At the fertilizer manufacturing plants participants inspected both operating and maintenance departments and had the opportunity to discuss questions with the plant management and maintenance engineers.

Twenty-three papers on fertilizer technology, distribution and handling were presented to the Workshop and summaries of these were distributed to the participants. (For the list of titles and authors see annex I; annex II contains an abridged "Review of fertilizer manufacturing facilities in New Zealand".)

Summary of comments by participants

The participants were impressed by the development of the phosphate fertilizer industry in New Zealand and by the relative capacity of the phosphate plants (a number of them produce 300,000 tons/year). They realised that the country is unique in its highly economic method of supplying nitrogen to the soil through fixation with clover. It is doubtful that such a scheme could be adopted by most developing countries whose different climates make grassland farming impossible. The co-operation between soil experts and farmers' co-operatives in providing the required "trace elements" to manufacture single superphosphate impressed the participants. They expressed the intention of promoting this type of co-operation in their own countries.

The bulk handling, transportation and application (in bulk) of fertilisers in New Zealand were of particular interest to the participants. These practices as well as aerial spreading could be adopted in developing countries when some of their present economic constraints have been overcome.

The participants also showed interest in the Government's policy of subsidizing superphosphate fertilizer intended for farmers without conflict of interest arising between competing manufacturing companies in the private sector.

Participants specializing in the maintenance of fertilizer plants in their own countries were interested in some of the equipment used, such as the Kelly filter for liquid sulphur, the "Bearing life detector" and a measuring instrument for tank-wall thickness.

The utilization of research institutes like the one visited at Ruakura to advise farmers on their soil deficiencies was noted as necessary for the increased economical use of fertilizers.

One of the participants noted that New Zealand has standardized the process technology for most of the newer plants for both sulphuric acid production and the manufacture of superphosphate. As all of them use the phosphate raw materials coming at present from the Christmas and Nauru Islands, their problems and solutions are very similar. The advantage of standardization is in the centralised storage and inventory for spare parts, thus reducing the capital tied up for each producing company. This is especially true for the equipment that has to be imported in many cases from distant countries.

Participants also remarked on the close and active relationship of the New Zealand Government with agriculture, research institutions and the fertilizer industry. The co-ordinated effort in these fields has resulted in the rapid development of New Zealand agriculture. Such effort was found to be lacking in most developing countries from which the participants came. The co-ordinating work done by the NZFMRA was noted as being instrumental in promoting the increased use of fertilizer, especially this organization's work in applied research in phosphate-rock feedstock and in encouraging its more efficient use by industry.

II. COUNTRY PAPERS

Country papers were presented by the 11 UNIDO participants from 9 countries: Chile, India, Indonesia, Malawi, Mauritius, Philippines, Sri Lanka and the United Republic of Tanzania. The papers are summarized in the following section. (For the list of participants, see annex II.)

Chile

In the paper presented by M. A. Farri (Johnson), the author indicated that sodium nitrate was still one of the main sources of nitrogen used in Chile. The present production capacities are:

Sodium nitrate (granular), 150,000 tons/year;

Sodium nitrate (crystalline), 140,000 tons/year;

Potassium nitrate (15-0-12), 200,000 tons/year.

These fertilizers are processed from indigenous saltpetre in the northern part of the country. The general trend is to modernize the existing plants and diversify the products to compete with urea and other nitrogen fertilizers.

The country's guano deposits have a composition of 0 to 14 per cent N, 12 to 14 per cent P_2O_5 and 2 per cent K_2O and are marketed as 5-20-6 by blending with sodium nitrate, TSP and potash. The present production is 18,000 to 25,000 tons/year. The granular product of guano is sold in 80 kg jute bags with plastic liners.

The future plans for the fertilizer industry include:

(a) Further exploitation of indigenous Chilean nitrate containing about 6 per cent $NaNO_3$ with estimated reserves of 100 million tons;

(b) Exploitation of sulphur of volcanic origin containing 47 to 50 per cent sulphur and estimated at 40 million tons; the deposits, however, are located at 3,000 to 4,500 metres above sea level;

(c) Exploitation of natural gas reserves in the Southern Magallanes area; the estimated reserves are 120 billion m^3. Consideration is being given the construction of an ammonia/urea export-oriented fertilizer complex, producing 1,000 metric tons/day;

(d) The construction of a triple superphosphate plant with a capacity of 120,000 tons/year near Ventama; and of a copper smelter using offgas for the manufacture of the sulphuric acid intermediates.

Single superphosphate is produced in Chile by CCSAF in a plant having a capacity of between 40,000 and 45,000 tons/year and, for triple superphosphate,

of 100,000 tons/year. Expansion of this plant has also been under consideration. Foreign investors are invited to participate in all new projects under consideration since Chile does not have the funds to process their programme.

India

In papers presented by Deb Kumar Moitra and Jayantha Rao Panchapu, the authors gave a resumé of their extensive survey of the fertilizer situation and future programmes in India.

The Indian fertilizer industry is already 45 years old, but only during the last 10 years have there been significant increases in the production of fertilizer. The country's requirements for food production will reach 200 million tons/year by 1985, i.e. at double the present rate, and to make this production possible the NPK requirements are estimated at 12 million tons/year, or about 4 to 5 times the present production. This goal should be possible to achieve provided modern agricultural practices are adopted and the extension services are intensified. A great effort is being made in India to increase the utilization of existing production facilities; both UNIDO and the International Bank for Reconstruction and Development (IBRD) are actively assisting in this effort. For the years 1968-1975 the average utilization of capacity in the nitrogenous industry was 60 per cent; in phosphate fertilizer plants only 56 per cent of the P_2O_5 capacity was used over the same period. The reasons for underutilization may be attributed to the feedstock used; process adopted; source of power supply; spare parts and standard in maintenance and operation.

Nitrogen production facilities using natural-gas, naphtha-steam reforming have achieved 78 per cent utilization, while those operating on partial oxidation of fuel average 75 per cent for the same period. The plants operating from solid feedstock, coal and lignite have proved to be the least efficient. In the manufacture of phosphate fertilizers, India is dependent on imported feedstock for phosphate and sulphur. Efforts to exploit indigenous phosphate are expected to account for 20 per cent of the P_2O_5 by 1980. Estimated reserves in different parts of the country are about 150 million tons.

As regards future developments in the Indian fertilizer industry, food production may be doubled by 1985 if the farmers' risks are reduced by motivating them to use modern agricultural practices, which in turn would necessitate a programme of expanding the agricultural extension services.

Plans for coal-based gasification plants to produce an additional 5 million tons/year of nitrogen are being given priority, although crude-oil feedstock from Bombay High may reduce the import gap by 1980. The expansion of the phosphate fertilizer industry is more likely to follow the example of the nitrophosphate industry in order to reduce the import requirements of sulphur. Exploitation of indigenous pyrites and phosphate ore deposits is being given top priority.

The fabrication industry for machinery and equipment is being expanded to reduce the reliance on imports for future plants and to standardize the equipment used in various plants.

The continued assistance of UNIDO is being solicited for large single-stream plant investments. The training of personnel in selected fields, such as management, operation and maintenance and instrumentation, is considered an area where such continued assistance will be requested. The Workshop held in New Zealand has provided an excellent forum for the exchange of information among developed and developing countries.

Indonesia

In two complementary country papers presented by Pramono Djojowikromo and Maraudin Pandjaitan, the authors summarized the present fertilizer production in Indonesia and outlined future plans in the nitrogen and phosphate or complex fertilizer sectors.

Indonesian agricultural development still has one of the highest priorities in the second five-year plan. In spite of the rapid expansion and ambitious plans to expand the nitrogen fertilizer industry, Indonesia is still a net importer of fertilizers as well as of rice.

If the current projects are completed by 1979, Indonesia is expected to have a surplus of nitrogen fertilisers for export of 200,000 to 300,000 tons/year with a total production of nitrogen exceeding 847,000 tons/year (on the basis of 80 per cent utilisation of installed capacities), using indigenous natural gas as a feedstock. Indonesia does not appear to suffer much from underutilization of plants. In fact, the PUSRI I fertiliser plant at Palumbang, commissioned in 1963, has operated close to or even above design capacity of 100,000 tons/year of urea.

PUSRI III ammonia/urea production facilities are expected to be commissioned in 1976 at North Bintang (East Kalimantan). A floating fertilizer plant is currently under construction and is expected to be completed in 1976 for producing 1,700 tons of urea per annum. In 1977, another ammonia/urea production plant with the same capacity is expected on-stream in West Java.

Feasibility studies are currently being undertaken for the construction of an NP/NPK fertilizer plant by Perum Petrokimia for 1,000 tons/day of which the bulk of the production will be TSP.

Malawi

In his paper A. E. Khoza stated that Malawi has no fertilizer industry at present. In the year 1973/74 the total imported fertilizer used in terms of nutrients amounted to 73,000 metric tons. Present forecasts indicate that by the year 1979/80 the total fertilizer consumption could reach 120,000 metric tons/year. UNDP has authorized UNIDO to act as executing agency in carrying out a feasibility study on establishing a viable project for constructing a fertilizer plant in Malawi.

Mauritius

In his paper H. E. Ng Kwing King stated that in 1974/75 the Mauritius Chemical and Fertilizer Industries Ltd (MCFI) was commissioned near the harbour of Port Louis. The plant is expected to produce 100,000 tons/year of NPK fertilizers as well as CAN (26 per cent); about 40,500 tons/year will be available for export. The feedstocks for this plant, ammonia, DAP and potash, are imported.

At present most of the fertilizer is used for the sugar-cane and tea production on the Island, which has 92,000 ha under cultivation. Future plans for the company have not been finalised. The production of both ammonia and phosphoric acid on the Island is being studied by the company.

Philippines

In a paper presented by F. J. M. Cabungcal, a review was given of fertilizer production in the Philippines which was started in 1953 by both the public and private sectors. There are presently four fertilizer companies having a rated capacity of 400,000 metric tons. The highest production rate of 304,500 metric

tons was achieved in [illegible]. Owing to various constraints such as shortage of feedstocks, power failures, lack of spare parts etc., this production rate has not been sustained since then, even though the yearly demand for fertilizers has increased from 53,000 tons in 1969 to 238,300 tons in 1974. The deficit is being met by imports. Plans for constructing a 1,000 tons/day ammonia plus 1,500 tons/day urea complex are under study, together with a 600,000 tons/year phosphatic fertilizer plant. The fertilizer industry in the Philippines is handicapped by insufficient funds and lack of technically qualified personnel. Assistance in these areas has been requested from UNIDO.

Sri Lanka

In his paper P. C. Gunawardena stated that Sri Lanka has no operating fertilizer plant to date. In November 1975 the Government was expected to award a contract to construct a 540 tons/day ammonia and 940 tons/day urea production complex. The feedstock for the plant would be naphtha from an existing refinery. Recently, Sri Lanka discovered indigenous phosphate deposits; so far about 25 million tons of reserves have been identified for exploitation. The present requirements of phosphate rock in the country are 85,000 tons/year. Plans are under way to build a plant for 100,000 tons/year capacity, which is to be expanded in the second stage to 300,000 tons/year at which point a sulphuric acid plant will be added with a capacity of 150,000 tons/year to manufacture superphosphates. For Sri Lanka, primarily an agricultural country, urea and ammonium sulphate are the most important requirements for increasing agricultural production.

In 1974, 79,500 tons of urea and 143,000 tons of ammonium sulphate were imported and used for rice, tea, coconut and rubber plantations. Estimates indicate that by 1980, 201,000 tons/year of urea and 84,500 tons/year of ammonium sulphate will be used in agriculture.

United Republic of Tanzania

The paper was presented by S. I. Nkalami.

The Tanzanian Fertilizer Company was commissioned in 1971. It is the only fertilizer producer in the country; it has a capacity of 105,000 tons/year of fertilizers. In 1974 the plant was still operating just below 60 per cent of

its rated capacity, and we have [illegible]
of power and water supply. It was [illegible]
increase to 70,000 tons/a.a. [illegible]
NPK complex fertilizer. [illegible]
imported. The country's [illegible]
year. Plans are under way [illegible]
the House of Parliament has [illegible]
off-shore natural gas for the [illegible]

III. THE FIFTEENTH TECHNICAL CONFERENCE OF THE NEW ZEALAND FERTILISER MANUFACTURERS' RESEARCH ASSOCIATION

The UNIDO participants all attended the two-day session of the Technical Conference of NZFMRA on 1[illegible] and [illegible] November 1975 (for the programme, see annex IV). The Conference sessions covered the following topics:

The New Zealand fertilizer industry in a changing world

Sources of phosphate raw materials in the Southeast Asia area

Impact of the "Clean Air Act" on selection of process equipment

Possible effects of cropping and afforestation on future fertilizer use

Fertilizer processing workshop

Fertilizer use workshop

The last two sessions were held concurrently and most UNIDO participants attended the workshop on fertilizer processing.

The papers presented were available in a preprinted form; the conference proceedings with the record of the discussions will be published and made available to all UNIDO participants in its final form with the approval of the Association. The full participation of the UNIDO participants clearly indicated their interest in the technical discussions.

IV. [illegible]

[illegible]

[illegible] was [illegible] ; and [illegible] acid:

(a) That New Zealand, [illegible] ;

(b) That a [illegible] ;

(c) That [illegible] ;

(d) That [illegible] ;

(e) That a method [illegible] ;

(f) That the technique [illegible] ;

(g) That it was feasible [illegible] manufacture of single superphosphate.

Recommendations

1. The majority of participants recommended at the conclusion of the Workshop that in view of its undoubted benefit it should be held every two years. They were of the opinion that the coverage of the phosphate fertilizer technology was very good. They also expressed the opinion that the future workshops could be of even more benefit to the developing countries if emphasis were given to:

(a) Training of production management;

(b) Training of production operators;

(c) Environmental protection regulations and the efficiency of double absorption systems used in the manufacture of sulphuric acid;

(d) Relative merits of single superphosphate application versus compound phosphates using phosphoric acid;

(e) Role of fertilizer companies in the distribution of fertilizers;

(f) Lectures, discussions, panels, especially when more complex operations were involved. (Most participants felt that the schedule of the programme was tight and did not give them enough time to formulate their questions for discussions during field trips.);

(g) Papers and research work on exploitation of new phosphate deposits and their treatment by industry.

2. Concerning the role of UNIDO in the Workshop, the group recommended that in future:

(a) Advance information about the workshop agenda should reach each participant before he left home;

(b) Increased emphasis should be given to management and operators' training in maintenance, corrosion, spare parts and processes;

(c) More information should be given on the way UNIDO provides technical assistance and the mechanics of requesting such assistance;

(d) Continued contact should be maintained with UNIDO and participants should receive UNIDO publications;

(e) Continued follow-up should be made of UNIDO projects and emphasis should be placed on their implementation in the field.

Annex I

LIST OF PAPERS PRESENTED AT THE WORKSHOP AND MADE AVAILABLE FOR THE PARTICIPANTS

Title	Author(s)
The development of fertilizer use in New Zealand	M. J. Bowers Kemptthorne Prosser and Co., Ltd.
Production planning based on historical data	M. A. Adamson and T. L. Muir Kemptthorne Prosser and Co., Ltd.
The aerial and trend distribution of fertilizers	G. Dyer and K. Gurney Institute of Agricultural Engineering Civil Air Laboratory
The needs of New Zealand soils and farmers for fertilizer	T. W. White Department of Soil Science Lincoln College
The effects of fertilizer works effluents on plants	G. T. Da Lincoln College
Fertilizer industry related studies in the University of Canterbury	A. G. Williamson Department of Chemical Engineering University of Canterbury
Training of junior supervisors	F. P. Crotty Technical Manager The East Coast Farmers' Fertilizer Co., Ltd
Indoctrination and training of plant	G. Bigg, Production Manager, and M. Jeffares, Personnel Officer, The East Coast Farmers' Fertilizer Co., Ltd
Preventive maintenance in fertilizer manufacture	J. A. Campbell General Manager The East Coast Farmers' Fertilizer Co., Ltd
Production planning based on historical data and modified by interpretation of likely future demand trends	Bay of Plenty Co-operative Fertilizer Co., Ltd
Distribution - the role of regional intermediate stores and on-farm storage to minimize peak loading on despatch and transport facilities, weather conditions, and to allow regular production schedules thus optimising plant use	Bay of Plenty Co-operative Fertilizer Co., Ltd

The fertilizer act and regulations	M. W. Brown Ruakura Agricultural Research Centre
Soil testing	E. Pawson Ruakura Agricultural Research Centre
Fertilizer analysis	M. W. Brown Ruakura Agricultural Research Centre
Library and information services	M. Kaye Otara Research Station New Zealand Fertilizer Manufacturers' Research Association (NZFMRA)
Evolution of fluorides, carbon dioxide and steam from superphosphate	K. R. Laing Otara Research Station, NZFMRA
Superphosphate - caking and granule strength	A. C. Herd Otara Research Station, NZFMRA
Calcium sulphate films	A. G. Charleston Otara Research Station, NZFMRA
Agronomy services and links with fertilizer manufacture	F. B. Muller Otara Research Station, NZFMRA
Techniques and application of herbage analysis	G. McSweeney Otara Research Station, NZFMRA
Receiving raw materials (P,K,S)	R. C. C. Pearce Northland Fertilizer Co., Ltd
Spare parts policy	W. B. Mackley Northland Fertilizer Co., Ltd
Operating manuals	T. Henry Northland Fertilizer Co., Ltd

Annex II

"A REVIEW OF FERTILISER MANUFACTURING FACILITIES IN NEW ZEALAND"
(By [illegible] N. [illegible])

All the fertiliser manufacturing works in New Zealand [illegible] granulated single superphosphate from sulphuric acid and imported phosphate rock.

Almost 70 per cent of the single superphosphate are manufactured by [illegible] companies located in the North Island of New Zealand. The total capacity [illegible] by 10 plants operated by 4 companies throughout the country was [illegible] 2.1 million tons of SSP per annum in the year 1973/74 and with the new sulphuric acid plants coming on-stream at Napier, Morrinsville and Otahuhu in the year 1976/77, the expected capacity will reach 2.0 million tons/year of SSP.

Sulphuric acid is manufactured by the contact process except at Waitara where the chamber process will remain in operation until 1977.

Most works use Bradley air-swept ring-roll grinding mills for the pulverizing of phosphate rock and Broadfield mixer and continuous dens for the manufacture of SSP. Various configurations of granulation circuit are incorporated to improve the storage and handling properties of the superphosphate product.

Mixtures of granulated single superphosphate incorporating lime, ground serpentine rock, nitrogen, potassium and trace element additives are produced at the various plants. The types of mixture produced depend on the type of farming, soils, climate etc. of the various areas serviced by the plants.

Raw materials

Phosphate rock is imported from Nauru Island, Ocean Island and, more recently, Christmas Island. Phosphate rock is purchased from the British Phosphate Commission (B.P.C.), a non-profit making organization formed in 1919 by the Governments of Australia, New Zealand and the United Kingdom to mine and distribute phosphates from Nauru and Ocean Islands to the member countries. The phosphate-mining rights of Christmas Island were purchased by the Australian and New Zealand Governments in 1948 and these phosphates too are distributed by the B.P.C. A small deposit of low-grade phosphate at Clarendon on the South Island was mined for a short time in the early days and again during the Second World War, but these deposits are now abandoned.

[illegible] is imported from various sources around the world depending on price and availability. The purchase and distribution is done through the Fertiliser Manufacturers Association, administered again through the N.F.C. The N.F.C. controls the purchase of stock and similar, makes shipping arrangements, arranges finance, and [illegible] operations at each port. In this way economies of operation are achieved. Costs are pooled so that each company pays the same landed price for raw materials and prices do not fluctuate each year. It is of interest to know that there is a source of sulphur in New Zealand at Lake Rotokawa near Taupo which is being mined on a small scale and will eventually supply a considerable portion of the needs of New Zealand.

The purchase of fertilizer such as potash, ammonium sulphate urea, concentrated superphosphate, trace elements and so on are the responsibility of the individual plants.

Marketing and distribution

The sale of fertilizers is not made direct to the dairy farmers, but through merchants who are paid a margin for arranging collection and delivery of fertilizer and for collecting payments. Sales are also made directly to some producer organizations such as the Fruit Growers Federation, dairy companies, trading societies and also to government organizations.

Another trend of recent years has been the operation of strategically placed intermediate bulk stores which allow storage of fertilizers well away from the plants. This has provided better service to the farmer and also reduced the effects of violent seasonal surges in sales volume from the plants.

Another factor affecting distribution is the regulation whereby transport of fertilizer by road for distances greater than 40 miles is not allowed where a rail service can be used.

Liaison between manufacturers and the farmers is accomplished largely through field officers and agronomists who advise on fertilizer use, put forward fertilizer recommendations, arrange field trials and soil tests, and conduct meetings and seminars to promote the use of fertilizer. A monthly newsletter is also published. A number of companies have similar sales promotion systems.

[illegible]

[illegible]

The first [illegible] was passed in [illegible] and [illegible] years after the start-up of the first [illegible] plant with the passing of the "Manure Adulteration Act" in [illegible]. This act and its subsequent fertilizer acts and amendments were administered by the Department of Agriculture. All standard fertilizer mixtures have to be registered with the Department with details of composition, elemental analysis and description. (See "Certificate of Analysis" attached). The fertilizer regulations detail methods of sampling and analysis, limits of error in mixture composition, fineness of grinding of additives and purity requirements, labelling and so on. Check analyses are carried out by the Department of Agriculture from time to time.

Price control regulations and subsidies

The prices charged for fertilizers are strictly controlled by the government Department of Trade and Industry, under the Price Stabilisation Regulations 1974 (previously "Control of Prices Act" 1947). Each year on 1 June the individual fertilizer companies submit to the Department of Trade and Industry information on which their fertilizer prices for the following year are set. The information required consists of actual and predicted profit and loss statements, balance sheets, working costs, capital expenditure, sales volumes for superphosphate and additives, raw material costs, intake costs and various other details. The Department of Trade and Industry then reviews this information from all the companies and decides on prices for the various products; the prices are then gazetted and the companies are only then allowed to adjust their prices. Prices vary from plant to plant.

In addition to controlling the price of fertilizers by the above means the Government has introduced various subsidies which reduce the cost of fertilizers to the farmers. The price of single superphosphate has been stabilized by the introduction of subsidies to cover increases in the purchase price of rock and sulphur, increases of raw material costs resulting from New Zealand's recent devaluation, and subsidies which also cover cost increases resulting from the downturn of business in 1974 and 1975. The price paid by a farmer for super-

[illegible] Hornby plant may, for instance, be $NZ 4.50 per ton, compared [illegible] of imported material, at $NZ 11.00 per ton.[1] The [illegible] has limited the continued use of fertilizer by farmers [illegible] of fertilizer is forecast to rise 10% p.a. This contrasts markedly with the disastrous performance of the Australian fertilizer industry in which recent years were [illegible] period.

In addition to these subsidies in the manufacture of fertilizers the Government subsidizes the use of fertilizer by [illegible] and aerial application of fertilizer.

Other regulations

Many other regulations affect the fertilizer industry in various forms. Chief among these are the "Clean Air Act", the "Dangerous Goods Act", the "Agricultural Chemicals Regulations", the "Weights and Measures Regulations", the "Machinery Act" as well as the many regulations governing conditions of employment and payment of wages.

Future

New Zealand will remain dependent on the produce of the land for import earnings for many years to come, thus assuring a steady future for the fertilizer manufacturers. The low-cost production processes for single superphosphate will undoubtedly remain the major sources of phosphorus. Most raw materials will continue to be imported, although it is possible that sulphur sources in the North Island may be increasingly utilized, and that nitrogenous fertilizers will be manufactured using the recently discovered sources of natural gas off the southwest coast of the North Island.

Bibliography

Accountants journal (Wellington) p. 101-103, October 1965.

Chemistry and industry in New Zealand (Auckland) p. 334-337, August 1966; p. 5-6, June 1967; p. 10-11, March 1969.

Evans, B. L. A history of agricultural production and marketing in New Zealand.

Le Pine, B. V. Down to earth, the revolution that came by air.

New Zealand. Ministry of Agriculture and Fisheries. Economics Division. Statistical review of fertilizers in New Zealand, 1972/73. Auckland, 1973.

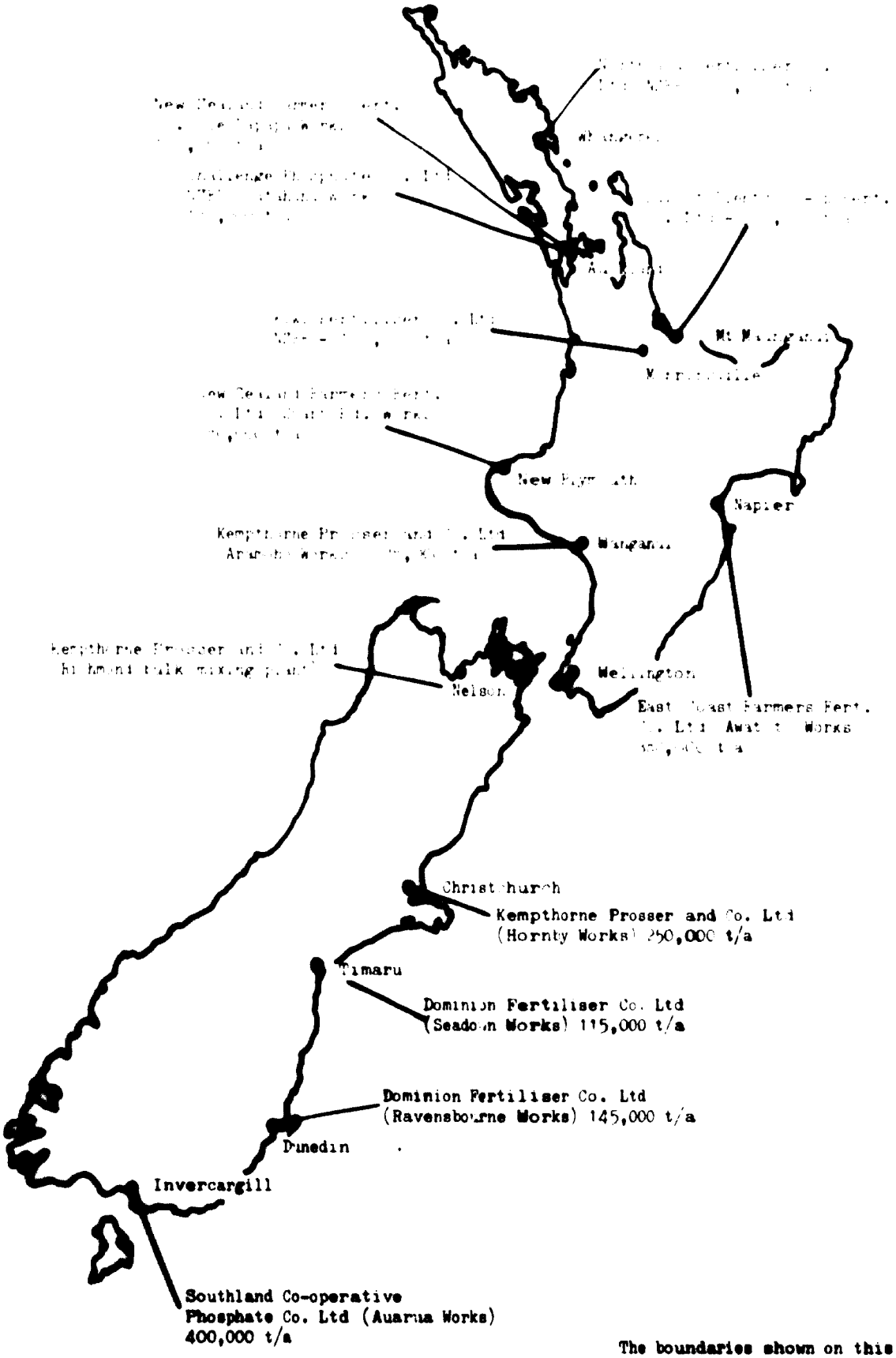
New Zealand fertilizer journal. 6: 16-17, November 1955; 8: 201, November 1956; 10: 16-17, August 1957; 18: 18-19, June 1961; 19: 14-15, December 1961; 25: 6-7, December 1964; 28: 13-15, June 1966; 32: 9-12, June 1968.

New Zealand journal of agriculture (Auckland) p. 186-197, August 1957.

New Zealand meat producer. p. 20-23, May 1960.

---

[1] $NZ 1 = $US 1.02.



The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

CERTIFICATE OF ANALYSIS

[illegible]

We Kempthorne Prosser & Company Ltd., hereby certify that the fertilisers sold by us this day and as stated herein contain the fertilising elements shown below

REGISTERED BRAND	[illegible]					[illegible]					
[redacted]	[illegible] Super										
	Superphosphate										
	Lime Reverted Super										
	Serpentine Reverted Super										
	Boron Super										
	Cobalt Super										
	Copper Super										
	Molybdic Super										
	Multipurpose Fertiliser	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
	Nitrogen Super	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]				
	10% Potash Super	[illegible]	[illegible]	1	[illegible]			1			
	10% Sulphur Super		[illegible]		[illegible]			[illegible]			
	Potato Fertiliser	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
	Wheatphos ... 4.0 Super		[illegible]		[illegible]			[illegible]		[illegible]	
	Turnip & Rape Fertiliser	[illegible]		[illegible]	[illegible]	[illegible]		[illegible]			
	Boron ... & Rape Fertiliser	[illegible]			[illegible]	[illegible]		[illegible]			
	Lucerne Sowing Fertiliser		[illegible]		[illegible]			1			
	Lucerne High K Fertiliser	[illegible]	1	24	[illegible]				[illegible]		[illegible]
	Lucerne Fertiliser	0	[illegible]	14	[illegible]			1	[illegible]	[illegible]	
	Canty ... Orchard Fertiliser	[illegible]		[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]		
	Horticultural Fertiliser	8	4	8	16	8.[illegible]	8	2.4	4		8
	Cropmaster "Boost"	6	0	20	0	6.[illegible]	6	[illegible]		20	
	Cropmaster "Hi-Yield"	9	12	15	0	9.[illegible]	9	[illegible]	12	15	
	Cropmaster "Extra"	12	15	10	0	12.0	12	15	15	10	
	Cropmaster "Premium"	15	[illegible]	5	0	15.0	15	[illegible]	[illegible]	5	
	Cropmaster "D.A.P."	18	20	0	[illegible]	18.0	18	20.0	20		
	Potassium Chloride	0	0	48	0					48	
	Ammonium Sulphate	21	0	[illegible]	24	21.0	21				
	Liquid Nitrogen	20	0	0	[illegible]	20.0	20				
	Special Mixture										
	Sodium Nitrate	16	0		[illegible]	16.0	16				
	Urea	46	0	0	0	46.0	46				
	Nitram (Ammonium Nitrate)	34		[illegible]		34.0	34				
	C.A.N. (Calcium Ammonium Nitrate)	26	0	0	0	26.0	26				
	Potassium Sulphate	0	0	40	[illegible]					40	
	Triple Super	0	20	0	0			19.5	20		
	Potassium Nitrate	13	0	38	0	13.0	13			38	
	Sulphur Coated Urea (Gold N)	32	0	[illegible]	[illegible]	[illegible]	32				

Annex II

LIST OF PARTICIPANTS

[illegible]

[illegible]

[illegible], Mrs. A.

[illegible]

India

[illegible], Dr. K.

[illegible]

[illegible], Jayantilal P.

[illegible]

Indonesia

[illegible], Prof.

[illegible]

Purbaiman, Marsudin

[illegible]

Malawi

Khoza, Armstrong E.

Deputy Secretary
Ministry of Agriculture and Natural Resources
P.O. Box 30134
Capital City, Lilongwe 3

Mauritius

Ng Kwing King, Harold E.

Shift Production Supervisor
The Mauritius Chemical and Fertilizer
Industry Ltd
Fort Georges, Port Louis

Philippines

Cabunggal, Filemon J. N.

Production Consultant
Fertilizer Industry Authority
6th Floor Rajah Sulaiman Building
Lezaspi Village, Makati Rizal

Lomarda, Reynaldo G.

Production Manager
Planters Products, Inc.
P.O. Box 3447, Manila

Sri Lanka

Gunawardena, Percy — Mechanical Engineer
State Fertilizer Manufacturing Corporation
21 Anderson Road
P.O. Box 1344, Colombo 5

United Republic of Tanzania

Nkalami, Suphian I. — Deputy Chief Engineer
Tanzania Fertilizer Company Ltd
Private Bag, Tanga

Observers

Australia

Abbott, Clifford A. — Technical Superintendent - Phosphate Project
B. H. South Ltd
P.O. Box 194C G.P.O.
Melbourne, Victoria 3001

Charles, Ivo — Production Superintendent
Consolidated Fertilizers Ltd
P.O. Box 140
Morningside, Brisbane
Queensland 4170

Hoare, John — Research and Development Engineer
The British Phosphate Commissioners and
Christmas Island Phosphate Commission
515 Collins St.
G.P.O. Box 784
Melbourne, Victoria 3000

Kreuiter, Ross J. — Manager
Greenleaf Fertiliser Ltd
P.O. Box 148
Mayfield, New Castle
New South Wales 2304

Richards, Robert I. — Senior Works Engineer
The Phosphate Co-operative Company of
Australia Ltd
P.O. Box 1322L
North Shore, Victoria 3001

Russell, Richard U. — Market and Research Officer
Nauru Phosphate Corporation
227 Collins Street
Melbourne, Victoria 3000

New Zealand

Carran, Robert A. — Scientist
Grasslands Division, DSIR
Gore Regional Station
Private Bag, Gore

[illegible], Francis P.	[illegible] [illegible] P.O. Box [illegible], [illegible]
Lawlor, John V.	[illegible] [illegible] P.O. [illegible], [illegible]
Mallon, [illegible] E.	[illegible] New Zealand [illegible] [illegible], Auckland
Markham, Alan J.	[illegible] New Zealand Farmers' Co-operative Association of Canterbury, Ltd Box [illegible], Auckland
Matson, Alan J.	Soil Chemist Soil Bureau, DSIR Private Bag, Lower Hutt
Miller, Grant A.	Works Manager The Southland Co-operative Fertiliser Co., Ltd Box 844, Invercargill
Murdoch, Keith H. M.	Chief Chemist Dominion Fertilizer Co., Ltd P.O. Box [illegible], Dunedin
Rogers, John	Director of Research New Zealand Fertiliser Manufacturers' Research Association P.O. Box 23-637, Papatoetoe East
Rothbaum, Henry P.	Scientist Chemistry Division, DSIR Private Bag, Petone
Spedding, Peter L.	Professor Department of Materials and Chemical Engineering University of Auckland Private Bag, Auckland
Thomas, David L.	Chemical Engineer New Zealand Fertiliser Manufacturers' Research Association P.O. Box 23-637, Papatoetoe East
Will, Donald G.	Training Officer External Aid Division Ministry of Foreign Affairs Private Bag, Wellington
Yuill, John	Chief Executive Officer (Finance) Ministry of Agriculture and Fisheries P.O. Box 2298, Wellington

UNIDO

Keleti, C.	Officer-in-Charge of the Workshop

Annex IV

PROGRAMME OF THE FIFTEENTH TECHNICAL CONFERENCE OF THE NEW ZEALAND FERTILISER MANUFACTURERS' RESEARCH ASSOCIATION

Wednesday, 19 November

Symposium - The New Zealand Fertiliser Industry in a Changing World: Chairman - D. H. Murdoch

(1) "The Energy Crisis and Fertilisers in New Zealand Agriculture", T. W. Walker, Lincoln College

(2) "Effects of Stabilisation of Farm Incomes on the Fertiliser Industry", K. C. Durrant and L. I. Bryant, Ministry of Agriculture and Fisheries

(3) "Growth in New Zealand Fertiliser Industry Technology over the Last Two Decades, and Some Thoughts about the Future", R. A. Warburton

Symposium - Sources of Phosphate Raw Materials in the Southeast Asia Area: Chairman - I. K. Walker

(1) "High Temperature Calcination of Christmas Island 'B' Grade Phosphate - A Trial Run", J. S. Hoare, British Phosphate Commissioners

(2) "Design and Installation of a High Temperature Calciner for Nauru Phosphate", R. U. Russell and L. A. Newcombe, Nauru Phosphate Corporation

(3) "Development of the Duchess Phosphate Deposits", C. A. Abbott, BH South Ltd

(4) "Review of FMRA Research Work on Phosphate Sources", M. S. White, FMRA

(5) "UNIDO's Assistance in Developing Chemical Fertiliser Industry", C. Keleti, UNIDO

Thursday, 20 November

Fertiliser Processing Workshop: Chairman - J. A. Campbell

(1) "The Economics of Acid Storage Tank Design", W. B. Mackley, NZFP

(2) "Practical Aspects of Power Costs in a Fertiliser Works", J. V. Lawlor, NZFP

(3) "Air Cooling of Sulphuric Acid", S. A. Clark, KP

(4) "BM30 Mill Operation", P. P. Crotty, NCFP

(5) "Reduction of Dust Emission from BM20 Mill Wet Scrubbers", P. W. King, Bay of Plenty

(6) "Operation of Vibco F130 Pulse Jet Dust Collector", W. K. McCully and L. J. Johns, KP

(7) "Operation of Dust Collectors", T. I. Henry, NZFP

(8) "Better Control and Use of Fertiliser Hopper B.O. Control Rooms", V. H. Smith and A. L. Lewis, Dominion

(9) "Den Scrubber Installation", G. A. Mackie, Southland

(10) "Continuous Fluoride Analysis", D. L. Thomas, FMRA

(11) "Ammonia Oxidation Plant", F. Rietmaier, KF

Fertiliser Use Workshop: Chairman - W. M. H. Saunders

(1) "Effect of the Quality of Winter Spot N-ration on Pasture Production in Southland", W. H. Rice, Southland

(2) "Lime Response and Affect [illegible] Tarawera Yellow Brown Loam Soils", L. H. Matcham, NZFF

(3) "The Effect of Magnesium Fertilisation on Pasture Production, Magnesium Uptake on a Yellow Brown Pumice Soil", J. F. Evans, NZFF

(4) "A Review of the Occurrence of Boron Deficiency and the Economic Agronomic Use of Boron Compounds in Canterbury, Marlborough, Nelson and Westland", W. J. Jordan, KF

(5) "Review of Copper Research in Northland", D. N. Rowley, Northland

(6) "Agronomic Studies on the Availability of Copper and Boron Materials", P. B. Muller and G. McSweeney, FMRA

(7) "A Study of the Use of Liquid Urea 20% N Solution and Nutrition on Potatoes", G. E. Mallon, NZFF

(8) "Some Aspects of the Formulation and Marketing of Horticultural Fertilisers", L. M. Anderson, KF

(9) "Migratory Loss of P from Ground Stored Fertiliser", J. E. Mauger, ECFF

(10) "Notes on Fertiliser Requirements, with Particular Reference to Phosphate Retention", B. T. Robertson, ECFF

(11) "Use of Herbage Analysis", A. A. Duncan, Dominion

(12) "Fertiliser Advice", R. G. Bonner, Kiwi

Symposium - Impact of the Clean Air Act on Selection and Operation of Equipment: Chairman - R. T. Douglas

(1) "Impact of Clean Air Act on Sulphuric Acid Plant Operations", P. P. Crotty and G. N. Chapman, ECFF

(2) "Den Scrubbing", C. W. Harland and W. E. Russell, NZFF

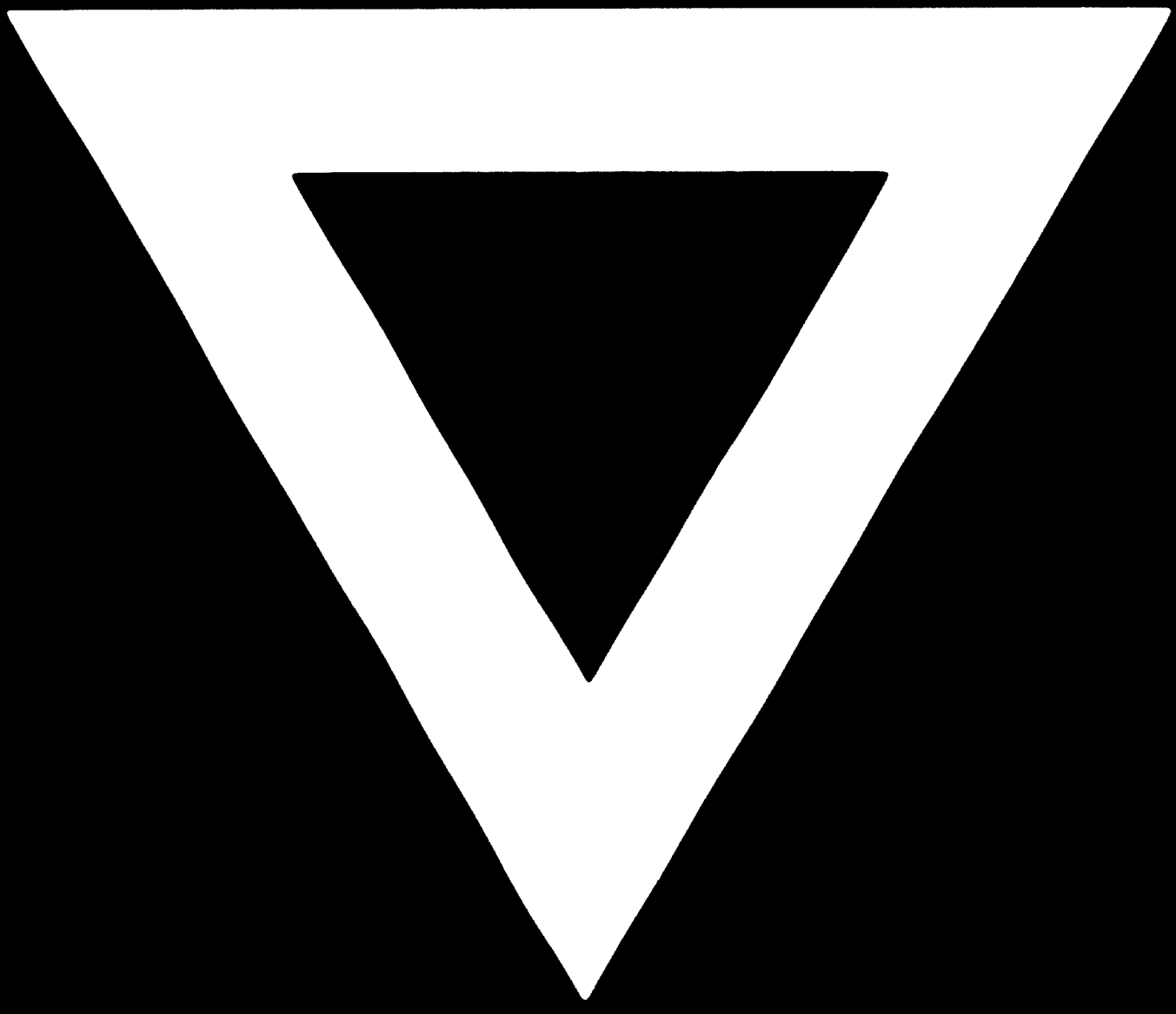
(3) "Dust Collection in the Fertiliser Industry", P. L. Spedding, University of Auckland

Symposium - Possible Effects of Cropping and Afforestation on Future Fertiliser Use: Chairman - T. W. Walker

(1) "Fertiliser Requirements for Crops", J. A. Douglas, MAF

(2) "Present and Projected Use of Fertilisers in New Zealand Forestry", G. N. Will and R. Ballard, Forest Research Institute

(3) "Forest Farming and its Effect on Fertiliser Usage", R. L. Knowles and J. R. Tustin, Forest Research Institute



76. 06. 30