[Chap6704]CHAPTER 67:04

FERTILIZERS, FARM FEEDS AND REMEDIES

ARRANGEMENT OF SECTIONS

SECTION

12 of 1970

9 of 1991

8 of 1996

G.N. 34/1989

An Act to provide for the registration of sterilizing plants and certain remedies; to provide for the establishment of committees for fertilizers, farm feeds and remedies; to regulate and restrict the sale of fertilizers, farm feeds and certain remedies, and substances of animal origin intended for the manufacture of fertilizers or farm feeds and to provide for matters incidental to the foregoing

[1ST APRIL 1970—FERTILIZERS AND STERILIZING PLANTS]

23RD AUGUST 1973—FARM FEEDS 1ST MAY 1989—REMEDIES 10TH MAY 1991

[Ch6704s1]1. Short title

This Act may be cited as the Fertilizers, Farm Feeds and Remedies Act.

[Ch6704s2]2. Interpretation

In this Act, unless the context otherwise requires—

"advertisement" includes any statement, picture, design or device—

(a) published in any newspaper or public print; or

(b) contained in any handbill, circular or other matter which is distributed to members of the public through the post or brought to the notice of the public in any other manner whatsoever;

"analyst" means a person appointed to be an analyst under section 11;

"brand" means the impression or representation of any letter, number, geometrical figure, mark, sign or symbol and includes any combination of such impressions or representations;

9 of 1991"committee" means any committee established under section 7A;

"compost" means vegetable matter or mixed vegetable and animal matter so decomposed as to form an organic manure;

"farm feed" means—

(a) (i) any substance obtained by a process of crushing, gristing or grinding or by the addition to any substance the removal therefrom of any ingredient;

(ii) any condimental feed or mineral substance which possesses or is alleged to possess nutritive properties; or

(iii) any substance of animal origin, which is intended or offered for the feeding of poultry, domestic animals or livestock;

(b) any stock lick or substance which can be used and is used as a stock lick, whether or not such stock lick or substance possesses medicinal properties;

(c) any substance declared by the Minister, by notice published in the Gazette, to be a farm feed for the purposes of this Act,

but does not include straw, chaff, unground hay, silage, cereal in the grain, or any substance which falls within this definition but which has been crushed, gristed or ground for a farmer in accordance with his directions for own use, unless such substance has been declared to be a farm feed under paragraph (c);

"farmer" means a person who devotes his attention to farming in Malawi, either exclusively or together with some profession, business or other occupation;

"farming requisite" means any fertilizer, farm feed or remedy, or any substance used in the manufacture of a fertilizer, farm feed or remedy;

"fertilizer" means any substance which is intended or offered for improving or maintaining the growth of plants or the productivity of the soil, but does not include farmyard or stable manure, kraal manure, compost, wood ash, gypsum, town refuse or night soil when sold in its original condition and under its name;

"inspector" means a person appointed an inspector under section 11;

9 of 1991"registrar" means the person appointed under section 7;

"remedy" means any substance which is intended or offered—

(a) for the destruction of any noxious plant or insect;or

(b) in regard to poultry, domestic animals, livestock or plants, for the prevention, treatment or cure of any disease, infestation or other unhealthy or unfavourable condition, or for the maintenance of health, but does not include any substance prescribed by a veterinarian for a specific patient or group of patients;

"sell" includes to offer, advertise, keep, expose, transmit, convey, deliver or prepare for sale or exchange, or to dispose of for any consideration whatever, or to transmit, convey or deliver in pursuance of a sale, exchange or disposal as aforesaid;

"sterilizing plant" means a plant used for the sterilizing of bones or other substances derived from an animal carcass.

[Ch6704s3]3. Restriction on sale, etc., of remedies

8 of 1996No person shall import, sell or distribute any remedy unless—

(a) it is registered under this Act;

(b) it is packed in the prescribed manner;

(c) the container in which it is sold complies with prescribed requirements and is branded, labelled, marked or sealed in the prescribed manner; and

(d) it is of the composition, efficacy, fineness and purity specified in the application for its registration, and possesses all other properties specified in such application:

Provided that any remedy shall be deemed to comply with paragraph (d) if its composition varies within such limits as may be prescribed.

[Ch6704s4]4. Use of sterilizing plant

No person shall use any sterilizing plant for the sterilizing of bones or other substances derived from an animal carcass unless such plant has been registered under this Act.

[Ch6704s4A]4A.Security of supply

8 of 1996The Minister may, for the purpose of ensuring supply of farm requisites, and on such terms and conditions as he deems fit, enter into arrangements with any supplier of farm requisites, or person dealing with farm requisites.

[Ch6704s5]5. Repealed by 8 of 1996

[Repealed by 8 of 1996.]

[Ch6704s6]6. Minister may exclude any fertilizer, farm feed or remedy from the Act

Subject to such conditions as he may therein specify, the Minister may by order exclude any fertilizer, farm feed or remedy from the operation of any or all the provisions of this Act.

[Ch6704s7]7. Registrar

9 of 1991(1) The Minister may appoint a public officer serving in the Ministry of Agriculture to be the Registrar for the purposes of this Act.

(2) The Registrar shall be secretary to every committee established under this Act and shall perform such other duties as the Minister or the chairman of the committee may assign to him.

[Ch6704s7A]7A.Committees

9 of 1991(1) The Minister may establish any number of committees for the purposes of this Act and such committees shall act in accordance with and be subject to any special or general directions of the Minister.

(2) Committees under this section may be established for the following functions—

(a) to advise the Minister on matters relating to the registration, sell and use of fertilizers, farm feeds or remedies;

(b) to keep a record of fertilizers, farm feeds or remedies; and

(c) to consider and deal with such matters as the Minister may refer to it or require of it.

[Ch6704s7B]7B. Composition of committees

(1) The Minister shall, by notice published in the Gazette, appoint the members of any committee established under this Act.

(2) The Minister may appoint to the committee such additional members as he deems essential to the committee in the exercise of its powers and functions.

(3) No person shall be appointed to the committee who—

(a) is an undischarged bankrupt;

(b) has, within three years last past, been convicted of an offence under this Act;

(c) has, within three years last past, been convicted of an offence under any written law and been sentenced therefor to imprisonment for a term of six months or more without the option of a fine; and

(d) has, within five years last past, been convicted of an offence involving fraud or dishonesty.

(4) Members of the committee shall not, by virtue only of their appointments to the committee be deemed to be officers in the public service.

(5) The names of all members of the committee as first constituted and every change in membership thereof shall be published in the Gazette.

[Ch6704s7C]7C. Committees may co-opt persons to attend meetings

(1) A committee may co-opt any one or more persons to attend any particular meeting for the purpose of assisting or advising the committee in respect of any particular matter under consideration by the committee.

(2) Any person co-opted pursuant to subsection (1) may take part in the deliberations of the committee at any meeting he so attends, but shall have no voting powers.

[Ch6704s7D]7D. Tenure of office of committee members

(1) Members of the committee shall, subject to the provisions of this section, hold office for a period of not exceeding two years as may be specified in their respective appointments.

(2) Ex officio members of any committee shall hold office as such so long as they hold the office by virtue of which they are members of the committee.

(3) A retiring member shall be eligible for reappointment.

(4) On the expiry of the period for which a member, other than an ex officio member, is appointed he shall continue to hold office until his successor has been appointed, but in no case shall such further period exceed three months.

(5) The office of a member, other than an ex officio member, shall be vacated—

(a) upon the happening to him of an event which would disqualify him from appointment;

(b) upon his death;

(c) if he is adjudged a bankrupt;

(d) if he is convicted of an offence under this Act;

(e) if he is convicted of an offence under any other written law and sentenced therefor to imprisonment for a term of six months or more without the option of a fine;

(f) if he is convicted of an offence involving fraud or dishonesty;

(g) if he is absent from three consecutive meetings of the committee without the permission of the chairman or the committee or without valid excuse;

(h) upon the expiry of one month’s notice in writing of his intention to resign his office given by him to the Minister;

(i) upon the expiry of one month's notice in writing terminating his appointment to such office given to him by the Minister;

(j) if he becomes mentally or physically incapable of performing his duties as a member of the committee; and

(k) if the Minister so directs.

[Ch6704s7E]7E. Allowances payable to members

The Minister may pay to all or any of the members of a committee such allowance as he may determine as honorarium or for attending to the specific business of the committee.

[Ch6704s7F]7F. Meetings of the committee

(1) A committee may meet at such places and times as the chairman of the committee may determine or as he may be directed by the Minister and such meetings shall be convened by notice to the members given by the chairman.

(2) At every meeting of the committee the chairman or, if one be appointed, the vice-chairman shall preside and in their absence, the members present shall elect one of their number to preside at that meeting and the person so elected shall have all of the powers and shall perform all of the duties of the chairman for that meeting and the person presiding shall have deliberative and a casting vote.

(3) Save where otherwise provided by this Act, a committee shall conduct its proceedings in such manner as may be directed by the Minister or, in the absence of such direction, in such manner as a committee deems fit.

(4) Minutes of each meeting of a committee shall be kept by the Registrar and shall be confirmed at the succeeding meeting by the committee.

(5) At every meeting of a committee the quorum shall be constituted by a majority of its membership.

[Ch6704s7G]7G. Non-liability of members of the committee

No member of the committee shall be personally liable for any act or default of his, or of the committee, done in the exercise in good faith of the functions of the committee.

[Ch6704s7H]7H. Members to declare interests

(1) If a member of the committee or his spouse, or any company of which he or she is a director or major shareholder, or any partner of such member or a partner of his spouse has or acquires any pecuniary interest, direct, or indirect, in any matter in which his private interests conflict with his duties as a member and which is the subject of consideration by the committee he shall, as soon as he becomes aware of such interest in such matter, disclose the facts relating thereto to the committee and the Minister.

(2) A member referred to in subsection (1) shall not take part in the consideration of, or vote on, any question before the committee which relates to the matter referred to in that subsection.

(3) For the purposes of this section, the expression “major shareholder” means any person who, at the relevant time, in his own right or by right of any other person, has the power to exercise or control not less than ten per centum of the voting rights in the relevant company, whether by reason of share holdings, debenture holdings, proxy or otherwise.

[Ch6704s08]8. Registration of remedies and sterilizing plants

9 of 1991, 8 of 1996(1) An Application for the registration of a remedy or sterilizing plant shall be made to the Registrar in the prescribed form for consideration by the relevant committee established under section 7A.

(2) As soon as practicable after the receipt of an application under subsection (1) the committee shall—

(a) if it is satisfied that the remedy or sterilizing plant in question is suitable and sufficiently effective for the purposes for which it is intended and complies with the prescribed requirements, register such remedy or sterilizing plant; or

(b) if it is not satisfied in accordance with paragraph (a), refuse to register such remedy or sterilizing plant.

(3) Any registration under this section shall be valid until cancelled under this Act or until and including the 31st March next after the date of such registration, whichever is the earlier.

(4) The committee may impose such conditions in regard to any registration under this section as it thinks fit.

(5) Any person who fails to comply with any condition imposed under subsection (4) or with any such condition as amended by the Minister under section 10 (2) shall be guilty of an offence, and shall be liable to a fine of K10,000 and to imprisonment for a period of 12 months.

[Ch6704s09]9. Cancellation of registration

9 of 1991, 8 of 1996If the committee referred to in section 8 is satisfied—

(a) that any person has failed to comply with any condition subject to which any remedy or sterilizing plant had been registered;

(b) that any remedy or sterilizing plant registered under this Act does not comply with any regulation made under this Act; or

(c) that any sterilizing plant registered under this Act does not sterilize bones or other substances derived from an animal carcass effectively,

the committee, may cancel the registration thereof.

[Ch6704s10]10. Appeal against decision of registering officer

9 of 1991, 8 of 1996(1) Any applicant for the registration of any remedy or sterilizing plant who is aggrieved by the decision of the committee referred to in section 8 to refuse registration or to impose conditions in regard thereto or to cancel any registration, may appeal to the Minister against such decision.

(2) Upon such appeal the Minister may uphold the decision of the registering officer or make an order instructing the committee—

(a) to register the remedy or sterilizing plant in question;

(b) to strike out all or any of the conditions imposed by the committee or to amend such conditions; or

(c) to restore the registration, and the committee shall comply with such order.

(3) Any decision of the Minister under this section shall be final and shall not be questioned in any court.

[Ch6704s11]11. Appointment of inspectors and analysts

The Minister may appoint persons as inspectors and analysts for the purposes of this Act.

[Ch6704s12]12. Powers of inspector

(1) An inspector or any other officer specially authorized thereto by the Minister may at all reasonable times—

(a) enter upon any premises, place or vehicle at or in which there is or is on reasonable grounds suspected to be any farming requisite or sterilizing plant;

(b) inspect any farming requisite or any sterilizing plant or any other machinery utilized in connexion with the manufacture of any farming requisite, or any book, record or document found in or upon such premises, place or vehicle;

(c) seize any farming requisite, book, record or document found in or upon such premises, place or vehicle which appears to afford evidence of a contravention of any provision of this Act;

(d) take samples of any farming requisite in such quantities as may be necessary for the purpose of examination or analysis under this Act:

Provided that any officer specially authorized by the Minister under this subsection shall on request produce his authority to enter upon any such premises, place or vehicle.

(2) The inspector or the officer specially authorized under subsection (1) shall give a receipt to the person from whose custody any farming requisite, book, record or document has been taken under subsection (1) (c). Such farming requisite, book, record or document shall be returned to the person from whose custody it was taken immediately after it has been decided that no prosecution will be instituted or the trial of the relevant person has been concluded, as the case may be:

Provided that such farming requisite shall not be returned at the conclusion of such trial if it has been declared forfeited under section 13.

(3) Any sample taken under subsection (1) (d) shall be taken in accordance with the methods prescribed and in the presence of the person who is in charge of such farming requisite or his representative, and such sample shall, in the presence of such person or such representative be divided into three parts, each of which shall forthwith be fastened up and sealed and suitably labelled or marked in such manner as its nature may permit. One part shall then be transmitted to an analyst together with a certificate in the prescribed form signed by such inspector or officer. The second part together with a copy of the aforesaid certificate shall be handed or forwarded under registered cover to the owner or seller of such farming requisite or to his agent. The third part shall be retained by the inspector or officer aforesaid.

(4) The analyst to whom one part of a sample has been transmitted under subsection (3) shall with all convenient speed analyse or test the article delivered to him, and the result of the analysis or test shall be stated in a certificate in the prescribed form.

(5) The owner of the farming requisite from which the sample was taken may claim from the Minister an amount equal to the market value of the sample.

[Ch6704s13]13. Offences and penalties

(1) Any person who—

(a) contravenes any provision of this Act;

(b) obstructs or hinders any inspector, analyst or other officer in the exercise of his powers or the performance of his duties under this Act;

(c) with fraudulent intent tampers with any sample taken in accordance with this Act;

(d) makes use in connexion with any fertilizer, farm feed or remedy of any certificate, invoice or other document issued in respect of any other fertilizer, farm feed or remedy;

8 of 1996(e) makes any false or misleading statement in connexion with—

(i) any remedy in the application for the registration; or

(ii) any fertilizer, farm feed or remedy in any advertisement thereof or in the course of the sale thereof;

(f) sells any fertilizer, farm feed or remedy upon the container of which a false or misleading statement in connexion with such contents is printed or written;

(g) sells or supplies any farming requisite which is not of the kind, nature, composition, strength, potency or quality described or represented when so sold or supplied,

shall be guilty of an offence and shall be liable to a fine of K200 and to imprisonment for a period of 6 months.

(2) The court convicting any person of an offence under this Act may, upon the application of the prosecutor, declare any farming requisite in respect of which the offence has been committed, and all farming requisites in respect of which such person has been convicted, and of which such person is the owner, or which are in his possession, to be forfeited.

[Ch6704s14]14. Procedure and evidence

(1) In any criminal proceedings under this Act—

(a) any quantity of a farming requisite in or upon any premises, place or vehicle at the time a sample thereof is taken under this Act shall, unless the contrary is proven, be deemed to be of the same composition, to have the same degree of efficacy and to possess in all other respects the same properties as that sample;

(b) any person who is proved to have tampered with any sample shall be deemed to have acted with fraudulent intent unless the contrary is proved;

(c) a certificate stating the result of an analysis or test carried out under section 12 (4) and purporting to be signed by the analyst who carried out such analysis or test shall be accepted as prima facie proof of the facts stated therein:

Provided that at the request of the accused not less than ten days before the trial such analyst shall be summoned to give oral evidence;

(d) any statement or entry contained in any book or document kept by any manufacturer, importer or owner of a farming requisite or by the manager, agent or employee of such person, or found upon or in any premises occupied by, or any vehicle used in the business of such person, shall be admissible in evidence against him as an admission of the facts set forth in that statement or entry, unless it is proved that that statement or entry was not made by such person, or by any manager, agent or employee of such person in the course of his work as manager, or in the course of his agency or employment:

Provided that no such statement or entry shall be tendered in evidence unless such person has been given not less than ten days' written notice of intention to produce such statement or entry and an opportunity to inspect the same and make a copy thereof.

(2) No prosecution shall be instituted as a result of any analysis or test performed under section 12 (4) unless a copy of the analyst's certificate has been transmitted at least twenty-one days before the institution of such prosecution to the person who is to be the accused.

[Ch6704s15]15. Special defences in case of prosecution

(1) It shall be a sufficient defence for a person charged with the sale of fertilizer, farm feed or remedy in contravention of section 3 (d) if he proves to the satisfaction of the court—

(a) that he purchased such fertilizer, farm feed or remedy under a registered name or brand as being the same in all respects as the article which he purported to sell; and

(b) that he had no reason to believe at the time of the sale that it was in any respect different from such article; and

(c) that he sold it in the original container and in the state in which it was when he purchased it; and

(d) that the container thereof was branded, labelled, marked or sealed in the prescribed manner.

[Ch6704s16]16. Regulations

8 of 1996(1) The Minister may make such regulations as may appear to him to be necessary or expedient for the proper carrying out of the purposes and provisions of this Act, and, without prejudice to the generality of the foregoing, such regulations may provide for—

(a) the manner in which remedies and sterilizing plants may be registered, the forms to be used, the fees to be paid and the information to be furnished with any application for registration;

(b) the description under which any substance registered as a remedy, or sold as fertilizer, farm feed, or remedy, and prescribing the conditions under which any such substance may be registered or sold, as the case may be, under any particular name or brand;

(c) the composition, efficacy, fineness, purity or other property required in any substance before it is sold or registered as a fertilizer, farm feed or remedy, as the case may be;

(d) the requirements as to the containers in which fertilizers, farm feeds or remedies shall be packed and the manner in which such containers shall be branded, labelled, marked or sealed;

(e) the process by which fertilizers, farm feeds or remedies or substances used in the manufacture of fertilizers, farm feeds or remedies shall be sterilized, and the manner of inspection of sterilizing plants;

(f) the methods to be employed, the fees to be paid, and the certificates to be issued in respect of the examination, analysis or test of samples taken under this Act;

(g) requiring any person who has in his possession or under his control any fertilizers, farm feeds or remedies to keep records relating thereto in the form and manner prescribed and to render returns in the form and manner and at the times prescribed; and

(h) prescribing any other matters required to be or which may be prescribed under this Act.

(2) Different regulations may be made in respect of different classes of fertilizers, farm feeds and remedies, or in respect of different classes or groups of persons.

(3) Any regulations made under this section may prescribe penalties for any contravention thereof but not exceeding the penalty provided under section 13 (1).

[Ch6704s17]17. Publication of returns

8 of 1996The Minister may from time to time cause to be published in the Gazette a return showing the names of the manufacturers, importers or dealers in remedies which have been registered under this Act. Such return shall state the name and the chemical constituents of each remedy so registered and such other particulars as the Minister may deem necessary.

[Ch6704s18]18. Compensation for injury arising from use of farm requisite

Where a farm requisite is sold or supplied otherwise than in accordance with the provisions of this Act, then any person whose land, crops, poultry, domestic animals, livestock or plants are injuriously affected by such farm requisite shall be entitled to claim compensation for such injury from the person who sold or supplied the farm requisite concerned.

SUBSIDIARY LEGISLATION

NOTICE

under reg. 2

G.N. 234/1970

102/1992

The Minister has specified that the fertilizer or type of fertilizer referred to hereunder shall have the composition set out opposite thereto and hereunder for the purposes of the said Regulations—

SCHEDULE

PART A

COMPOUND FERTILIZERS

NP2 O5K2 OBSCompound A218150.1 0.5 Nit 1.5 Amm 15 Sul0.1 Compound B41815 Sul0.1 1.0 Nit 3.0 Amm 15 Sul Compound C618150.1 2 Nit 10 Sul 4 Amm 5 Chlor Compound D618150.1 2.64 Nit 10 Sul 5.36 Amm 5 Chlor Compound S6186 Sul0.1 1.5 Nit 4.5 Amm Compound 20.20.020200 8.3 0

11.7 Amm Compound J15520 5.5 Nit 9.5 Amm 20 Chlor Compound V418151.5 1 Nit 15 Chlor 3 Amm Super Compound B (SB)5.3324201.58.4 1.73 Nit 13.75 Sul 3.6 Amm 6.25 Chlor Super Compound C (SC)824201.56.8 2.64 Nit 13.75 Sul 5.36 Amm 6.25 Chlor Super Compound D (SD)1024201.57.0 3.3 Nit 13.75 Sul 6.7 Amm 6.25 Chlor Compound 23.21.023210 8 Nit 15 Amm

PART B

STRAIGHT FERTILIZERS

(a)Phosphate (Straight) % Citric Soluble P2O5% Water Soluble P2O5Total % Single Superphosphate19.018.519.0 Double Superphosphate44.844.044.8 Di-ammonia phosphate18480 Mono-ammonia phosphate11510(b)Nitrogen (straight) Nitrate %Amm %Total % Urea†4646 CAN (26)131326 CAN (28)141428 CAN (30)151530 Ammonium sulphate†2121 Nitrate of soda16†16(c)Potash (straight) Amm % K%% K2O Muriate of potash50†60 Sulphate of potash40†48

FERTILIZERS AND FARM FEEDS (STERILIZATION OF ANIMAL PRODUCTS) REGULATIONS

ARRANGEMENT OF REGULATIONS

REGULATION

G.N. 140/1970

65/1996

FERTILIZERS AND FARM FEEDS (STERILIZATION OF ANIMAL PRODUCTS) REGULATIONS

under s. 16

1. Citation

These Regulations may be cited as the Fertilizers and Farm Feeds (Sterilization of Animal Products) Regulations.

2. Application for registration of a sterilizing plant

(1) An application for the registration of a sterilizing plant shall be made by completing in triplicate Part I of the form set out in the First Schedule and submitting it to the Registrar, Ministry of Agriculture and Natural Resources, P.O. Box 30134, Capital City, Lilongwe 3. G.N. 65/1996

(2) The Registrar shall, on registering a sterilizing plant, issue a certificate of registration by completing Part 2 of the aforesaid form and returning the certificate to the applicant. G.N. 65/1996

3. Appeals against decisions of registering officer

An applicant who wishes to appeal under section 10 of the Act shall—

(a) request the Registrar, in writing, for the reasons for his refusing the application, imposing conditions or cancelling the registration and the Registrar shall, within twenty-one days of the receipt of such request, furnish the applicant, in writing, with such reasons; and G.N. 65/1996

(b) within sixty days of being notified of the refusal, imposition of conditions or cancellation, appeal to the Minister, in writing, against the registering officer's decision.

4. Sterilizing of containers

Substances of animal origin, after being sterilized, shall not be sold in containers that have previously been used for such substances unless such containers have been sterilized by one of the methods specified in the Second Schedule.

FIRST SCHEDULE reg. 2

PRESCRIBED FORM

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

PART I

APPLICATION FOR THE REGISTRATION OF A STERILIZING PLANT

1. Name of applicant .....

2. Address of applicant .....

3. Address where plant is situated .....

4. Name and Trade Mark (if any) of plant .....

5. Nature of materials to be sterilized .....

6. Number of sterilizing units .....

7. Method of sterilizationSee the Second Schedule.* .....

Period of registration for which application is made .....

..... 20..... to the 31st March, 20.....

Date ..... Signature .....

PART II

For Official Use Only

No.

CERTIFICATE OF REGISTRATION

I hereby certify that the sterilizing plant referred to in Part I has been registered.

Date ..... Registering Officer .....

SECOND SCHEDULE (reg. 4)

METHODS OF STERILIZING SUBSTANCES OF ANIMAL ORIGIN AND USED CONTAINERS

Bones and other substances of animal origin and containers previously used for such substances shall be sterilized by one of the following methods—

(1) Subjection to moist heat under a pressure of not less than 2.11 kg per square centimetre for not less than thirty minutes.

(2) In the case of bones, after being broken up, subjection to the vapour of benzol boiling between 95°C and 115°C for not less than eight hours.

(3) In the case of blood, subjection to moist heat at a temperature of not less than 95°C for not less than ninety minutes.

(4) In the case of marine products, subjection to heat for twenty minutes at a temperature of not less than 100°C.

(5) In the case of used containers, subjection to steam under a pressure of not less than 1.76 kg per square centimetre for not less than fifteen minutes.

FERTILIZERS REGULATIONS

ARRANGEMENT OF REGULATIONS

REGULATIONS

G.N. 142/1970

123/1985

64/1996

FERTILIZERS REGULATIONS

under s. 16

1. Citation

These Regulations may be cited as the Fertilizers Regulations.

2. Interpretation

In these Regulations, unless the context otherwise requires—

“fee” means the appropriate fee prescribed in the First Schedule;

“form” means the appropriate form prescribed in the Second Schedule;

“specified composition” in relation to a fertilizer or type of fertilizer means the required composition thereof as specified by the Minister from time to time by notice published in the Gazette.

PART I

QUALITY OF FERTILIZER G.N. 64/1996

3. Composition and fineness of fertilizers

(1) Fertilizers listed in the Third Schedule shall have the specified composition set out in relation to such fertilizer in the Third Schedule. G.N. 64/1996

(2) Fertilizers listed in the Fourth Schedule shall comply with the minimum fineness requirements listed in relation to such fertilizer in the Fourth Schedule.

(3) No product shall be imported, sold or distributed as fertilizer if such product is contaminated with heavy metal or other substance that would be harmful to the soil, or the environment, or to public health.

4.

[Revoked by G.N. 64/1996.]

5.

[Revoked by G.N. 64/1996.]

PART II

LABELLING OF CONTAINERS

6. Labelling of containers

(1) The container in which a fertilizer is sold shall be duly and legibly marked or labelled in English with the relevant information set out in the Third Schedule. G.N. 64/1996

(2) Any figures or numerals used for representing the chemical composition of a fertilizer shall be preceded or followed by the appropriate symbol.

7.

[Revoked by G.N. 64/1996.]

PART III

SAMPLING AND ANALYSIS

8. Taking of samples

(1) The manner of taking samples of fertilizers shall be as follows—

(a) where the fertilizer is packed in containers, samples shall be taken at random from different parts of the whole quantity, as follows: G.N. 123/1985

(i) if the quantity of fertilizer does not exceed three tonnes, from not less than two unopened containers per 1.01 tonne or part thereof; and G.N. 123/1985

(ii) if the quantity exceeds 3.03 tonnes, from one additional unopened container for every additional 1.01 tonne or part thereof:

Provided that in no case need samples be taken from more than twenty containers;

(b) where the fertilizer is not packed in containers, not less than six samples shall be taken from different parts of the whole quantity, where possible in the ratio of two samples per 1.01 tonne or part thereof:

Provided that in all not more than fifty samples need be taken.

(2) Where the fertilizer is packed in containers the samples shall be taken by means of a sampling probe not less than 0.03 metre in diameter. G.N. 123/1985

(3) Where the fertilizer is not packed in containers the samples shall be taken by means of a sampling probe not less than 0.3 meter in diameter or by such other means as will ensure as far as is practicable, the taking of a representative sample.

(4) The samples taken in accordance with subregulation (1) in respect of a whole consignment shall form a bulk sample which shall not be less than 4.50 kg in weight and need not exceed 6.75 kg in weight. G.N. 123/1985

(5) The bulk sample thus obtained shall be thoroughly mixed, formed into a flattened heap and quartered. One quarter randomly selected shall then be rejected and the remainder remixed and requartered. This procedure of mixing, quartering and rejection shall be repeated until the original bulk sample has been reduced to approximately 1.35 kg in weight. The resultant sample shall then be dealt with as specified in section 12 (3) of the Act. G.N. 123/1985

(6) In the case of liquid fertilizers, the samples shall be taken by such means as will ensure as far as is practicable the taking of a representative sample.

9. Analysis and sampling at the request of purchaser

(1) The purchaser of a fertilizer may request an inspector to sample and analyse such fertilizer in the manner prescribed in section 12 (3) of the Act and regulation 8.

(2) The purchaser shall pay the appropriate fee for such sampling and analysis.

10. Certificate of sampling

The certificate referred to in section 12 (3) of the Act shall be in form No. 3.

11. Results of analysis

The analyst to whom a sample of a fertilizer has been submitted in accordance with section 12 (3) of the Act shall state the results of the analysis on form No. 4.

12. Limits of variation

A fertilizer shall be deemed to comply with these Regulations if, upon analysis, the composition is found not to differ from the specified composition by more than the variations set out in the Fifth Schedule. G.N. 64/1996

13. Method of analysis

The methods of analysing fertilizers for the purposes of the Act shall be those set out in the Sixth Schedule.

14. Imported fertilizer not complying with requirements

(1) If an examination, analysis or test of samples of fertilizer being imported into Malawi shows that any such fertilizer does not comply with the requirements of the Act or these Regulations, the Minister may—

(a) order such fertilizer:

(i) to be destroyed without compensation; or

(ii) at the option of the importer to be removed from Malawi within a specified period; or

(b) permit the removal thereof from the port of entry subject to such conditions as he may impose.

PART IV

GENERAL

15. Labelling of containers

No person shall— G.N. 64/1996

(a) add to or abstract from any fertilizer any substance or portion so as to alter its composition with the intention that the fertilizer so treated may be sold under its name in an altered state;

(b) knowingly sells fertilizer under the brand or name of such fertilizer but altered in its composition.

16. Offences and penalties

Any person not complying with any of the requirements of these Regulations shall be guilty of an offence and shall be liable to a fine of K 1,000 and to imprisonment for six months. G.N. 64 of 1996

FIRST SCHEDULE (reg. 2)

FEES

The fee for the analysis of a sample at the request of the purchaser shall be K2 for each determination, with a maximum charge of K8 for any one sample.

G.N. 64/1996

SECOND SCHEDULE (reg. 2)

PRESCRIBED FORMS

[FORMS No. 1 and No. 2 deleted by G.N. 64/1996]

FORM No. 3

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

CERTIFICATE OF SAMPLING

To be completed in triplicate

I hereby certify that the accompanying are samples of .... taken by me on ..... at (full address) ..... from stock in charge of ..... in the presence of (state name and address of witness) .....

.....

The following further particulars are given in connexion with the samples—

Samples No.BrandNameQuantity represented by sample..... .....

Other particulars: .....

.....

.....

.....

..... Signature of WitnessInspector

Place: .....

Date: .....

NOTE— A copy of this certificate shall be handed or forwarded to the owner or seller or to his agent. The second copy shall be forwarded to the analyst and the third copy shall be retained by the Inspector.

FORM No. 4

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

CERTIFICATE OF ANALYSIS OF FERTILIZER

To be completed in triplicate

Brand .....

Name of Fertilizer .....

Sample Size .....

Sample Number .....

Name of Laboratory .....

ANALYTICAL REPORT

Actual analysis per centumRegistered analysis per centumTotal nitrogen (expressed as N).....Ammoniacal nitrogen (expressed as N).....Nitric nitrogen (expressed as N).....Water-soluble phosphorus (expressed as P2O5).....Citric acid-soluble phosphorus (expressed as P2O5).....Total phosphorus (expressed as P2O5).....Potassium (expressed as K2O).....Chloride (expressed as Cl).....Boron (expressed as B).....

Observations: .....

.....

.....

.....

Date: .....Analyst

THIRD SCHEDULE (regs. 3, 6 and 7), G.N. 64/1996

PART A

FERTILIZER MIXTURES

Compound FertilizersNP2O5K2OSBZnB: 4:18:15Max5201740.1Min316134C: 6:18:15Max8201740.1Min5161340.1D: 8:18:15Max10201740.1Min71613S: 6:18:6Max8207Min5165X:

20:10:5Max22126Min1884J: 15:5:20Max17622Min134183:2:1 (25)Max13216Min1017440.123:21:0 + 4SMax25225Min20283 0:22:30Max2432Min2028Diammonium Phosphate (DAP)Max19480.15Min1744Monoammonium Phosphate (MAP)Max12520.15Super B (5.33:24:20)Max626220.15Min422186Super C: (8:24:20)Max1026220.15 Min622186Super D: (10:24:20)Max1226220.15Min92218610:20:20Max122222Min8181820:20:5+ 4S+ 0.1ZnMax2222660.1ZnMin18184

Calcium Nitrate (15.5%N+ 19.0% Calcium) (Water soluble)

Urea—S:(8:l) (40%N + 5% SO4)

Mixture B, and C should contain 0.1 per cent Boron and Mixture S should contain at least 0.04 per cent Boron.

PART B

STRAIGHT FERTILIZERS

FERTILIZERS SPECIFICATION

(i) PhosphatesP2O5Total% Citric Soluble% Water SolubleP2O5FERTILIZERStraightsSingle Superphosphate19.018.519.0Double Superphosphate44.844.044.8(ii) Nitrogen% Nitrate % AmmoniaTotalUrea—4646Calcium Ammonium Nitrate131325–30Ammonium Sulphate—2121Nitrate of Soda16—16Ammonium Nitrate171734(iii) Potash% K% K2OMuriate of Potash5060Sulphate of Potash4048

FOURTH SCHEDULE (reg. 3)

MINIMUM REQUIRED FINENESS

FertilizerFineness RequirementsBasic slag, rock phosphate, fused magnesium phosphateGround so that not less than 80 per cent will pass through a sieve, mesh No. 100.Bone mealGround so that not less than 85 per cent will pass through a sieve, mesh No. 8.Bone flourGround so that 100 per cent will pass through a sieve, mesh No. 8, and not less than 50 per cent will pass through a sieve, mesh No. 16.

FIFTH SCHEDULE (reg. 13)

FertilizerLimits of VariationAll fertilizers not mentioned elsewhere in this ScheduleAll forms of nitrogen (expressed as N): not more than 1/10th of the specified composition above and below the specified composition with a minimum of 0.3 per cent of N and a maximum of 1.0 of N.All forms of phosphorus (expressed as P2O5): not more than 1/15th of the specified composition above and below the specified composition with a minimum of 0.5 per cent of P2O5 and a maximum of 2.0 per cent of P2O5.Potassium (expressed as K2O): not more than 1/15th of the specified composition above and below the specified composition with a minimum of 0.7 per cent of K2O.Chloride (expressed as Cl): not more than 0.5 per cent of chloride (Cl) above and below the specified composition.Boron (expressed as B): where the boron content is 0.05 per cent of B or less, not more than 1/3rd of the specified composition above and

below the specified composition. Where the boron content is greater than 0.05 per cent of B, not more than 1/5th of the specified composition above and below the specified composition.Straight FertilizersThe tolerance for Straight Fertilizers shall not be more than 1/20th of the specified composition above and below the specified composition with a minimum and a maximum of either N or P_2O_5 or K_2O provided under this Schedule.Ammoniated superphosphates and bone productsTotal nitrogen (expressed as N): not more than 0.5 per cent of nitrogen above and below the specified composition.All forms of phosphorus (expressed as P_2O_5): not more than 1/20th of the specified composition above and below the specified composition with a minimum of 0.5 per cent. of P_2O_5 and a maximum of 2.0 per cent. of P_2O_5.GuanosTotal nitrogen (expressed as N): not more than 1/5th of the specified composition with a minimum of 0.3 per cent. of N. and a maximum of 1.5 per cent. of N.Total phosphorus (expressed as P_2O_5): not more than 1/10th of the specified composition above and below the specified composition with a minimum of 0.5 per cent. of P_2O_5 and a maximum of 2.0 per cent. of P_2O_5.Potassium (expressed as K_2O): not more than 1/5th of the specified composition above and below the specified composition.Boron and fertilizer borateBoron (expressed as B): not more than 1/10th of the specified composition above and below the specified composition with a maximum of 1.0 per cent. of B.

SIXTH SCHEDULE

METHODS OF ANALYSIS

1. Preparation of the sample for analysis

1.1 If the sample contains any extraneous matter which cannot be conveniently ground and homogenized with the rest of the material, such matter should be removed, weighed and allowed for in calculating the results of the analysis.

1.2 Where a fertilizer is too moist to be ground in its original condition, the sample should be thoroughly mixed and a portion thereof taken for moisture determination as described at 2.1 below.

The remaining portion shall be dried at 100°C., except where the fertilizer may lose ammonia on heating or contains soluble phosphorus compounds. In these latter cases, the sample should be dried either by placing it in a desiccator over anhydrous calcium chloride or silica gel, or alternatively by passing dry air at room temperature over it until it is in a suitable condition for grinding. The dried sample should then be treated appropriately as described under 1.4 and 2.2 below.

1.3 The results of analysis of the dried sample should be adjusted to and expressed on the "as received" basis.

1.4 Crystalline, dry powder or granular fertilizers.—Grind the sample to pass through a mesh No. 16 sieve, mix thoroughly and finely grind a portion of about 250 g. in a mortar.

1.5 Basic slag.—Grind the sample to pass through a mesh No. 100 sieve.

1.6 Liquid fertilizers.—The sample should be thoroughly mixed before analysis. The prepared portion of the sample shall be stored in a non-corrodible container fitted with an air-tight screw-cap or stopper.

2. Determination of moisture

2.1 In absence of volatile constituents.—In duplicate, weigh to the nearest mg. about 5 g. of the sample, heat in the oven at 100°C. for 5 hours, cool in a desiccator, and weigh again.

In the case of sodium nitrate, ammonium sulphate and potassium salts, heat to constant weight at 130°C.

2.2 In presence of volatile constituents.—In duplicate, weigh to the nearest mg. about 5 g. of the sample and dry by placing in a vacuum desiccator overnight under not less than 20 in. vacuum, or by subjection to passage of dry air at room temperature overnight, as mentioned at 1.2 above. Weigh again.

2.3 Calculate the loss in weight as a percentage of the original weight.

3. Preparation of extracts

3.1 If the fertilizer is mixture or a substance in an impure state, extract it for the required elements as described under the respective headings below.

3.2 If the material is a pure compound, however, and is soluble in water (e.g. sulphate of ammonia, muriate of potash or sulphate of potash), extract it by dissolving an accurately weighed (correct to the nearest mg.) portion of the sample in a measured volume of water and determine the required constituents on aliquots drawn from such solutions.

4. Determination of nitrogen

4.1 Reagents to be used:

(a) Concentrated sulphuric acid (preferably nitrogen-free).

(b) Salicylic acid (analytical reagent grade).

(c) Zinc dust or sodium thiosulphate.

(d) Mixed catalyst.—Grind and mix together: 160 g. anhydrous potassium sulphate (K_2SO_4) or sodium sulphate (Na_2SO_4) 10 g. cupric sulphate ($CuSO_4 . 5H_2O$) 3 g. sellenium powder.

(e) Capryl alcohol or paraffin wax.

(f) Sodium hydroxide: 46 per cent. aqueous solution.

(g) Boric acid: 2 per cent. aqueous solution, dissolved in boiling water.

(h) Mixed indicator.—To 3 parts of 0.1 per cent., bromcresol green in 90 per cent. ethyl alcohol, add 2 parts of 0.1 per cent. methyl red in 90 per cent. ethyl alcohol.

(i) N/70 Hydrochloric acid.—Add 1.23 ml. concentrated hydrochloric acid (analytical reagent grade) to water and dilute to 1 litre.

(j) Ammonium alum.

(k) Sucrose (analytical reagent grade).

(l) Indigo solution.—Cautiously add 40 ml. of concentrated sulphuric acid to 1 g. of indigo carmine and stir until dissolved. Pour the solution into 800 ml. of water and dilute to 1 litre. Adjust the strength of the solution to comply with the following test:

Add 20 ml. to a solution of 4 mg. of potassium nitrate in 20 ml. of water. Add rapidly 40 ml. of concentrated sulphuric acid and heat to boiling: the blue colour is just discharged in 1 minute.

(m) Ferrous sulphate.

(n) Sodium nitrate.

(o) Magnesium oxide (carbonate-free): Analytical reagent grade magnesium oxide heated at 600-700°C. in a muffle furnace for 2 hours and stored in a desiccator over potassium hydroxide pellets.

4.2 Test for absence of nitrates.

(a) Shake 5 g. of the sample with 80 ml. of water in 100ml. volumetric flask. Add 1 g. of ammonium alum, dilute to 100 ml. shake well and filter into a dry beaker. Dilute 1 ml. of the filtrate with 8 ml. of water. Add 1 ml. of standard indigo solution and 10 ml. of concentrated sulphuric acid. Heat to boiling point. If the blue colour is not discharged, regard the sample as free from nitrates, or

(b) Shake 5 g. of the sample with 25 ml. of hot water and filter. To 1 volume of this solution add 2 volumes of concentrated sulphuric acid (nitrogen-free), and allow to cool. Add a few drops of concentrated ferrous sulphate solution in such a way that the fluids do not mix. If nitrates are present, a purple colour appears at the junction which afterwards turns brown or, if only minute quantities of nitrates exist, a reddish colour. (To another portion of the solution add 1 ml. of 1 per cent. sodium nitrate solution and test as above to determine whether sufficient sulphuric acid was added in the first test.)

4.3 Total nitrogen (organic and ammoniacal) in absence of nitrates:

(i) In duplicate, weigh to the nearest mg. about 1 g. of the sample (or an amount containing not more than 250 mg. of nitrogen) and transfer to a Kjeldahl digestion flask. Add 15 ml. of concentrated sulphuric acid followed by 1.7 g. of mixed catalyst. * Add a few glass beads or porcelain chips to avoid local overheating and control bumping. Heat gently until frothing ceases, adding 2–3

drops of capryl alcohol, or about 0.5 g. of paraffin wax, if frothing is excessive. Increase the heat and continue the digestion until the liquid is clear (pale green or practically colourless). Continue heating for a further hour. Cool, transfer to a 100 ml. volumetric flask and make up to the mark with water. Carry out a blank determination on the reagents using 1 g. of sucrose in place of the sample.

(ii) Transfer a 2 ml. (or suitable) aliquot of the extract obtained at 4.3 (i) above to a Markham still. Add 5 ml. of 46 per cent. sodium hydroxide solution (or enough to ensure an excess of alkali) through the funnel of the still with the stoprod in position. Then lift the stoprod and allow most of the alkali to pass into the still; wash the funnel with 5–10 ml. of water, letting most of the washings run into the still too. Steamdistil, collecting the distillate in a 100 ml conical flask containing 10 ml. of 2 per cent. boric acid to which 5 drops of the mixed indicator have been added and in which the delivery tube of the still dips. Distil until the wine-red colour turns green, taking care not to lose any of the liberated ammonia. Proceed for 1 minute after the green colour has appeared, and then continue distilling for a further minute with the tube above the solution in the receptacle. The rate of distillation should be at least 5 ml. per minute.

(iii) Titrate the recovered ammonia against N/70 hydrochloric acid from a microburette until the original wine-red colour reappears. Express the result in terms of percentage total nitrogen in the sample as received.

1 ml. N/70 HC1=0.2 mg. nitrogen

4.4 Total nitrogen (organic, ammoniacal and nitric) in presence of nitrates

(i) In duplicate, weigh to the nearest mg. about 1 g. of the sample (or an amount containing not more than 250 mg. of nitrogen) and transfer to a Kjeldahl digestion flask. Add 15 ml. of concentrated sulphuric acid and 0.5 g. of salicylic acid, swirl and allow to stand for 30 minutes. Add 1 g. of zinc dust or 5 g. of sodium thiosulphate followed by 1 g. of mixed catalyst and a further 10 ml. of concentrated sulphuric acid. Carry on the extraction as described from the point marked * in paragraph 4.3 (i) above and continue to complete the determination as in paragraphs 4.3 (ii) and (iii), expressing the result as percentage total nitrogen in the sample as received.

1 ml. N/70 HC1=0.2 mg. nitrogen

4.5 Ammoniacal nitrogen

(i) In duplicate, weigh to the nearest mg. about 2 g. of the sample, transfer to a 100 ml. volumetric flask, dissolve or take up by shaking in about 80 ml. of water, make up to the mark and filter if necessary.

(ii) Transfer 5 ml. of the solution (or a quantity containing not more than 25 mg. of nitrogen) to a Markham still, and add a little water. Add 2 ml. of 46 per cent. sodium hydroxide solution through the funnel of the still as described in paragraph 4.3 (ii). (If the sample contains urea, 0.5 g. of carbonatefree light magnesium oxide suspended in water should be used instead of 46 per cent. sodium hydroxide.) Steam-distil and proceed to complete the determination as described in paragraphs 4.3 (ii)

and (iii). Carry out a blank test on the re-agents. Express the result as percentage ammoniacal nitrogen in the sample as received.

1 ml. N/70 HC1=0.2 mg. nitrogen

4.6 Ammoniacal and nitrate nitrogen

(i) In duplicate, weigh to the nearest mg. about 1 g. of the sample, transfer to a 100 ml. volumetric flask, add 80 ml. of water, shake well to dissolve, dilute to volume and filter if necessary.

(ii) Transfer 5 ml. of the solution or filtrate (or a volume containing not more than 25 mg. of nitrogen) to a Markham still. Add 0.5 g. of zinc dust by washing with water through the funnel of the still. Add 2 ml. of 46 per cent. sodium hydroxide solution (or 0.5 g. of carbonate-free light magnesium oxide if urea is known to be present in the sample). Add as much water as the inner jacket of the still can hold without hindering the steam distillation process. Allow to stand in the cold for 15 minutes with the delivery tube of the still dipping in 10 ml. of 2 per cent. boric acid to which 5 drops of mixed indicator have been added, in a 250 ml. conical flask. Then warm gently by passing steam at a slow rate for up to 30 minutes. Slowly increase the temperature and distil at the rate of 5 ml. per minute for 30 minutes, i.e. until about 150 ml. distillate has been collected.

(iii) Titrate the recovered ammonia as described in paragraph 4.3 (iii). Carry out a reagent blank determination in which only the sample is omitted. Express the result as percentage ammoniacal plus nitrate nitrogen in the sample as received.

1 ml. N/70 HC1=0.2 mg. nitrogen

(Note—The difference between the result obtained in this determination and that in the determination in section 4.5 gives the amount of nitrate nitrogen in the sample.)

5. Determination of phosphorus

5.1 Colorimetric ammonium phosphosmolybdate methods

(i) Reagents to be used

(a) 50 per cent. (volume/volume) hydrochloric acid.

(b) Ammonium molybdate reagent (1.5 per cent. ammonium molybdate solution in 3.5 N hydrochloric acid).—Dissolve 15 g. ammonium molybdate [(NH4)6Mo7O24 4H2O] in about 300 ml. of water warmed to 50°C., filtering if necessary. Cool; then slowly add 350 ml. of concentrated hydrochloric acid, stirring rapidly. Cool and make up to 1 litre with water. Store in a brown glass-stoppered bottle.

(Note—This reagent must be renewed every 2 months.)

(c) Stannous chloride.—Dissolve 1.25 g. stannous chloride ($SnCl_2. 2H_2O$) in 5.6 ml. concentrated hydrochloric acid, warming slightly if necessary to dissolve. Cool and make up to 50 ml. with freshly boiled and cooled water.

(d) Calcium acetate solution.—Dissolve 120 g. calcium acetate in litre of water and slowly add 1 litre of alcohol.

(ii) Extraction

In duplicate, weigh to the nearest mg. about 0.5 g. of the sample into an evaporation basin. (If the sample contains organic matter, saturate with calcium acetate solution and ignite in the muffle furnace at a temperature not exceeding 550°C. until all organic matter is destroyed, i.e. until a uniformly grey ash is obtained. Allow to cool.) Add 10 ml. of 50 per cent. hydrochloric acid, swirling carefully to mix. Evaporate to dryness in a sand bath on a hotplate. Remove, allow to cool somewhat and take up in 2.5 ml. of 50 per cent. hydrochloric acid. Add some hot water and filter into a 100 ml. volumetric flask, using a policeman to loosen and remove the residue from the basin. Wash through the filter paper several times with small portions of hot water, collecting the washings in the flask. Cool, make up to the mark with water and mix well.

(iii) Determination

Pipette a 2 ml. aliquot of the extract into a 50 ml. volumetric flask and * add from a burette 10 ml. of the ammonium molybdate reagent. Make up to the mark with water and then add 0.25 ml. of the stannous chloride reagent from a microburette. Shake to mix thoroughly. Stand to allow maximum colour development and measure the intensity of the blue colour on the Hilger absorptiometer after 5 minutes but within 20 minutes (N.B. The colour fades after 20 minutes) using Filter 70 and a 2 cm. cell.

Determine the amount of phosphorus (as percentage P_2O_5) in the sample from known dilution factors and the weight of the sample, making use of a calibration curve prepared by plotting absorptiometer scale readings against known concentrations of phosphorus in a series of standard solutions prepared as described under paragraph 5.1.1 (iv) below.

(iv) Calibration curve

Phosphorus (P) stock solution.—Dissolve in water 0.2195 g. of analytical grade potassium dihydrogen phosphate (KH_2PO_4), previously dried at 105°C. for 1 hour, and add 25 ml. of 7N sulphuric acid. Make up to 1 litre in a volumetric flask. This solution contains 50 mg. of phosphorus per litre (i.e. 50 mg. P/litre).

Phosphorus P standard solutions.—From a burette measure into a series of 50 ml. volumetric flasks 0.5,1.0,1.5, 2.0, 3.5, 5.0, 7.5 and 10 ml. of the 50 mg. P/litre stock solution (i.e. 0.025, 0.050, 0.075, 0.100, 0.175, 0.250, 0.375 and 0.500 mg. P) and dilute to 50 ml. with water. Withdraw 2 ml. aliquots ** from each flask, transfer to a corresponding second series of 50 ml. volumetric flasks and proceed with the determination as described from the point marked * in paragraph 5.1.1 (iii) above.

Plot a calibration curve relating absorptiometer scale readings to the phosphorus concentrations represented by the 2 ml. aliquots withdrawn and referred to at ** in the paragraph immediately above.

5.1.2 Colorimetric phosphomolybdate method for total phosphorus in basic slag

(i) Extraction

In duplicate, weigh to the nearest mg. about 0.5 g. of the sample into a 400 ml. beaker, wet thoroughly with 20 ml. of water and then add a further 80 ml. of water with continuous stirring. Warm the mixture and add dropwise with stirring 10 ml. of concentrated hydrochloric acid, followed by 5 ml. of concentrated nitric acid. Gently boil the solution for 10 minutes, cool and dilute to about 200 ml. with water. Stir to mix and then filter the solution into a 250 ml. volumetric flask through a filter paper which has previously been washed with 20-30 ml. of a solution of 2 per cent. strength (v/v) in respect of nitric acid and 4 per cent. in respect of hydrochloric acid. Wash through the filter paper with several small portions of water into the flask and make up to the mark. Shake to mix thoroughly.

(ii) Determination

Proceed as in paragraph 5.1.1 (iii).

5.1.3 Colorimetric phosphomolybdate method for citric acid-soluble phosphorus in all fertilizers

(i) Extraction

In duplicate weigh to the nearest mg. about 0.5 g. of the sample and transfer to a stoppered bottle of about 500 ml. capacity. Add 250 ml. of a 2 per cent. solution of pure crystallized citric acid (monohydrate) to the sample in the bottle, shaking to avoid possible caking. Shake the bottle continuously for 30 minutes. Pour the whole of the liquid at once onto a large filter paper and collect the filtrate. If the filtrate is not clear, pass it again through the same filter.

(ii) Determination

Proceed as in paragraph 5.1.1 (iii).

5.1.4 Colorimetric phosphomolybdate method for water-soluble phosphorus in all fertilizers

(i) Extraction

In duplicate, weigh to the nearest mg. about 1 g. of the sample and transfer to a stoppered bottle of about 500 ml. capacity. Add 200 ml. of water and shake the bottle continuously for 30 minutes. Filter into a 250 ml. volumetric flask. Wash through the filter with 2–3 large portions of water, make up to the mark and mix well.

(ii) Determination

Proceed as in paragraph 5.1.1 (iii).

5.2 Spectrophotometric vanadophosphomolybdate methods

5.2.1 Reagents to be used

(a) Concentrated hydrochloric acid.

(b) Concentrated nitric acid.

(c) Calcium acetate solution.—Dissolve 120 g. calcium acetate in 1 litre of water and slowly add 1 litre of alcohol.

(d) Crystallized citric acid (monohydrate).

(e) Potassium dihydrogen phosphate (KH_2PO_4).—Containing at least 99.8 per cent. of monopotassium dihydrogen phosphate.

(f) Vanadium molybdate reagent.—Dissolve separately 20 g. of ammonium molybdate and 1 g. of ammonium vanadate in hot water. Cool and then mix by slowy adding the molybdate solution to the vanadate solution. Acidify with 140 ml. of concentrated nitric acid and dilute to 1 litre.

(g) 1-N Sodium hydroxide.—Dissolve 40.00 g. of sodium hydroxide in water, cool and make up to 1 litre in a volumetric flask. Store in a waxed brown glass bottle.

(h) Standard phosphate solution.—Dissolve in water 1.9173 g. of potassium dihydrogen phosphate previously dried at 105°C. for 1 hour, and dilute to 1 litre. Make a 5-fold dilution. [1 ml.=0.2 mg. phosphoric acid (P_2O_6)].

5.2.2 Spectrophotometric vanadophosphomolybdate method for total phosphorus in all fertilizers except basic slag

(i) Extraction

(a) In the absence of organic matter

In duplicate, weigh to the nearest mg. about 5 g. of the sample into a 400 ml. beaker, add 100 ml. of water and stir thoroughly. Heat to boiling and, to the boiling mixture, add 10 ml. of concentrated hydrochloric acid in a thin stream, followed by 10 ml. of concentrated nitric acid. Boil gently for 10 minutes, cool, transfer to a 500 ml. volumetric flask and dilute to the mark. Mix well and filter the solution through a dry filter paper into a dry flask, discarding the first 10–20 ml. and retaining the rest of the filtrate.

(b) In the presence of organic matter

In duplicate, weigh to the nearest mg. about 5 g. of the sample into an evaporation basin of about 5 cm. diameter and saturate with calcium acetate solution. Dry the contents slowly and ignite in a muffle furnace at a temperature not exceeding 550°C. until all organic matter is destroyed. Allow to cool and carefully transfer the contents to a 400 ml. beaker.

Add 100 ml. of water, stir thoroughly and heat to boiling. To the boiling mixture add slowly 10 ml. of concentrated hydrochloric acid and 10 ml. of concentrated nitric acid and continue boiling for a further 10 minutes. Cool, transfer to a 500 ml. volumetric flask and dilute to the mark. Mix well and filter through a dry filter paper into a dry flask, discarding the first 10–20 ml. of the filtrate and retaining the rest.

(ii) Standardization of the spectrophotometer (calibration graph)

From a burette measure into a series of 100 ml. volumetric flasks 25.0, 26.0, 27.0, 28.0, 29.0, 30.0 and 31.0 ml. of the standard phosphate solution (i.e. 5.0, 5.2, 5.4, 5.6, 5.8, 6.0 and 6.2 mg. P_2O_5). And 25 ml. of the vanadomolybdate reagent to each flask and dilute to 100 ml. with water, making sure the reagent and the dilution water are at room temperature. Shake and allow to stand for 10 minutes.

Set the spectrophotometer to a correct wave-length (say 4,000 or 4,200 Å), fill two 1 cm. cells with the 5 mg. P_2O_5 solution and check the optical density of the cells. If there is a small difference, select the cell with the smaller reading as the standard reference cell.

Determine the apparent optical density at room temperature (corrected for cell differences) of the 5.2, 5.4, 5.6, 5.8, 6.0 and 6.2 mg. P_2O_5 solutions referred to the 5.0 mg. P_2O_5 solution as standard.

Plot a calibration graph of scale readings against known P_2O_5 contents.

(iii) Determination (procedure for all determinations except water-soluble phosphorus)

Successively dilute a portion of the extract prepared so that the final volume of about 25 ml. contains between 5.5 and 6.2 mg. P_2O_5, taking care that the dilution water is at room temperature.

Transfer this final volume to a 100 ml. volumetric flask, add 25 ml. of the vanadomolybdate reagent at room temperature, dilute to the mark, mix and allow to stand for 10 minutes. Measure the difference in optical density at room temperature between the two solutions and determine the P_2O_5 content of the volume of the unknown solution from the calibration curve.

From the known dilution factors and weight of the sample, calculate the P_2O_5 content of the sample.

Note:—Prepare a fresh reference standard for each series of readings on the instrument.

5.2.3 Spectrophotometric vanadophosphomolybdate method for total phosphorus in basic slag

(i) Extraction

In duplicate, weigh to the nearest mg. about 2.5 g. of the sample into a 400 ml. beaker, wet thoroughly with 20–30 ml. of water with continuous stirring, and then add a further 70 ml. of water. Warm the mixture and add dropwise with stirring 10 ml. of concentrated hydrochloric acid, followed by

10 ml. of concentrated nitric acid. Gently boil the solution for 10 minutes, cool and dilute to 250 ml. in a volumetric flask. Mix well and filter the solution through a dry filter paper into a dry flask, rejecting the first 20–30 ml. of the filtrate and retaining the rest.

(ii) Determination

Proceed as described in paragraph 5.2.2 (iii) above.

5.2.4 Spectrophotometric vanadophosphomolybdate method for citric acid-soluble phosphorus in all fertilizers

(i) Extraction

In duplicate, weigh to the nearest mg. about 2.5 g. of the sample and transfer to a glass-stoppered bottle of about 500 ml. capacity. Add 250 ml. of a 2 per cent. solution of pure crystallized citric acid (monohydrate), shaking the bottle to avoid possible caking. Shake continuously for 30 minutes. Pour the whole of the liquid at once onto a large filter paper and collect the filtrate. If the filtrate is not clear, pass it again through the same filter.

(ii) Determination

Proceed as described in paragraph 5.2.2 (iii) above.

5.2.5 Spectrophotometric vanadophosphomolybdate method for water-soluble phosphorus in all fertilizers

(i) Extraction

In duplicate, weigh to the nearest mg. about 10 g. of the sample and transfer to a glass-stoppered bottle of about 500 ml. capacity. Add 400 ml. of water and shake continuously for 30 minutes. Transfer the contents to a 500 ml. volumetric flask make up to the mark, mix well and filter, collecting the filtrate in a dry flask.

(ii) Determination

To 25 ml. of the extract add 1 ml. of concentrated nitric acid. Heat to almost boiling on a hotplate and maintain at this temperature for 10 minutes. Cool, neutralize with 1-N sodium hydroxide solution and complete the determination as in paragraph 5.2.2 (iii) above.

6. Determination of potassium

6.1 Flame photometric methods

6.1.1 Reagents to be used

(a) Concentrated hydrochloric acid.

(b) Ammonium oxalate, $(NH_4)_2C_2O_4$.—A saturated aqueous solution.

(c) Concentrated ammonia, NH_4OH_4.—A solution of specific gravity 0.96.

(d) Potassium dihydrogen phosphate, KH_2PO_4: Containing at least 99.8 per cent. of monopotassium dihydrogen phosphate.

(e) Standard potash solution.—Dissolve 5.779 g. of potassium dihydrogen phosphate (KH_2PO_4) previously dried for 1 hour at 105°C. and dilute to 1 litre in a volumetric flask. Shake well. Transfer 50 ml. of this solution to a 1 litre volumetric flask and dilute to the mark. Shake well. This final solution now contains 100 mg. K_2O per litre (i.e. 100 mg. K_2O/1.).

6.1.2 Method for potassium salts other than those containing ammonium, calcium, iron, aluminium or other interfering substances

(i) Extraction

In duplicate, weigh to the nearest mg. about 0.5 g. of the sample and transfer to a 400 ml. beaker. Add 10 ml. of concentrated hydrochloric acid and 50 ml. of water and bring to boiling, using a stirring with a flattened end to break down any crystals or lumps. Dilute with water to about 100 ml. and boil gently for a few minutes. Cool, transfer to a 250 ml. volumetric flask and make up to the mark. Mix well and filter through a dry filter paper.

Successively dilute a measured portion of the extract so that the final solutions contains approximately 16 mg. K_2O/1. and determine the potash content of the extract as described under paragraph 6.1.2 (iii) below.

(ii) Standardization of the flame photometer (calibration graph)

From the standard (100 mg. K_2O/1.) potash solution obtained under paragraph 6.1.1 (e) above, prepare a set of accurate dilutions containing 10, 12, 14, 16, 18 and 20 mg. K_2O/1. (e.g. by correspondingly diluting 10, 12, 14, 16, 18 and 20 ml. of the standard solution to 100 ml. in a series of 100 ml. volumetric flasks). Set the sensitivity of the flame photometer so that 100 scale divisions (i.e. full-scale deflection) are equivalent to the 20 mg. K_2O/1. solution. Spray the 10, 12, 14, 16 and 18 mg. K_2O/1. solutions three times. Take the median reading (not the mean) and construct a calibration graph. (N.B.—After spraying each different strength solution, spray the 20 mg. K_2O/l. solution again to ensure that the sensitivity of the flame photometer has not changed.)

(iii) Determination

Reset the photometer at 100 scale divisions with the 20 mg. K_2O/1. solution. Spray the diluted fertilizer extract obtained as described under paragraph 6.1.2 (i) above, and read the approximate K_2O content of the solution from the graph prepared as described in paragraph 6.1.2 (ii) above.

Prepare two further dilutions of the standard K_2O solution to contain respectively 1 mg. K_2O/1. more and 1 mg. K_2O/1. less than the estimated K_2O content of the diluted solution of the

sample. Successively spray the low standard solution, the diluted solution of the sample, and the high standard solution. Repeat this twice more. Take the median result of each set of three readings and calculate the K2O content of the sample solution and hence of the fertilizer, from the proportionality of the radiation given by the sample solution and that given by the two standard solutions containing respectively 1 mg. K2O/1. more and 1 mg. K2O/1. less than the predicated K2O content.

(Note.—Diluted standard solutions should be freshly prepared, and the photometer must be set up in a vibration-free position and a dust-free atmosphere.)

6.1.3 Method for potassium in mixed fertilizers containing little or no organic matter, or in salts containing ammonium, calcium, iron, aluminium or other interfering substances

(i) Extraction

In duplicate, weigh to the nearest mg. about 2.5 g. of the sample and place in a 400 ml. beaker. Add 125 ml. of water and 50 ml. of saturated ammonium oxalate solution. Boil for 30 minutes, adding, if necessary, a small quantity of a potassium-free anti-foaming agent (e.g. capryl alcohol). Cool, add a slight excess of concentrated ammonia solution and cool to room temperature. Dilute to 250 ml. in a volumetric flask, mix and filter through a dry filter paper.

Successively dilute a measured portion of the extract so that the final solution contains approximately 16 mg. K2O/1. and determine the potash content as described in paragraph 6.1.2 (iii) above.

6.1.4 Method for potassium in mixed fertilizers containing organic matter

(i) Extraction

In duplicate, weigh to the nearest mg. about 10 g. of the sample into an evaporation basin and gently incinerate in a muffle furnace at a temperature not exceeding 500°C. to destroy organic matter. Grind the residue to eliminate any lumps. Add 125 ml. of water and 50 ml. of saturated ammonium oxalate solution and boil for 30 minutes. Cool, add a slight excess of concentrated ammonia solution, cool to room temperature, and dilute to 500 ml. in a volumetric flask. Mix well and filter through a dry filter paper.

Successively dilute a measured portion of the extract so that the final solution contains approximately 16 mg. K2O/1. and determine the potash content as described in paragraph 6.1.2 (iii) above.

7. Determination of calcium

7.1 Volumetric method

7.1.1 Reagents to be used

(a) 0.02N versenate solution.—Dissolve 3.723 g. of disodium ethylenediamine tetraacetate (EDTA) and make up to 1 litre with water. Standardize this solution at least once per month against 0.02N calcium chloride solution (1.001 g. of analytical reagent grade calcium carbonate previously dried at 105°C., dissolved in about 250 ml. of water containing 5 ml. of concentrated analytical reagent grade hydrochloric acid, boiled, cooled and made up to 1 litre with water=0.02N calcium chloride), using 2 ml. of 10 per cent. potassium hydroxide solution in a volume of about 50 ml. for buffering but omitting reagent (b) below.

(b) Sodium diethyldithiocarbamate (0.3 per cent. aqueous solution). Shake vigorously to dissolved; filtering is not necessary.

(c) Potassium hydroxide (10 per cent. aqueous solution).

(d) Concentrated hydrochloric acid.

(e) Murexide/sodium chloride mixture as an indicator.—To 100 g. sodium chloride add 0.5 g. ammonium purpurate; grind to mix well.

OR

(f) Alizarin indicator.—Dissolve 0.5 g. of the indicator solid in 75 ml. of triethanolamine and make up to 100 ml. with absolute ethanol.

7.1.2 Procedure

(i) Extraction

In duplicate, weigh to the nearest mg. about 0.4 g. of the sample into a 250 ml. beaker and add 10 ml. of concentrated hydrochloric acid. Heat, if necessary, to dissolve. Add 20 ml. of water and boil down to about 5 ml. Then dilute and filter while hot into a 100 ml. volumetric flask. Cool and make up to the mark with water.

(ii) Determination

Pipette a suitable aliquot (2 ml. is adequate if the sample has a high calcium content) into a 250 ml. conical flask. Add 1 ml. of 0.3 per cent. sodium diethyldithiocarbamate, 20 ml. of 10 per cent. potassium hydroxide solution, and about 0.3 g. of murexide/sodium chloride (or 6 drops of alizarin) indicator. Titrate against 0.02N versenate (EDTA) solution, using a microburette. (The colour change at the end point is from wine-red to violet.) Calculate the calcium content from the titre obtained and from the weight of the sample equivalent to the aliquot of the extract taken.

1 ml. 0.02N EDTA=0.4008 mg. Ca.

Express the result in terms of percentage calcium oxide in the sample.

% CaO= % Ca * 1.40

7.2 Gravimetric method

7.2.1 Reagents to be used

(a) Concentrated hydrochloric acid.

(b) Ammonium oxalate solutions.—6 per cent. and 0.1 per cent. aqueous solutions.

(c) Ammonium hydroxide (1:1).—50 per cent. aqueous solution (v/v).

(d) Methyl red indicator.—Dissolve 0.1 g. of methly red in 250 ml. of ethanol.

7.2.2 Procedure

(i) Extraction

In duplicate, weigh to the nearest mg. about 0.5 g. of the sample and place in a 400 ml. beaker. Add 10 ml. of water and 10 ml. of concentrated hydrochloric acid, and heat, if necessary, to dissolve. Dilute to about 200 ml. with water. Filter if necessary (i.e. if suspended impurities are present). Add 3–4 drops of methyl red indicator and heat to boiling. While boiling, add 500 ml. of warm 6 per cent. ammonium oxalate solution. To the hot solution add dropwise, with stirring, 1:1 ammonium hydroxide, maintaining the temperature at about 80°C. or above, until the solution is neutral or faintly alkaline. Stand warm for at least 1 hour. After the precipitate has settled, test for complete precipitation by adding a few drops of 6 per cent. ammonium oxalate solution (run the solution down a glass rod).

If precipitation is complete, filter through paper suitable for fine precipitates (e.g. Whatman No. 40 paper), washing the precipitate of calcium oxalate chloride-free with cold 0.1 per cent. ammonium oxalate. (Test for chloride by taking 5 ml. of the washings and adding dilute nitric acid followed by a few drops of dilute silver nitrate solution: if no precipitate forms, then the calcium oxalate precipitate is chloride-free; if a precipitate forms with silver nitrate, continue washing with cold 0.1 per cent. ammonium oxalate till choride-free.)

(ii) Determination

Then transfer the precipitate and the filter paper to a tared crucible previously ignited at 500°C. and cooled. Dry in the oven at 110-120°C. When dry, ignite in the muffle furnace for 2 hours with the temperature maintained at 500°C. or just below. (Note.—Cover the crucible with a lid during ignition but slightly tilt the lid over to one side to permit oxidation.) Cool the crucible in a desiccator and weigh the resultant calcium carbonate. Return to the furnace and ignite at 500°C. for a further 1 hour. Cool and reweigh.

(If a change in weight occurs, some of the carbonate has been converted to oxide: moisten with a few drops of a saturated ammonium carbonate solution, dry in the oven at 110°C. cool and weigh. Gain in weight proves oxide was present.) Calculate the percentage calcium content from the weight of the calcium carbonate obtained and that of the sample taken:

% Ca = wt. of $CaCO_3$ × 0.4004 × 100.....)wt. of sample taken

(Note.—In this gravimetric method, calcium may also be finally determined as the oxide by igniting the calcium carbonate precipitate obtained and subjecting it to dissociation at 900°C. until constant weight is attained. The percentage calcium content is then calculated from the weight of the calcium oxide obtained and that of the sample taken:

% Ca =wt. of CaO × 0.7147 × 100.....)wt. of sample taken

8. Determination of magnesium (e.g. in dolomite)

8.1 Reagents to be used

(a) 0.02N versenate (EDTA) solution.—As described under paragraph 7.1.1 (a).

(b) Sodium diethyldithiocarbamate (0.3 per cent. aqueous solution).—As under paragraph 7.1.1 (b).

(c) Ammonium chloride/ammonium hydroxide buffer solution (pH 10).—Dissolve 67.5 g. of ammonium chloride in 570 ml. of concentrated ammonium hydroxide solution and make up to 1 litre with water.

(d) Eriochrome Black-T indicator.—Dissolve 0.5 g. of Eriochrome Black-T powder and 4.5 g. of hydroxylamine hydrochloride in 100 ml. of 95 per cent. ethanol.

(e) Concentrated hydrochloric acid.

8.2 Procedure

(i) Extraction (for magnesium in presence of calcium e.g. dolomite)

Follow the procedure described in paragraph 7.1.2 (i).

(ii) Determination

Pipette a suitable aliquot (2 ml. is adequate if calcium content is high) into a 250 ml. conical flask. Add 1 ml. of 0.3 per cent. sodium diethyldithiocarbamate, 5 ml. of ammonium chloride/ ammonium hydroxide buffer solution and 10 drops of Eriochrome Black-T indicator solution. Titrate with 0.02N versenate (EDTA) solution, using a microburette. (The end-point colour change is from wine-red to blue.) In presence of calcium, the total amount of EDTA solution added to reach this end-point gives a measure of the sum of calcium and magnesium. The difference between the quantity of EDTA solution used to determine the content of calcium alone and that used to determine the sum of calcium and magnesium in an equivalent aliquot of the extract represents the magnesium content of the aliquot.

In the absence of calcium, the titre obtained represents the amount of magnesium present in the aliquot.

Calculate the magnesium content of the sample from the direct or differential titre obtained (whichever is applicable) and from the weight of the sample equivalent to the aliquot of the extract taken.

1 ml. 0.02N EDTA=0.2432 mg. Mg.

Express the result in terms of percentage magnesium oxide in the sample.

% MgO= % Mg × 1.66

9. Determination of boron

9.1 Reagents to be used

(a) 5 per cent. nitric acid solution.

(b) Bismuth nitrate solution.—Dissolve 22 g. of bismuth nitrate in 8 ml. of concentrated nitric acid and dilute to 100 ml. with water.

(c) 10 per cent. sodium hydroxide solution.

(d) 0.02N sodium hydroxide solution.—Carbon dioxide free.

(e) Mannitol.

(f) Bromothymol blue indicator solution.

9.2 Procedure

(i) Extraction

In duplicate, weigh to the nearest mg. about 2.5 g. of the sample and transfer to a 400 ml. beaker. Add 2 ml. of concentrated nitric acid and 50 ml. of water, stir, warm, and dilute to 100 ml. with water. Warm to 75°–85°C. (do not boil as boric acid is volatile) and slowly add from a burette with continuous stirring 5 ml. of bismuth nitrate solution for each 25 mg. of phosphorus (P_2O_5) present. Keep the solution hot during precipitation. Allow the precipitate to settle, cool, wash into a 250 ml. volumetric flask and dilute to the mark. Filter through a dry paper, discarding the first 10–20 ml.

(ii) Determination

To a 100 ml. aliquot add a few drops of bromothymol blue indicator solution and then 10 per cent. sodium hydroxide solution until the indicator turns blue. Filter and wash the precipitate several times with cold water to give a total volume of filtrate of 150–200 ml. Using a pH meter, adjust to pH 5, adding 5 per cent. nitric acid solution. Heat to about 85°C. (do not boil) and stir vigorously to expel carbon dioxide.

Cool and titrate with 0.02N sodium hydroxide solution to pH 6.3. Add 10 g. of mannitol and readjust to pH 6.3 with 0.02N sodium hydroxide solution. Continue to add 10 g. portions of mannitol

and to adjust to pH 6.3 until, after the final addition of mannitol, the pH remains constant at 6.3. The total amount of 0.02N sodium hydroxide solution used after the first addition of mannitol corresponds to the amount of boron present in the solution.

Carry out a reagent blank determination.

Calculate the amount of boron in the portion taken for analysis from the factor:

1.0 ml. 0.02N NaOH=0.216 mg. B

10. Determination of chloride

10.1 Reagents to be used

(a) Dilute nitric acid.—Dilute 1 volume of concentrated nitric acid with 1 volume of water.

(b) Nitrobenzene.—Analytical reagent grade.

(c) 0.1N silver nitrate solution.

(d) 0.1N potassium thiocyanate solution.

(e) Ferric alum indicator solution.—Prepare a saturated solution of ferric ammonium sulphate and add a small quantity of dilute nitric acid.

10.2 Procedure

(i) Extraction

In duplicate, weigh to the nearest mg. about 5 g. of the sample and transfer to a stoppered bottle of about 500 ml. capacity marked at 250 ml. Add 200 ml. of water and shake continously for 30 minutes. Transfer through a filter paper into a 250 ml. volumetric flask, washing several times with small portions of water. Make up to the mark and shake to mix well.

(ii) Determination

Dilute an aliquot of the extract (containing about 70 mg. Cl) to 100 ml. with water, add 10 ml. of dilute nitric acid, an excess of 0.1N silver nitrate solution, 2–3 ml. of nitrobenzene and 1 ml. of ferric alum indicator. Shake vigorously to coagulate the precipitate. Titrate the residual silver nitrate with 0.1N potassium thiocyanate solution until a faint reddish-brown colour persists. Carry out a reagent blank determination.

Calculate the amount of chloride in the portion taken for analysis from the relationship:

1 ml. 0.1N $AgNO_3$=3.55 mg. Cl

11. Determination of sulphate

11.1 Reagents to be used

(a) Concentrated hydrochloric acid.

(b) Concentrated nitric acid.

(c) 5 per cent. barium chloride ($BaCl_2$) solution.

11.2 Procedure

(i) Extraction

In duplicate, weigh to the nearest mg. about 1 g. of the sample and transfer to a 250 ml. beaker. Add 20 ml. of concentrated hydrochloric acid followed by 4 ml. of concentrated nitric acid. Evaporate just to dryness on a hotplate in the fume chamber, covering the beaker with a watchglass to avoid loss through spattering. Cool, add 2 ml. of concentrated hydrochloric acid and dilute to about 200 ml. with hot water. Filter into a 500 ml. volumetric flask, washing 4–5 times with hot water. Cool, make up to the mark and shake well.

(ii) Determination

To a 100 ml. aliquot in a 400 ml. beaker, add water until the volume is about 200 ml. Heat to boiling and slowly add 20 ml. of 5 per cent. barium chloride solution with stirring. Maintain at gentle boiling for about 15 minutes, allow the precipitate to settle and add a few drops of the 5 per cent. barium chloride solution to confirm that precipitation is complete. Stand for at least 2 hours (preferably overnight) to obtain a coarse, easily-filtered precipitate.

Filter by decantation through filter paper of suitable texture (e.g. Whatman No. 40), washing the precipitate with hot water. Transfer the precipitate quantitatively to the filter paper and continue washing with hot water until the filtrate is chloride-free (i.e. until a clear solution, or no more than a very faint opalescence, results after adding dilute silver nitrate solution to a portion of the washings acidified with about 1 ml. of dilute (2N) nitric acid).

Place the filter paper plus the precipitate in a previously ignited, cooled and weighed silica or porcelain crucible, and dry in the oven at 100°C. Transfer to the muffle furnace and gradually raise the temperature until the paper begins to char. (N.B.—The paper must not catch fire.) Then heat at 500–600°C. until incineration is complete.

Cool in a desiccator and weigh as barium sulphate, $BaSO_4$.

(iii) Calculation

As barium sulphate contains 41.153 per cent. sulphate, the amount of sulphate in the sample can be calculated from the relationship:

$$\%SO_4 \text{ in sample} = \frac{\text{wt. of } BaSO_4 \text{ precipitate obtained} \times 41.153}{\text{wt. of sample equivalent to the aliquot of extract taken}}$$

FERTILIZERS, FARM FEEDS AND REMEDIES (FARM FEEDS) REGULATIONS

ARRANGEMENT OF REGULATIONS

REGULATION

Limits of Variation

Fifth Schedule

Methods of Analysis

G.N. 159/1973

63/1996

FERTILIZERS, FARM FEEDS AND REMEDIES (FARM FEEDS) REGULATIONS

under s. 16

PART I

PRELIMINARY

1. Citation

These Regulations may be cited as the Fertilizers, Farm Feeds and Remedies (Farm Feeds) Regulations.

2. Interpretation

In these Regulations, unless the context otherwise requires—

“additives” means any substance added to a compound or a protein concentrate in the course of manufacturing for some specific purpose other than as a direct source of nutrient;

“authorized officer” means an officer specially authorized by the Minister of Agriculture and Natural Resources;

“composition” means the percentages of the constituents of a farm feed;

“concentrate” means a material of relatively high content designed for further mixing before feeding, at an inclusion rate of 5 per cent or more with planned proportions of cereals and other feedstuffs either on the farm or by a feedstuffs compounder;

“constituent” means a component of a farm feed determined by chemical means;

“crude protein” means protein and other nitrogenous compounds, and is expressed as the total nitrogen content of a farm feed multiplied by a factor of 6.25;

“form” means the appropriate form prescribed in the First Schedule;

“formation” means the percentage of straights included in a farm feed;

“ingredient” means a component part of a mixture or one of the constituents of a mixture;

“mixed feed” means a number of different straights mixed and blended in appropriate proportions, to provide properly balanced diets for all types of stock at every stage of growth and development and includes minerals, trace elements, vitamins and other additives;

“per centum” or “percentage” means per centum or percentage by weight to be specified either on dry weight basis or on fresh weight basis;

“protein equivalent” means urea or biuret, and is expressed as the nitrogen content of these ingredients multiplied by a factor of 6.25;

“straight” means a single feeding stuff of animal or vegetable origin which may or may not have undergone some processing before purchase;

“supplements” means technical products for use at less than 5 per cent of the total ration in which they are included, and designed to supply planned proportions of vitamins, trace elements, one or more non-nutrient additives and other special ingredients.

G.N. 63/1996

PART II

LABELLING OF FARM FEEDS

3. Requirement and application for registration

All farm feeds for sale to the general public shall be labelled with the following information— G.N. 63/1996

(a) the name and brand of the farm feed;

(b) the composition of the farm feed, including—

(i) crude protein (nitrogen × 6.25);

(ii) protein equivalent;

(iii) fat (ether extra);

(iv) crude fibre

(v) calcium (Ca);

(vi) phosphorous (P); and

(c) ingredients of which the farm feed is compounded and their percentage inclusion.

4.

[Revoked by G.N. 63/1996.]

5.

[Revoked by G.N. 63/1996.]

6.

[Revoked by G.N. 63/1996.]

7. Farm feed to comply with specifications

Where a farm feed consists or is compounded of ingredients prescribed in the Third Schedule, such farm feed or ingredient shall comply with the specifications in that Schedule.

8. Constituents

(1) Where any constituent claimed to have nutritive value, other than those set out in the Second Schedule, is used in any farm feed, the label shall state— G.N. 63/1996

(a) in the case of inorganic constituents other than salt, the percentage of the constituent expressed in terms of the elemental form;

(b) in the case of salt, the maximum percentage of sodium chloride expressed as NaCl; and

(c) in the case of added vitamins, antibiotics and drugs, the content of the active constituent.

(2) No product shall be used as a constituent if such product is contaminated so as to be harmful to livestock or the consumer or to public health.

9. Sterilization

No person shall sell a farm feed containing any ingredient of animal origin unless such substance has been sterilized in accordance with the Fertilizer and Farm Feeds (Sterilization of Animal Products) Regulations, and a certificate to that effect has been issued. Cap. 67:04, sub. leg. p. 13, G.N. 63/1996

10.

[Revoked by G.N. 63/1996.]

11.

[Revoked by G.N. 63/1996.]

PART III

CONDITIONS OF SALE

12. Restrictions

No person shall register or sell any farm feed which—

(a) except in the case of liquid farm feed, or blood meal contains more than 12 1/2 per centum of moisture; or

(b) is manufactured or intended for consumption by pigs or poultry and which, when prepared according to the instructions of the manufacturer, will contain more than 1 per centum of salt expressed as NaCl.

13. Labelling of containers

(1) For the purposes of section 16 of the Act and subject to the provisions of this regulation, the container in which the farm feed is sold shall be durably and legibly marked or labelled in English with— G.N. 63/1996

(a) the brand and name of the farm feed; and

(b) the particulars specified in the Second Schedule and the numerical values of the farm feed.

(2) In the case of protein concentrate feeds the label shall bear a statement of the proportions in which it is recommended that the concentrate shall be fed with grain meal.

(3) In the case of poultry mashes, the label shall state whether the feed is completely balanced or is intended for feeding with grain and other feedstuff.

(4) Where a farm feed contains urea, biuret, antibiotics or drugs, the label shall bear—

(a) a statement giving instructions for use; and

(b) an appropriate warning.

(5) Where a label or inscription upon a container claiming a content of a constituent, other than those set out in the Second Schedule, the content shall be registered, and in the case of—

(a) inorganic constituents, the elemental content shall be stated except for salt where the maximum percentage, expressed as NaCl shall be stated; and

(b) added vitamins, antibiotics and drugs, the contents of the active ingredients shall be stated.

14.

[Revoked by G.N. 63/1996.]

PART IV

SAMPLING AND ANALYSIS

15. Sampling procedure

(1) The manner of taking samples of farm feeds for the purpose of examination or analysis, in terms of section 12 of the Act, shall be in accordance with the provisions of this regulation.

(2) Where the farm feed is packed in containers, the samples shall be taken from different parts of the whole quantity by means of a sampling probe not less than one inch in diameter and if the quantity of farm feed—

(a) does not exceed three tonnes, from not less than two unopened containers per tonne or part thereof;

(b) exceeds three tonnes, from one additional unopened container for every additional tonne or part thereof:

Provided that in no case need samples be taken from more than twenty containers.

(3) Where the farm feed is not packed in containers, not less than two samples per ton or part thereof shall be taken from different parts of the whole quantity by means of a sampling probe or by such other means as will ensure as far as practicable, the taking of a representative sample:

Provided that in all, not less than six samples shall be taken, but not more than fifty samples need be taken.

(4) Where farm feed consists of material that cannot be satisfactorily sampled with a sampling probe, portions shall be taken by some other suitable means from the selected containers or, if it is not in containers, from different parts of the farm feed.

(5) The several quantities taken for sampling in terms of this regulation shall, after any matted portions have been torn up, be thoroughly mixed together and reduced to a sample approximately six pounds in weight which shall then be used for analysis.

16. Sampling and analysis at the request of a purchaser

(1) The purchaser of a farm feed may request an inspector or authorized officer to sample the farm feed in the manner prescribed in regulation 15.

(2) The fee for the analysis of a sample at the request of a purchaser shall be—

(a) in the case of a farmer, three Kwacha for the determination of a constituent with a maximum charge of ten Kwacha for any one sample;

(b) in the case of any other person, five Kwacha for the determination of a constituent with a maximum charge of twenty Kwacha for any one sample.

17. Certificate of sampling

A certificate on form F.F. 3 shall be issued for each sample taken and shall be issued at the time of sampling in triplicate, the original to be retained by the supplier, the duplicate to be attached to the sample, and the triplicate retained by the authorized officer taking the sample.

18. Certificate of analysis

The analyst to whom a sample of farm feed has been submitted shall state the results of the analysis of form F.F. 4.

19. Limits of variations

(1) A farm feed shall be deemed to comply with the provisions of these Regulations if upon analysis, the composition is found not to differ from the composition by more than the variations set out in the Fourth Schedule. G.N. 63/1996

(2) Where no limit of variation is prescribed in the Fourth Schedule, the accepted variation shall be within one-tenth more or less than the stated amount. G.N. 63/1996

20. Methods of analysis

The methods of analysing farm feeds for the purposes of the Act shall be those set out in the Fifth Schedule.

PART V

GENERAL

21. Offences

(1) No person shall— G.N. 63/1996

(a) add to or remove from any farm feed any substance or portion so as to alter its composition or formulation with the intention that the farm feed so treated may be sold under its name in the altered state; or

(b) knowingly sell any farm feed under its name but altered in composition or formulation.

(2) No person shall use any figures or numerals on any label or inscription upon a container save as is otherwise provided in these Regulations. G.N. 63/1996

FIRST SCHEDULE

PRESCRIBED FORMS G.N. 63/1996

[FORMS F.F. 1 and F.F. 2 deleted by G.N. 63/1996.]

FORM F.F. 3

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04) reg. 17

CERTIFICATE OF SAMPLING

(To be completed in triplicate)

I hereby certify that the accompanying are samples of ..... taken by me on (date) ..... at (full address) .....

..... from stock in charge of ..... in the presence of .....

(state full name and address of witness)

The following further particulars are given in connexion with the samples:

Samples No.BrandNameQuantity represented by sample.....
.....
.....
.....

Other particulars .....

.....

.....

.....

..... Signature of WitnessAuthorized Officer

Place .....

Date .....

NOTE—A copy of this certificate shall be handed to the grower or seller or to his agent. The second copy shall be forwarded to the analyst and the third copy shall be retained by the authorized officer.

FORM F.F. 4

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04) reg. 18

CERTIFICATE OF ANALYSIS OF FARM FEED

(To be completed in triplicate)

I hereby certify that I received on the ..... day of ..... 20..... from ..... a sample of

BrandName of Farm FeedSampled atSample No.Laboratory No.

ANALYTICAL REPORT

Actual AnalysisRegistered AnalysisCrude protein

(nitrogen × 6.25)%%Protein equivalent%%Fat (ether extract)%%Crude fibre%%Calcium (Ca)%%Phosphorus (P)%%.....%%.....%%

NOTE—The data are reported on fresh/drydelete whichever is not applicable.* weight basis.

Observations .....

.....

Date .....Analyst

SECOND SCHEDULE (regs. 5, 8 and 13)

FERTILIZERS, FARM FEEDS AND REMEDIES ACT G.N. 63/1996

(CAP. 67:04)

INFORMATION TO BE GIVEN ON CONTAINERS

PART I

Farm FeedParticulars to be given on containers1.Blood meal, dried yeastThe percentage of crude protein2.Meat meal, maize germ meal and dried milk productsThe percentages of crude protein and fat3.Ground cereal grains, brewers grains, cereal grain by-product not mentioned in this Schedule and fruit and citrus pulp and lucerne (alfalfa) mealThe percentages of crude protein and crude fibre4.Ground oilseeds, oilcakes and meals, hominy chop, rice bran, beans and peasThe percentages of crude protein, fat and crude fibre5.MolassesThe percentage of sugar (both reducing and non-reducing forms of sugar expressed as sucrose)6.Molasses feedsThe percentages of sugar (both reducing and non-reducing forms of sugar expressed as sucrose) and crude fibre7.Fish meal and whale mealThe percentages of crude protein, fat, calcium (expressed as Ca), phosphorus (expressed as P) and salt (expressed as NaCl)8.Meat and bone meal, bone mealThe percentages of crude protein, fat, calcium (expressed as Ca) and

phosphorus (expressed as P)9.Mineral feedsThe maximum and minimum percentages of the principal constituents (expressed in the elemental form except for common salt, which shall be expressed as NaCl).

SECOND SCHEDULE

FERTILTIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

PART II G.N. 63/1996

Farm FeedParticulars to be given on containers1.Mixed feeds for sheep and cattleThe percentages of crude protein and crude fibre and where a farm feed contains:(a) Urea or biuret, the percentage of protein equivalent which shall be stated next to the percentage of crude protein, and(b)Antibiotics or drugs, such statement as the registering officer may require.2.Mixed feeds for poultryThe percentages of crude protein, crude fibre, calcium (Ca), phosphorus (P) and where a farm feed contains antibiotics or drugs such statement as the registering officer may require.3.Other mixed feeds not mentioned in this ScheduleThe percentages of crude protein and crude fibre and where a farm feed contains antibiotics or drugs such statement as the registering officer may require.

NOTE—The percentages of crude protein, protein equivalent, crude fibre, calcium, phosphorus and salt shall be stated to the first decimal place.

THIRD SCHEDULE (reg. 7)

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

SPECIFICATIONS

Farm feed or ingredientSpecification1.Blood mealGround, sterilized, artificially dried blood containing not less than 80 per centum crude protein and not more than 15 per centum moisture.2.Hominy chopA mixture of maize bran, maize germ and some of the starchy part and containing not less than 4 per centum ether extract (fat) and not more than 14 per centum fibre.3.Meat and bone mealGround, sterilized, artificially dried meat and bone containing not less than 50 per centum crude protein and not more than 11 per centum ether extract (fat). An antioxydent should be added.4.Rice branGround, containing not more than 2 1/2 per centum of outer husk and with not less than 11 per centum crude protein and not more than 11 per centum crude fibre.5.Groundnut cake mealContaining not less than 40 per centum crude protein and not more than 8 per centum crude fibre, and not more than 7 per centum fat.

FOURTH SCHEDULE (reg. 19)

FERTILIZERS, FARM FEEDS AND REMEDIES ACT G.N. 63/1996

LIMITS OF VARIATION

Farm FeedLimit of Variation1.Blood MealCrude protein, not more than 1/10th of the registered percentage above or 1/20th of the registered percentage below the registered percentage.2.Meat and bone mealCrude protein, not more than 1/6th of the registered percentage above or 1/20th of the registered percentage below the registered percentage. Fat, not more than 1/8th of the registered percentage above or below the registered percentage. Calcium and phosphorus, not more than 1/5th of the registered percentage above or below the registered percentage.3.Ground cereal grains, brewers grains, cereal grain by-products not mentioned elsewhere in this Schedule, dried fruit and citrus pulp and lucerneCrude protein, not more than 1/6th of the registered percentage above or 1/20th of the registered percentage below the registered percentage. Crude fibre, not more than 1/8th of the registered percentage above or 1/4th of the registered percentage below the registered percentage.4.Farm feeds including compounded feeds not mentioned elsewhere in this Schedule.Crude protein, not more than 1/6th of the registered percentage above or 1/20th of the registered percentage below the registered percentage. Crude fibre, not more than 1/8th of the registered percentage above or 1/4th of the registered percentage below the registered percentage. Fat, not more than 1/8th of the registered percentage above or below the registered percentage with a maximum of 1 per centum.Calcium and phosphorus, not more than 1/10th of the registered percentage above or below the registered percentage with a minimum of 0.2 per centum Ca or P and a maximum of 1 per centum Ca or P Salt, not more than 0.5 per centum NaCl above the registered percentage, provided that in feeds for pigs and poultry the salt content of the feed when prepared according to the instructions of the manufacturer shall not exceed 1 per centum NaCl.

NOTE—Where no limit of variation is stated, the variation allowed shall be within 1/10th more or less of the stated amount. G.N. 63/1996

FIFTH SCHEDULE (reg. 20)

METHODS OF ANALYSIS

PREPARATION OF THE SAMPLE FOR ANALYSIS

1.—(1) If the sample contains any extraneous matter of material than cannot be conveniently ground, weigh the whole sample, remove and weigh the extraneous matter or material, and allow for the portion removed in calculating the results of analysis.

(2) Where the sample is in a fine condition and passes a sieve having apertures one millimetre square, mix the sample thoroughly.

(3) Where the sample is in a coarse condition or contains larger pieces of material, grind so that the whole sample passes a sieve having apertures one millimetre square.

(4) Where the sample is too moist to be ground in its original condition, mix the sample thoroughly and remove a portion for a moisture determination. Dry the remaining portion at 100°C, or at a specified lower temperature for material which may deteriorate or decompose at 100°C.

Express the results of analysis of the dried samples in terms of the sample as received.

(5) Where the sample is of such a nature that it cannot be conveniently ground, mix the sample thoroughly.

(6) Store an approximately 250 g portion of the prepared sample in a non-corrodible container with an air-tight closure.

DETERMINATION OF MOISTURE

2. Weigh to the nearest milligramme about 5 g of the sample, heat at 100°C for 2 to 3 hours, cool in a desiccator and weigh. Reheat for another hour, cool and reweigh. If the difference in weight exceeds 2 mg continue the heating and cooling procedure until a weight constant within 2 mg is attained. Calculate the total loss of weight as a percentage of the original weight and regard as moisture.

DETERMINATION OF TOTAL NITROGEN AND CRUDE PROTEIN

3.—(1) Apparatus:

1. Kjeldahl flasks (100 or 200 ml)4. Microburette2. Volumetric flasks (50 ml)5. Pipettes3. Conical flasks (100 ml)6. Markhan still

(2) Reagents:

Mixed catalyst: Grind and mix together—

160 g anhydrous potassium sulphate (K_2SO_4) or sodium sulphate (Na_2SO_4)

10 g cupric sulphate ($CuSO_4 . 5H_2O$)

3 g selenium powder (Se).

Sodium hydroxide (NaOH): 46 per cent aqueous solution.

Boric acid (H_3BO_3): 2 per cent aqueous solution dissolved in boiling water.

Mixed indicator: 3 parts 0.1 per cent brom-cresol green in 90 per cent ethanol plus 2 parts 0.1 per cent methyl red in 90 per cent ethanol.

N/70 hydrochloric acid (HCl): 1.23 ml AR concentrated hydrochloric acid/litre standardize against a standard NaOH solution.

AR concentrated sulphuric acid (H_2SO_4): (Nitrogen-free preferably).

(3) Procedure—

(a) Digestion (Extraction)

To 1 g accurately weighed sample placed in a Kjeldahl flask add approximately 1.7 g mixed catalyst, 1.5 ml water and 12 ml concentrated sulphuric acid (N-free). Swirl to mix well and stand for 15–20 minutes.

Digest on the Kjeldahl digestion unit in the fume chamber, applying gentle heat for about 10 minutes first, with frequent swirling of the flask to prevent frothing, then heating strongly with occasional swirling, until a clear pale green extract is obtained. Then digest for a further 1 hour after this change. (N.B.—Total heating time should not exceed 2 hours, to avoid loss of ammonia.)

Cool the flask and then add 10–15 ml water, shake and cool. When cool, transfer to a 50 ml volumetric flask through a funnel, washing the Kjeldahl flask several times into the volumetric flask using several small quantities of water. Make up to the mark.

In this extract:

1 ml = 0.02 g original sample.

(b) Distillation

Pipette a 2 ml aliquot (= 0.04 g sample) of the above extract into a Markham still and add 10 ml 46 per cent sodium hydroxide solution through the funnel with the funnel plug in position. Then lift the funnel plug and allow most, but not all, of the sodium hydroxide solution to pass into the still.

Wash the funnel with 5–10 ml. water, letting most, but not all, of it run into the still. (N.B.—Volume of 46 per cent. sodium hydroxide solution require=4/5 volume of concentrated sulphuric acid used, approximately.)

Steam distil, collecting liberated ammonia in a 100 ml. conical flask containing 5 ml. 2 per cent. boric acid to which 5–6 drops mixed indicator have been added. Distil till the wine-red colour of the solution in the conical flask flashes to green. Ensure the tip of the delivery tube of the condenser is dipping in boric acid from the start of distillation until 1 minute after the solution turns green. Continue distilling for a further 1 minute after this change, but with the tube above the solution in the conical flask, then wash the tip of the delivery tube into the conical flask, using a wash bottle of distilled water. (Rate of distillation should be at least 5 ml./Minute.)

Notes on Distillation

(i) Should the alkaline mixture run over into the condenser during distillation, dismantle the apparatus and wash thoroughly before steaming out.

(ii) At the start of each day's distillation, pass steam through the apparatus for several minutes, collecting the distillate in boric acid and titrating it, to ensure that the Markham still is free from ammonia and/or sodium hydroxide contamination.

(c) Titration

Titrate the recovered ammonia with N/70 hydrochloric acid from a microburette until the colour changes from green to the original wine red (or pink).

Correct the burette readings by subtracting a reagent blank reading determined as above but with the farm feed material omitted.

Calculation—

Since 2 ml. aliquot of extract taken=0.04 g. materialand 1 ml. N/70 hydrochloric acid =0.1 mg. nitrogen,then %N =Corrected mls. of N/70 HCl used2

To obtain percentage of crude protein, multiply percentage of nitrogen 6.25.

DETERMINATION OF PROTEIN EQUIVALENT

4.—(1) Reagents to be used—

Urease solution

(a) To standardize the urease, determine its alkalinity by dissolving 0.1 g. in 50 ml. of water and titrating with standard N/10 hydrochloric acid, using methyl-red indicator. Then prepare a neutralized 1 per cent. solution of urease and add different quantities of the solution to 0.1 g. portions of pure urea and proceed with the enzymatic digestion and distillation as described in the procedure at 4 (2) below.

(b) To prepare the urease solution for the actual determination, dissolve urease in water in such a proportion that 10 ml. of the neutralized solution will convert at least 0.1 g. of pure urea under the conditions described below.

The solution must be freshly prepared for each determination.

Magnesium oxide

25 per cent. calcium chloride solution

Defoaming solution—Dissolve 50 g. of diglycol stearate in 375 ml. of benzine, 75 ml. of alcohol and 250 ml. of dibutyl phthalate, warming if necessary.

N/10 hydrochloric or sulphuric acid

N/10 sodium hydroxide solution

Methyl-red indicator—screened or unscreened

4.—(2) Procedure—

Weigh to the nearest milligramme about 1 g. of the sample and transfer to a Kjeldahl flask. Add 250 ml. of water and 10 ml. of urease solution and stopper tightly. Allow the digestion to proceed for one hour with occasional shaking.

Remove the stopper, washing it and the neck of the flask with water, and add 2 g. of magnesium oxide, 1 ml. of 25 per cent. calcium chloride solution and 5 ml. of the defoaming solution or an effective amount of any other suitable nitrogen-free, defoaming agent.

Connect to a distillation apparatus and distil into an appropriate volume of N/10 acid until 100 ml. of the distillate has passed over.

Titrate the excess of acid with N/10 sodium hydroxide solution using methyl-red indicator.

Carry out a blank determination on all reagents.

Express the result in terms of protein equivalent.

1 ml. N/10 acid=0.00875 g. protein equivalent.

DETERMINATION OF FAT AND OIL (ETHER EXTRACT)

5. (1) Apparatus:

(1) Soxhlet extraction apparatus (Quickfit).

(2) Heating mantles (electrothermal extraction unit).

(3) Whatman extraction thimbles (single layer thickness).

(4) Filter paper (11.0 cm. or 12.5 cm. Whatman No. 1).

(5) Razor blade.

(2) Reagents:

(1) Petroleum ether (boiling range 80°C–100°C) or benzine (repurified).

(2) Washed sand—wash with distilled water and heat in the muffle furnace at 500°C for several hours, then wash again and dry.

OIL

(3) Procedure:

(a) Preparation

If the sample is oil seeds (e.g. groundnuts), first determine the moisture content on, say, 15 g. of the sample, drying the sample in an oven at 98°C for at least 4 hours (preferably overnight). Then remove the testa and weigh it separately to determine % of testa. Note the weight of total dry kernel. Cut up a proportion of the dry kernel into thin slices, using a sharp razor blade and proceed as follows—

(b) Extraction

In duplicate weigh to the nearest mg. about 2.5 g. of the sliced sub-sample (or otherwise homogeneously prepared sample) and carefully wrap it in folded Whatman No. 1 filter paper. Place in a labelled (use lead pencil) extraction thimble and plug the thimble with oil-free cotton wool. Place in a soxhlet extractor.

One-quarter fill the extractor and two-thirds fill the labelled extraction flask with petroleum ether (or benzine) and extract the oil for 6 hours on an electrothermal extract unit, setting the apparatus so that it siphons once every 4–5 minutes.

Cool, dismantle the apparatus, remove the filter paper from the thimble and dry it in the oven at 98°C for about 30 minutes. Place the dried sample residue in a mortar and grind to a fine consistency with about 2 to 3 g. clean sand. Wrap in the same filter paper and return to the original thimble, plug, replace in the extractor and continue extraction for a further 2 hours.

(c) Recovery of extractant

After cooling, remove the thimble, pouring all the extractant into the extraction flask. Place on the heating mantles again and allow to siphon twice. Then proceed to recover the extractant by distillation until about 20 ml. of solution remains in the extraction flask. Allow to cool.

(d) Drying of extract

Dismantle the extraction apparatus and place the flask in the oven for 1 hour at 100°C to volatilize all remaining extractant. Cool in a desiccator and weigh. Repeat oven drying, cooling and weighing until the weight is constant. (Note: weight of flask + oil + residue (impurities) = W1.)

Remove the oil by dissolving in hot petroleum ether or benzine and decanting, leaving any residual impurities in the extraction flask. Wash similarly twice till all the oil is removed. Dry the flask + residue at 100°C for 30 minutes, cool and weigh (=W2).

Calculation

(i) Per cent. oil in dry kernel=W1-W2X100weight of sample taken

(ii) To find % oil at a given % moisture content—

% Oil =(100-a) yz(100-m)x

where a = given % moisture content at which the oil content is to be expressed

m = % moisture on whole nut as determined in the laboratory

x = weight of whole nut taken before drying

y = weight of kernel (i.e. weight of whole nut-weight of testa)

z = % oil in dry kernel

e.g. at 6% moisture content—

% Oil=(100-6) yz(100-m) x

=94yz(100-m)x

ETHER EXTRACT (OR RESIN)

(4) Procedure—

If the sample is other than oil seeds (e.g. maize flour, etc.) accurately weigh about 2.5 g. sample and proceed to extract it as described above but using a previously cleaned, dried and weighed extraction flask.

After drying the extract to constant weight, obtain the weight of the ether extract by subtracting the weight of the flask from the weight of the flask+extract. In other words, re-dissolution of the extract in petroleum, ether or benzine is unnecessary as the empty flask is weighed at the beginning instead of at the end of the procedure.

DETERMINATION OF CRUDE FIBRE

6. (1) Reagents to be used—

1.25% Sulphuric acid—Prepare a sulphuric acid solution of 0.2555 normality.

1.25% sodium hydroxide solution—Prepare a solution containing 1.25 g.

per litre of sodium hydroxide.

1% hydrochloric acid.

Ethyl alcohol (95%v/v).

(2) Procedure—

Weigh to the nearest milligramme about 2 g. of the sample and extract the bulk of the fat. (The residue from the ether extract determination may be used.)

Transfer to a conical flask of such dimensions that 200 ml. of liquid will form a layer 1-1½ inches deep.

Heat to boiling 200 ml. of 1.25% sulphuric acid and add to the flask. Connect the flask to a reflux condenser and bring the contents of the flask to boiling within one minute, then boil gently and continuously for 30 minutes. The contents of the flask should be rotated at 5-minute intervals during the boiling period. Care should be taken to ensure that no material is out of contact with the boiling liquid.

At the end of 30 minutes immediately filter with suction through a Whatman No. 541 filter-paper supported on a pre-warmed Hartley funnel or through an equivalent filtering system. The time of filtration for the 200 ml. of liquid should not exceed 10 minutes. Wash the residue with boiling water until the washings are no longer acid.

Heat to boiling 200 ml. of 1.25% sodium hydroxide solution and with this wash the residue back into the original conical flask.

Boil for 30 minutes observing the precautions stated for the acid treatment.

At the end of 30 minutes, immediately filter with suction through a suitable filter crucible. Wash the residue once with boiling water, then with hot 1 per cent. hydrochloric acid, and then again with boiling water until the washings are no longer acid. Finally, wash three times with ethyl alcohol.

Dry the crucible and residue for 2 hours at 100°C, cool and weigh. Ignite, until free from carbonaceous material, at a temperature not exceeding 600°C, cool and weigh.

Express the loss in weight on ignition of the dried residue as a percentage of the original sample weight.

DETERMINATION OF CALCIUM

(A titrimetric method using versenate (EDTA))

7. (1) Apparatus:

1. Evaporating basins (silica)

2. Hotplate

3. Filtration apparatus, using 12.5 cm. Whatman No. 2 paper

4. Volumetric flasks (100 ml.)

5. Conical flasks (100 ml. and 250 ml.)

6. Policeman (rubber ended glass rod)

7. Pipette

8. Burettes and microburette (5 ml. 10 ml.)

9. Measuring cylinder (25 ml.)

(2) Reagents:

1:1 hydrochloric acid: Dilute a quantity of concentrated HC1 with an equal quantity of distilled water

4.5% hydroxylamine hydrochloride in ethanol

2% sodium cynide in water

N/50 versenate solution: Dissolve 3.72 g. disodium

ethylenediamine tetra-acetate (EDTA) and make up to 1 litre with distilled water.

Standardize this solution at least once a month against N/50 calcium chloride solution (1.001 g. AR 105°C dried calcium carbonate dissolved in approximately 250 ml. water containing 5 ml. AR concentrated hydrochloric acid, boiled, cooled and made up to 1 litre with water to give a .02N calcium chloride solution).

HSN (2-hydroxy-1-(2-hydroxy-4-sulpho-1-naphthyl-azo)3-naphthoic acid) indicator:

100 g. sodium sulphate (anhydrous)

1 g. HSN indicator

Mix thoroughly in a mortar

Potassium hydroxide (KOH): 10% aqueous solution

Ammonium hydroxide—ammonium chloride buffer solution (pH 10): Dissolve 67.5 g. ammonium chloride in some water. Add 570 ml. concentrated ammonium hydroxide and make up to 1 litre with distilled water.

Sodium diethyldithiocarbamate: 0.3 % solution in water.

(3) Procedure—

(a) Extraction

Place an accurately weighed 2 g. sample in a silica evaporating basin and ignite in the muffle furnace at 500°C until a uniformly whitish grey ash is obtained (approximately 30 minutes). Cool and moisten the ash with a few drops of water. Then add 10 ml. 1:1 hydrochloric acid and carefully evaporate to dryness on a hotplate. Cool, then add in all a further 5 ml. 1:1 hydrochloric acid from a burette, breaking the ash and stirring with a policeman.

Transfer the contents into a 100 ml. volumetric flask through a funnel, using 12.5 cm Whatman No. 2 paper and washing with hot water. Cool and make up to the mark with distilled water.

(b) Determination

To a 5 ml. aliquot (=0.1 g. material) in 250 ml. connical

flask:—20 ml. distilled water

1 ml. 0.3% sodium diethyldithiocarbamate

20 ml. 10% potassium hydroxide

1 ml. 2% sodium cyanide

1 ml. 4.5% hydroxylamine hydrochloride

a speck of HSN indicator

and titrate immediately against 0.02N EDTA contained in a microburette, swirling quickly and constantly, until the colour flashes to blue. Note the number of mls. of EDTA used. (N.B. On standing, the original purple colour quickly re-appears.)

Calculation

(i) 1 ml. 0.02N EDTA=0.0004008 g. calcium let y be the number of mls. of EDTA used,

then % calcium=y X 0.004008 X 100z

=0.04008yz

where z = weight of original material equivalent to the aliquot taken (e.g. if 5 ml. aliquot is taken), then:

% calcium=y X 0.0004008 X 1000.1=0.4008y

(ii) to convert % calcium to % calcium oxide:% calcium oxide=% calcium X 1.40% calcium oxide=1.40 X 0.04008yz

DETERMINATION OF PHOSPHORUS

(A colorimetric method)

8. (1) Apparatus:

1. Evaporation basins

2. Muffle furnace

3. Hotplate with sand bath, or water bath

4. Filtration apparatus using 12.5 cm. Whatman No. 2 or No. 1 paper

5. Volumetric flasks (100 ml. and 50 ml.)

6. Policeman

7. Pipette (2 ml.)

8. Burette and microburette

9. Absorptiometer

(2) Reagents:

50% HC1 v/v aqueous solution

Ammonium molybdate (1.5 per cent. ammonium molybdate in 3.5N hydrochloric acid)

Dissolve 15 g. (NH4)6Mo7O24.4H2O in about 300 ml. water warmed to 50°C (filter if necessary). Cool, then slowly add 350 ml. concentrated hydrochloric acid, stirring rapidly. Cool and make up to 1 litre with water. Store in a brown glass-stoppered bottle; renew every 2 months.

Stannous chloride reagent: Dissolve 1.25 g. SnCl2.2H2O in 5.6 ml. concentrated hydrochloric acid (warm slightly to dissolve if necessary). Cool and make up to 50 ml. with freshly boiled and cooled distilled water.

(3) Procedure

(a) Extraction

Place an accurately weighted 0.5 g. sample in an evaporating basin and ignite in a muffle furnace at 550°C until the ash is uniformly grey. Cool, then moisten with a few drops of distilled water. Add 10 ml. 50 per cent. hydrochloric acid, carefully swirling to mix, and evaporate on a hot plate (using a sand bath) to dryness. Remove, cool, then add 2.5 ml. 50 per cent. hydrochloric acid, triturate, add some hot water and mix, using a policeman. Filter through 12.5 cm. Whatman No. 2 or No. 1 paper into a 100 ml. volumetric flask. Wash the basin several times with hot water, each time pouring the wash into the 100 ml. flask. Cool, make up to the mark, stopper and shake.

(b) Determination

Pipette a 2 ml. aliquot (=0.01 g. sample) into a 50 ml. volumetric flask. Add (using a burette) 10 ml. ammonium molybdate reagent and make up to the mark with water.

Finally add 0.25 ml. stannous chloride reagent from a microburette and mix thoroughly. Stand to permit full colour development and measure the colour intensity on the absorptiometer after 5 minutes, using Filter 70 and Cell 2 cm. (N.B. The Colour fades after 20 minutes.)

Calculation

(i) % P=100y1,000,000z

=y10,000z

where y = parts per million from a calibration curve prepared as described below, z = weight of original material equivalent to the aliquot taken, e.g. where 2 ml. aliquot (=0.01 g. material) is taken, as in the case above procedure,

(i) % P=parts per million from graph X1001,000,000 X 0.01=parts per million (p.p.m.)100

(4) Calibration curve

(a) Phosphorus stock solution: Dissolve 0.2195 g. 40°C dried analytical reagent grade potassium dihydrogen phosphate (KH_2PO_4) in about 400 ml. distilled water, add 25 ml, 7N sulphuric acid (H_2SO_4) mix, cool and make up to a litre with distilled water. The solution contains 50 parts per million phosphorus (i.e. 50 p.p.m. P)

(b) Phosphorus standard solutions: Prepare a 2 parts per million phosphorus per millilitre (2 p.p.m. P/ml.) solution by diluting solution (1) above 25 times (e.g. 10 ml. of solution (1) to 250 ml. with distilled water). Then, using this solution and the aliquots shown in column 1 below, prepare a series of calibration standards and proceed to develop the colours in 50 ml. volumetric flasks. Plot a graph connecting absorptiometer readings with parts per million phosphorus p.p.m. P) standard solutions.

Col. 1Col. 2Col. 3Col. 4Mls. 2 p.p.m. solution takenConcentration of final solution (p.p.m./ml.)p.p.m./50 ml. (for graph)% Phosphorus1.042.022.5.105.055.0.2010.1010.0.4020.2015.0.6030.3020.0.8040.4025.01.0050.5030.01.2060.60

DETERMINATION OF SODIUM CHLORIDE

9. (1) Reagents to be used—

Calcium oxide—Solid

Dilute nitric acid—Dilute 1 volume of concentrated nitric acid with 1 volume of water

Nitrobenzine—Analytical reagent grade

N/10 silver nitrate solution

N/10 potassium or ammonium thiocyanate solution

Ferric alum indicator solution—Prepare a saturated solution of ferric ammonium sulphate and add a small quantity of dilute nitric acid.

(2) Procedure—

Weigh to the nearest milligramme 4 g. of the sample into a dish, mix with 1 g. of finely divided calcium oxide and sufficient water to give a thin paste. Dry the mixture carefully and ignite at a temperature not exceeding 550°C until all organic matter is destroyed.

Cool, moisten with a little water and dissolve the ash in 25 ml. of dilute nitric acid.

Filter and wash into a 250 ml. conical flask and dilute with water to 150 ml. When cool, add an excess of N/10 silver nitrate, 2–3 ml. of nitro-benzine and 1 ml. of ferric alum indicator. Shake vigorously to coagulate the precipitate. Titrate the residual silver nitrate with N/10 potassium or ammonium thiocyanate solution until a faint redish-brown colour persists.

1 ml. N/10 silver nitrate=5.845 mgm. NaCl.

DETERMINATION OF SUGAR

10. (1) Reagents to be used—

Potassium oxalate solution—Dissolve 50 g. of potassium oxalate in water and dilute to 1 litre

Zinc acetate solution—Dissolve 219 g. of crystallized zinc acetate and 30 ml. of glacial acetic acid in water and dilute to 1 litre.

Potassium ferrocyanide solution—Dissolve 106 g. of crystallized potassium ferrocyanide in water and dilute to 1 litre.

N hydrochloric acid

Phenolphthalein indicator solution—Dissolve 250 mg. of phenolphthalein in 150 ml. of ethyl alcohol and dilute with 250 ml. of water.

10 per cent. sodium hydroxide solution—Dissolve 100 g. of sodium hydroxide in water and dilute to 1 litre.

Fehling's solution—Mix equal volumes of a solution of copper sulphate and a solution of sodium potassium tartrate prepared as follows—

Copper sulphate solution—Dissolve 69.28 g. of copper sulphate ($CuSO_4.5H_2O$) in water and dilute to 1 litre.

Sodium potassium tartrate solution—Dissolve 346 g. of sodium potassium tartrate and 100 g. of sodium hydroxide in water and dilute to 1 litre.

Note:The strength of the Fehling's solution should be such that 10 ml. is equivalent to 0.0525 g. of invert sugar. It should be checked or standardized by titrating with a solution of pure sucrose as follows—

Dissolve 2.375 g. sucrose (dried at 100°C) in about 100 ml. of water in a 300 ml. beaker, add 15 ml. of N hydrochloric acid and add sufficient water to give a volume of 150 ml. Heat to boiling point, boil for 2 minutes, cool, add 2 or 3 drops of phenolphthalein solution, just neutralize with 10 per cent. sodium hydroxide solution, transfer to a 500 ml. volumetric flask and dilute to 500 ml. Then follow

the procedure described in paragraph 10 (2) (b) (iii). 1 ml. of this sucrose solution=0.00475 g. sucrose=0.0050 g. invert sugar.

Methylene blue solution—Dissolve 2.5 g. of methylene blue in water and dilute to 250 ml.

(2) Procedure—

(a) Preparation of the sample

(i) When the substance is in solid form—weigh to the nearest 10 mg. about 20 g. of the sample or a sufficient quantity to contain about 2 g. of sugar. Grind in a mortar with hot water (temperature not to exceed 60°C) and transfer with the aid of water to a 250 ml. beaker using in all about 120 ml. of water. Stir well and decant through muslin into a 250 ml. volumetric flask, allowing to drain until the liquid is substantially removed, and then squeeze the residue on the muslin. Return the residue to the beaker, add about 50 ml. of water, mix, and decant through the muslin into the volumetric flask, again squeezing the residue after draining. Repeat this treatment with a further 50 ml of water, and finally squeeze the residue on the muslin. Add 5 ml of potassium oxalate solution to the contents of the volumetric flask followed by 5 ml of zinc acetate solution, mix well and then add 5 ml of potassium ferrocyanide solution, dilute to 250 ml, mix well and filter. Determine the sugar in 50 ml of the filtrate by the method described in paragraph (b) below.

(ii) When the substance is in liquid form—weigh to the nearest milligramme about 5 g of the sample and wash with water into a 250 ml volumetric flask using about 200 ml of water. To clear the solution add 5 ml of zinc acetate solution. Mix, then add 5 ml of potassium ferrocyanide solution, again mix dilute to 250 ml, mix and filter. Determine the sugar in 25 ml of filtrate by the method described in paragraph (b) immediately below.

(a) Determination of the sugar content

(i) Inversion of the sucrose.

Transfer the measured volume of filtrate obtained as described in paragraph (1) (i) or paragraph (1) (ii) to a 300 ml beaker, add 15 ml of N hydrochloric acid, dilute to 150 ml with water, cover with a glass and heat to the boiling point. Continue to boil for 2 minutes, cool, add 2 or 3 drops of phenolphthalein indicator solution, just neutralize with 10 per cent sodium hydroxide solution, transfer to a 200 ml volumetric flask and dilute to 200 ml. Filter if necessary.

(ii) Preliminary estimation. (This estimation is usually necessary where the percentage of sugar is unknown.)

Transfer exactly 10 ml of Fehling's solution to a 250 ml conical flask and add 20 ml of water. Add from a burette approximately 10 ml of the filtrate prepared as described in paragraph (b) (i), heat to boiling point and boil briskly for 1 minute. Add 3 drops of methylene blue solution and titrate from the burette at the rate of 1 ml of the filtrate per 15 seconds until the blue colour is discharged, the contents of the flask being kept boiling throughout the titration. Note the total number

of millilitres required and call this x ml. This titration should not be outside the range 15–40 ml, otherwise the determination should be repeated using a more appropriate initial volume of the filtrate.

(iii) Exact determination.

To 10 ml of Fehling's solution in a 250 ml conical flask add from a burette (x–1) ml of the filtrate prepared as described in paragraph (b) (i), together with sufficient water to make a total volume of 60 ml. Heat to boiling point, boil briskly for 1½ minutes and add 3 drops of methylene blue solution. Titrate from the burette at the rate of approximately 0.25 ml per 15 seconds until the blue colour is discharged, the contents of the flask being kept boiling briskly throughout the titration which must not take more than 1½ minutes. Then the total number of millilitres used in the determination equals the sugar equivalent of 10 ml of Fehling's solution.

Not more than 1 ml of filtrate should be required for the completion of the titration. If more than 1 ml is required, then the determination should be repeated using a more closely calculated volume or filtrate for the original addition. The time taken from the initial boiling point until the end of the titration should be about 3 minutes. If this time is exceeded by more than 20 seconds, the titration should be repeated.

10 ml Fehling's solution=0.525 g invert sugar. The total copper reducing power should finally be expressed in terms of sucrose ($C_{12}H_{22}O_{11}$).

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

ARRANGEMENT OF REGULATIONS

REGULATION

G.N. 94/1989

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

under s. 16

1. Citation

These Regulations may be cited as the Fertilizer, Farm Feeds and Remedies (Remedies) Regulations.

2. Interpretation

In these Regulations—

"active ingredient" means the substance in a remedy which—

(a) prevents the establishment of, controls or destroys undesirable plants, insects or animals, or which prevents or cures a disease, infection or infestation or other unhealthy condition of a plant or a product derived therefrom; or

(b) stimulates or retards the rate of plant growth;

"common name" means the name assigned to the pesticide active ingredient as being internationally recognized as the common or genetic name of the active ingredient;

"experimental remedy" means a chemical to be assessed in Malawi for primary biological activity, and not available to the public as a remedy;

"label" means the written, or graphic matter on, or attached to, a pesticide or the immediate container thereof and the outside container or wrapper of the package of the pesticide;

"pest" means any form of plant or animal life or any pathogenic agent which is injurious or potentially injurious to plants or plant products;

"pesticide" means any substance or mixture of substances intended for preventing, destroying or controlling any pest including unwanted species of plants during the production, processing, storage, transport or marketing of food and agricultural commodities, and includes substances intended for use as a plant growth regulator, defoliant, desiccant or fruit and substances applied to crops either before or shortly after harvest to protect the commodity from deteriorating during storage, but does not include fertilizers or other plant nutrients and agents such as veterinary medicines and feed additives;

"recognized research institution" means a research institution recognized by the Minister as competent to carry out research into remedy use;

"register" means a book where all remedies are recorded as an indication that their use in Malawi is authorized;

"season" means a period in which the plant is to be protected by the remedy under conditions in which the plant is normally grown;

"similar environment" means an environment that closely resembles the environment in which the pesticide will be used;

"trade name" means the name under which the pesticide is sold;

3. Application for registration

(1) Every application for registration of a remedy shall be submitted, in triplicate, to the registering officer on Form P.R. 1, set out in the First Schedule.

(2) Every application shall be accompanied with—

(a) three copies of the draft of the label which is intended for use on the container in which the remedy is to be sold; and

(b) any advertisement which is intended for immediate use in respect of such remedy if registration is successful; and

(c) two samples of the remedy, in an amount to be determined by the registering officer; and

(d) a registration fee of K150.

(3) The registering officer shall consider an application in respect of a remedy manufactured outside Malawi only if the application is submitted through a representative who is registered with the Ministry of Trade, Industry and Tourism and is licensed as an importer of remedies in Malawi.

(4) No application for registration shall be considered by the registering officer unless such application—

(a) complies with the Malawi Standards in current use, the specification against which the remedy is manufactured or any internationally recognized specification for that remedy formulation;

(b) complies with the requirements of these Regulations and any such requirements that may, from time to time, be prescribed; and

(c) contains adequate experimental data and information collected in Malawi or similar environment on the efficacy of the pesticide, its toxicity, persistence, intended use and such further information as may be required to determine whether the remedy is suitable for the purpose for which it is intended and to determine whether the use of the pesticide will be beneficial to the user and the country as a whole.

(5) The proprietary rights in the data and information referred to in subregulation 3 (4) (c) shall be duly protected.

4. Registration

(1) The registering officer shall, when registering a remedy—

(a) issue a certificate of registration; and

(b) forward the certificate to the applicant.

(2) Registration shall not be complete unless a copy of the approved label or a fascimile thereof is received by the registering officer.

(3) A registration certificate issued under this regulation shall apply only to the remedy formulation to which the certificate relates.

(4) A remedy registered under this regulation shall not be altered in any way so as to change its formulation, composition or usage or in any other manner unless the registering officer so approves.

(5) Before the registering officer registers any remedy, he shall ensure that such a remedy has not been banned elsewhere, and that is registered in the country of origin.

5. Import of experimental remedy

(1) No person, except an approved research institution, shall import into Malawi any experimental remedy unless he is authorized in writing on Form P.R. 3 set out in the Third Schedule, by the registering officer to do so. No details of the remedy need be given at this stage except name, active ingredient, toxicity, approximate quantity and intended use.

(2) Any person who imports an experimental remedy shall, not later than seven days after the arrival of the remedy in Malawi, complete in triplicate, and forward to the registering officer Form P.R. 4 set out in the Fourth Schedule, except that where an experimental remedy is imported by an approved research institution, such an institution shall, at the discretion of the registering officer, only be required to supply the registering officer with the name or designation and intended experimentation of the experimental remedy using Form P.R. 6 set out in the Sixth Schedule.

(3) No experimental remedy shall be offered to any person other than a person approved by the registering officer to participate in the experimentation.

(4) In granting permission to import an experimental remedy under this regulation the registering officer shall issue a certificate in Form P.R. 5 set out in the Fifth Schedule within fourteen days after receipt of Form P.R. 4 and the registering officer may impose such conditions as may be necessary with regard to the experimentation with the remedy.

(5) It shall be a condition for the importation of experiemntal remedy that plants or products thereof treated with the experimental remedy shall not be sold or disposed of or consumed without the written authority of the registering officer.

(6) The experimental period shall be for a minimum of three seasons except where satisfactory proof is supplied that the remedy has been similarly tested and registered or approved in a similar environment, the Minister may reduce the period to one season.

(7) The label affixed to a container in which a remedy is imported for purposes other than sale shall be clearly marked with the words “FOR EXPERIMENTAL PURPOSES ONLY—NOT FOR SALE”.

(8) A remedy imported into Malawi for re-export within a period of fourteen days while remaining in unopened original containers shall be subject to subregulation (1) and shall be exported within the said fourteen days and where repackaging will be done before re-export, such remedy shall be subject to subregulations (1), (2), (3) and (4), and shall be exported within a reasonable time as agreed upon with the registering officer.

6. Approval of brands

(1) Subject to subregulation (2) the registering officer shall, before registering any brand, receive confirmation from the Registrar of Trade Marks, and satisfy himself that the name of the brand does not resemble the name of any other brand.

(2) A remedy shall not be registered under a brand if in the opinion of the registering officer the brand is—

(a) of an insufficiently distinctive nature; or

(b) so similar to a brand under which a remedy had already been registered as to be liable to be mistaken for the other brand; or

(c) of a quantity not complying with the specifications indicated on the label as specified in regulation 7 and such information shall be shown on certificate of analysis issued by the Malawi Bureau of Standards or any other institution recognized by the Minister; or

(d) misleading in any other way.

7. Labelling of containers

(1) No person shall sell any remedy unless the label is securely affixed to the container and it is in the English language or, where the registering officer considers it appropriate, in the Chichewa language as well.

(2) The label, which shall be verbally and graphically identical in all respects to that approved by the registering officer under these regulations shall state—

(a) the name and address of the applicant;

(b) the company brand or symbol;

(c) the brand of the remedy;

(d) the registration number under which the remedy is registered, and the identity of each lot or batch of the product in numbers or letters that can be read, transcribed and communicated by anyone without the need for codes or other means of deciphering;

(e) the net quantity by weight or volume in the container;

(f) the common and trade names, and the percentage of active ingredient provided that such percentages and quantities of active and inert matter shall be verified by the Malawi Bureau of Standards or any other institution recognized by the Minister;

(g) the purpose for which the remedy has been registered;

(h) the directions for use of the remedy, the target pest, target crop, dosage, timing of treatment, safety period and any other similar information required by the registering officer;

(i) the precautionary measures to be observed in handling and using the remedy;

(j) the appropriate warning with regard to the poisonous nature of the remedy specified in this regulation;

(k) the symptoms of poisoning;

(l) the remedial treatment in the case of poisoning where applicable;

(m) the date of manufacture and shelf life of the pesticide;

(n) a warning against the re-use of containers and instructions for the safe disposal or decontamination of empty containers; and

(o) any other information which the registering officer may approve or consider to be necessary.

(3) Remedies which are transported to premises where they are further to be processed or packed for the retail trade shall be clearly marked with the particulars specified under this regulation.

(4) A symbol shall be printed on, or securely affixed to, the label in a colour approved by the registering officer and such symbol shall occupy an area of not less than one-twentieth of the area of the label.

(5) The symbol of approved colour shall be located on the label in a position equi-distant from the two vertical sides and be delienated from the rest of the label by a black border to emphasize the approved colour.

(6) The symbol of approved colour shall be—

(a) a triangle to denote marketing for agricultural use; and

(b) a circle to denote marketing for stored products use.

(7) A symbol specified in subregulation (6) may be superimposed where the uses and marketing thereof are found to be the same or where the remedy is used for both purposes.

(8) The colour coding of the symbols and warning shall be as specified in the Seventh Schedule.

(9) Within the symbol of approved colour, there shall be printed such information in the English language or, where the registering officer considers it appropriate, in the Chichewa language as well as the registering officer thinks necessary to denote toxicity or hazardous nature.

(10) Within the symbol of approved colour there shall be printed, the words “skull and cross-bones”.

(11) Except with the permission of the registering officer, no label shall contain any information other than that provided for in this regulation.

(12) No label, approved by the registering officer, shall be altered without the written approval of the registering officer.

8. Containers

(1) No remedy shall be sold, transported or stored unless the registering officer is satisfied that the container in which the remedy is to be packed is of sufficiently durable construction and material.

(2) A container which contains any combustible substance shall be of suitable material.

(3) Remedies which contain inflamable or volutile ingredients shall be packed in durable containers.

(4) No remedy shall be packed in a container that resembles a container of a consumable product.

9. Safety during use

Any user of a remedy shall, when using such a remedy, be required to take appropriate safety precautions and to facilitate in these precautions being taken—

(a) every label shall bear warning or precautionary statements advising the user on how to handle, use and apply the product with safety;

(b) in the case of very toxic remedies bearing a "red label"—

(i) persons selling such category of remedy to the public shall also stock appropriate safety clothing and equipment such as face masks and gloves;

(ii) all persons who use such remedy shall ensure that they wear appropriate protective clothes and apparatus when handling and using the remedy;

(iii) all persons who buy such remedies shall ensure that if they employ other people to handle and apply the remedy and they shall cause such employees to wear appropriate protective clothes and apparatus;

(iv) a person who sells remedies shall have a register in which he shall enter all the details of his transactions such as names of buyers and quantity of the remedy sold; and such a register shall be made available to the registering officer or his nominee on demand for inspection.

10. Sampling inspection and analysis

(1) An inspector or any other officer charged with the collection of a remedy for the purposes of these Regulations shall collect a sample determined by an approved research institution.

(2) A sample of a remedy shall be analysed following methods prescribed from time to time by the Malawi Bureau of Standards or any other institution recognized by the Minister.

(3) A remedy shall be deemed to have complied with the provisions of these Regulations if, upon analysis, the composition is found to be in conformity with the declared percentages and quantities of ingredients referred to in regulation 7 (2) (f).

(4) The applicant may request an inspector or any authorized officer to collect samples from containers using approved sampling procedures and send such samples to the Malawi Bureau of Standards or any other institution recognized by the Minister for analysis.

(5) Sampling, inspection and analysis shall be conducted as need arises.

11. Prohibition

The Minister may, by General Notice in the Gazette, restrict or prohibit the use of a remedy specified in such notice and such restriction or prohibition may be either general or specific.

12. Savings

Upon the commencement of these Regulations—

(a) a remedy the registration of which was recommended upon the basis of whose recommendation was research work carried out in Malawi or similar environment prior to the commencement of these Regulations shall be automatically registered;

(b) any remedy for which there is insufficient data to support registration thereof, shall be treated as experimental remedy;

(c) where there is no data available concerning a remedy, no additional importations shall be permitted except as provided for in regulation 5.

13. Offences and penalties

Any person who fails to comply with the provisions of these Regulations shall be guilty of an offence and shall be liable to a fine of K200 or to imprisonment for a term of 6 months.

FIRST SCHEDULE

FORM P.R. 1

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

APPLICATION FOR REGISTRATION OF A REMEDY

(UNDER REGULATION 3)

A. To be submitted to the registering officer, in triplicate.

1. Name of applicant: .....

2. Address of applicant:

(a) Postal: .....

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(b) Business: .....

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3. Type of remedy (fungicide, insecticide, etc.): .....

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B. Information to be submitted with this application for all remedies for which registration is sought.

1. Brand name: .....

2. Full chemical name of each ingredient: .....

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3. Common name of each active ingredient: .....

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4. The empirical and structural formulae for each active ingredient: .....

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5. Proposed formulation: .....

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6. Percentage of purity on a mass-by-mass or mass-by-volume basis (specify), of each active ingredient and other ingredients (including inert matter) in the remedy stating which method or percentage applies to each ingredient: .....

.....

.....

7. Physical and chemical properties of each ingredient with specific reference to type of formation: .....

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8. Size of containers in which remedy is to be sold, and nett-weight: .....

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9. Nature of containers in which remedy is to be sold: .....

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10. Stability of formulation—

(a) on storage: .....

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(b) on dilution: .....

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(c) shelf life from date of manufacture: .....

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11. Corrossiveness of equipment: .....

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12. Phytotoxicity: .....

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13. Toxicology: .....

14. Safety precautions to be observed in handling, use and storage:.....

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15. Hazard to wild life: .....

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16. Residue data: .....

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17. Proposed use: .....

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18. Directions for use: .....

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19. Biological effectiveness and benefit in use: .....

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I hereby apply for the registration, under the Fertilizers, Farm Feeds and Remedies (Remedies) Regulations, 1989, of the remedy of which particulars are given above, and I certify that these particulars are to the best of my knowledge, true and correct.

Date: .....Signature of applicant and

Official Stamp

NOTE: The detailed information required under these regulations or any other information that the registering officer requires must accompany the application. Any claims made for biological effectiveness and statements made respecting residues, etc., must be supported by detailed relevant experimental data.

SECOND SCHEDULE

FORM P.R. 2

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

CERTIFICATE OF REGISTRATION OF A REMEDY

(UNDER REGULATION 3)

Number:

It is hereby—

(a) certified that the remedy referred to in Form P.R. 1 has been registered; and

(b) approval has been granted of the labels and advertisements copies of which are attached hereto, and which are to be used in connexion with the said remedy.

This registration expires on ..... and is subject to the following conditions: .....

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.....

Date and Official Stamp

.....

Registering Officer

THIRD SCHEDULE

FORM P.R. 3

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

APPLICATION FOR IMPORTATION OF A REMEDY TO BE USED ONLY FOR EXPERIMENTATION

(UNDER REGULATION 5)

To be submitted to the registering officer, in triplicate.

1. Name of applicant: .....

.....

2. Address of applicant—

(a) Postal: .....

.....

(b) Business: .....

.....

3. Type of remedy (fungicide, insecticide, etc.): .....

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.....

4. Active ingredient: .....

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5. (a) Oral LD 50 .....

.....

(b) Dermal LD 50 .....

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6. Brand name: .....

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7. Common name: .....

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8. Approximate quantity: .....

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9. Intended use: .....

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10. Name of manufacturer: .....

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11. Address of manufacturer: .....

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12. Proposed use: .....

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.....

I hereby apply for importing, under the Fertilizers, Farm Feeds and Remedies (Remedies) Regulations, 1989, the remedy for experimental purposes particulars of which are given above.

Date: .....

.....

Signature of Applicant and

Official Stamp

For Official use only—

Date application received: .....

Experimental Registration Number: .....

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Your application to import .....

.....

..... has not been/been approved.

Reasons for non-approval .....

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FOURTH SCHEDULE

FORM P.R. 4

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

APPLICATION FOR REGISTRATION OF A REMEDY TO BE USED ONLY FOR EXPERIMENTATION

(UNDER REGULATION 5)

Information to be submitted, in triplicate, to the registering officer in respect of experimental remedy.

1. Name of applicant: .....

2. Address of applicant—

(a) Postal: .....

.....

(b) Business: .....

.....

3. Name, code or number of remedy: .....

.....

4. Type of remedy (fungicide, insecticide, etc.): .....

.....

5. Chemical group: .....

.....

6. Toxicological data, if available—

(a) humans and animals: LD 50 oral (state type of animal), LD 50 dermal, LD 50 inhalation: .....

(b) symptoms of poisoning: .....

(c) first aid: .....

7. Weight or volume of remedy imported: .....

8. Suggested use: .....

9. Location of trials: .....

10. Plot size to be agreed: .....

11. Person conducting the trials: .....

Date: .....

.....

Signature of applicant and

Official Stamp

FIFTH SCHEDULE

FORM P.R. 5

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

CERTIFICATE OF REGISTRATION OF A REMEDY TO BE USED ONLY FOR EXPERIMENTATION

(UNDER REGULATION 5)

Number:

I hereby certify that the remedy ..... has been registered for experiemental purposes.

The registration number is: .....

The registration expires on: ..... and is

subject to the following conditions: .....

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.....

Date: .....

.....

Registering Officer and Official Stamp

SIXTH SCHEDULE

FORM P.R. 6

FERTILIZERS, FARM FEEDS AND REMEDIES ACT

(CAP. 67:04)

FERTILIZERS, FARM FEEDS AND REMEDIES (REMEDIES) REGULATIONS

FORM NOTIFICATION BY A RECOGNIZED RESEARCH INSTITUTE TO THE REGISTERING OFFICER FOR POSSESSION OF A REMEDY UNDER TEST

(UNDER REGULATION 5)

To be submitted to the registering officer, in triplicate.

1. Name of the research institute: .....

2. Address of the research institute—

(a) Postal: .....

.....

(b) Business: .....

.....

3. Type of remedy (fungicide, insecticide, etc.): .....

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.....

4. Registration number: .....

5. Brand name: .....

6. Common name: .....

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7. Approximate quantity: .....

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8. Proposed use: .....

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Date: .....

.....

Signature of Scientist and Official Stamp

SEVENTH SCHEDULE (reg. 7 (8)

Pesticide toxicitySymbol colour codeWarningAcute oral LD 50 up to mg/kgRedVery dangerous poisonAcute dermal LD 50 up to 200 mg/kgRedVery dangerous poisonAcute inhalation LC 50 up to 200

mg/m3RedVery dangerous poisonAcute oral LD 50 51–500 mg/kgPurpleDangerous poisonAcute dermal LD 50 201–2,000 mg/kgPurpleDangerous poisonAcute inhalation LD 50 201–2,000 mg/m3PurpleDangerous poisonAcute oral LD 50 501–5,000 mg/kgAmberPoisonAcute dermal LD 50 2,001–20,000 mg/kgAmberPoisonAcute inhalation LC 50 2,001–20,000 mg/m3AmberPoisonAcute oral LD 50 greater than 5,000 mg/kgGreenHarmful if swallowedAcute dermal LD 50 greater than 20,000 mg/kgGreenHarmfulAcute inhalation LC 50 greater than 20,000 mg/m3GreenHarmful