The International POPs Elimination Project

Fostering Active and Effective Civil Society Participation in Preparation for Implementation of the Stockholm Convention

Hotspot Report for a Contaminated Site: Kawanda Agricultural Research Institute (KARI) Uganda

National Association of Professional Environmentalists (NAPE)

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Uganda
June 2005

About the International POPs Elimination Project

On May 1, 2004, the International POPs Elimination Network (IPEN http://www.ipen.org) began a global NGO project called the International POPs Elimination Project (IPEP) in partnership with the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Program (UNEP). The Global Environment Facility (GEF) provided core funding for the project.

IPEP has three principal objectives:

- Encourage and enable NGOs in 40 developing and transitional countries to engage in activities that provide concrete and immediate contributions to country efforts in preparing for the implementation of the Stockholm Convention;

- Enhance the skills and knowledge of NGOs to help build their capacity as effective stakeholders in the Convention implementation process;

- Help establish regional and national NGO coordination and capacity in all regions of the world in support of longer term efforts to achieve chemical safety.

IPEP will support preparation of reports on country situation, hotspots, policy briefs, and regional activities. Three principal types of activities will be supported by IPEP: participation in the National Implementation Plan, training and awareness workshops, and public information and awareness campaigns.

For more information, please see http://www.ipen.org

IPEN gratefully acknowledges the financial support of the Global Environment Facility, Swiss Agency for Development and Cooperation, Swiss Agency for the Environment Forests and Landscape, the Canada POPs Fund, the Dutch Ministry of Housing, Spatial Planning and the Environment (VROM), Mitchell Kapor Foundation, Sigrid Rausing Trust, New York Community Trust and others.

The views expressed in this report are those of the authors and not necessarily the views of the institutions providing management and/or financial support.

This report is available in the following languages: English

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LIST OF ACRONYMS

FAO	Food and Agriculture Organization
GTZ	Germany Technical Services
ILO	International Labour Organization
IPCS	International Program on Chemical Safety
IPEP	International POPs Elimination Project
KARI	Kawanda Agricultural Research Institute
NAEATRI	Namulonge Agricultural Engineering and Appropriate Technology Research Institute
NAPE	National Association of Professional Environmentalists
NEMA	National Environment Management Authority
NGO	Non-governmental Organizations
NIP	National Implementation Plan
OECD	Organization for Economic Cooperation and Development
PAN	Pesticides Action Network
PIC	Prior Informed Consent
PMA	Plan for Modernization of Agriculture
POPs	Persistent Organic Pollutants
SAICM	Strategic Approach to International Chemicals Management
UN	United Nations
UNEP	United Nations Environment Program
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization

1.0 EXECUTIVE SUMMARY

Uganda like many developing countries is faced with a problem of managing its stockpiles of obsolete chemicals that are hazardous to human health, genetic structures and reproductive outcomes and to the environment. In the 1980s, the Government of Uganda imported a substantial amount of herbicides to 'protect' bananas, cotton and for seed dressing, but most of these chemicals were not used due to the political instability in the country then. To date some of these stocks of pesticides are kept in stores at the Kawanda Research Station. Some chemicals in the stores have leaked out of their containers resulting in corrosion of the bases of the old iron-walled storage rooms.

This study was carried out by the National Association of Professional Environmentalists (NAPE), to establish the quantities of obsolete chemicals; with specific emphasis on POPs that are currently stored at Kawanda Agricultural Research Institute (KARI). It tried to find out the purpose, for which these chemicals were imported, the countries of origin of the pesticides, how long they have been stored at KARI and why they became obsolete. It also investigated on the possible hazards to public health and to the environment, of these obsolete chemicals and plans by KARI management for possible safe and environmentally friendly removal or disposal of these obsolete pesticides.

This report has been written in sections, the first section of the report talks about the background and status of chemical management in Uganda. It focuses on the Stockholm Convention on Persistent Organic Pollutants (POPs) and plans or mechanisms of reducing or eliminating them with the primary aim of minimizing their undesirable effects to human life and to the environment. Section two of the study gives the physical location and description of KARI and the location of the stores.

The study concludes that cleanup and restoration of environmental conditions at KARI and other areas with storage facilities of obsolete pesticides is paramount if public health and sound environmental management are to be promoted. The study also notes that for this to be done, the country requires technical and financial support as well as government's openness about the problem at hand, good will and political support for the clean up strategies.

The study recommends that the obsolete pesticide storages facilities at KARI be improved on so as to reduce on the likely health and environmental risks that may result from their current status. It also recommends that government and KARI in particular carry out an inventory of obsolete pesticides at the site so as to identify and classify them; their source, and the available quantities in the stores. It further recommends education and awareness raising programmes as well as drawing plans and mechanisms for safe removal/disposal of these chemicals and consequent cleanup activities, be drawn up immediately. Finally, it recommends for government to explore the opportunities provided for under the Stockholm Convention for managing POPs especially in capacity building, acquiring skills and expertise not available in the country.

2.0 PHYSICAL DESCRIPTION OF KARI

Kawanda Agricultural Research Institute (KARI) is a subsidiary of the National Agricultural Research Organisation (NARO) and is found in Nabweru Sub-county of Wakiso District. The institute is to the North of Kampala in one of the peri-urban areas, which is about 9 kilometres from the capital City of Uganda. It is located at about longitude 45˚N and latitude 48˚E on a raised ground but steadily sloping to the south and west of the institute where it is partly bordered by swampy wetlands. The west of the institute is also bordered by human settlements where the neighbouring communities predominantly practice subsistence agricultural activities; including animal husbandry. To the east, the institute boarders with the Gulu highway while to the North and to the North West it boarders with business centres with a number of small scale business activities being carried out by the local communities. The site has a land cover that can be approximated to two (2) square kilometre most of which is covered by a number of agricultural demonstration plots.

Entrance to KARI 9 km Kampala – Gulu Highway

The stores are located to the North West of the institute barely 20 metres from a business centre that is densely populated. Within the confines of the store there are about 2 families that reside and carry out their domestic activities in the area. About 200 metres from these stores is located a school and a church. There are about two protected wells further west from the stores at a radius of about 1 km from the stores. Some of the members of the community close to the stores have access to piped water although this is limited to the business centre.

A protected well for the communities near the KARI establishment

The majority of the population living in surrounding areas to the KARI establishment do not have access to piped water and depend on protected springs. Being that KARI stands on a raised ground, some protected springs drain their water from the KARI establishment. Little information however is available on the water quality from these springs. However, the communities interviewed from the area indicated that they had not experienced any chemical related health problems emanating from the water although, it would be difficult for most of these communities to distinguish common diseases from chemical related ailments.

3.0 HISTORY OF THE SITE

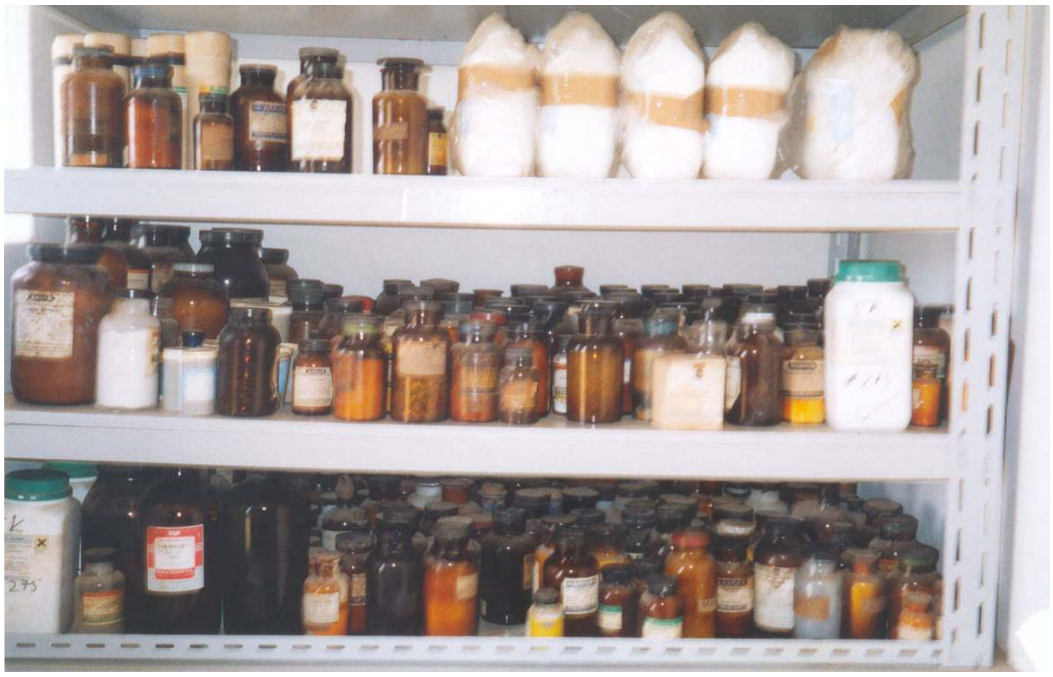
KARI was formerly known as Kawanda Agriculture Research Station and was linked to various agricultural research stations in the country. The institute used to provide agricultural support services including agricultural extension services to farmers. The institute also provided one of the main storage facilities for agricultural chemical in the country, some of which were constructed as early as 1939. The site has at least 10 stores most of which were constructed using iron sheets. Apart from being a major storage and supply centre for agrochemicals to farmers, KARI carried out research on agriculture related field and laboratory tests on chemical efficacy on crops in demonstration plots before they could be released out to farmers. Under the new Plan for Modernisation of Agriculture (PMA), KARI is charged with responsibility of carrying out research in agriculture. Agricultural Extension Services which were also formerly done by KARI

were taken over by the National Agricultural Advisory Services (NAADS) under the new framework of modernising agriculture in the country.

In the 1980s, the Government of Uganda imported a substantial amount of herbicides to 'protect' bananas, cotton and for seed dressing, but most of these chemicals were not used due to the then political instability in the country. To date, some of these stocks of pesticides have been kept in stores at Kawanda Research Station. Some of the chemicals have been in the stores for more than 30 years and have leaked leading to corrosion of the bases of the old iron-walled storage rooms. This corrosion is likely to have been a result of a poor storage system as well as the effects of rusting of some of chemical containers while in storage. The sorry state of the corroded iron sheet-walled stores can be easily noticed on the basement. It is difficult to estimate the exact quantities of pesticides that are available at KARI following the disposal of some obsolete chemicals some years back and leakage of the containers.

Iron-walled stores for obsolete chemicals at KARI

There are obsolete laboratory chemicals that have been stored for over 20 years. Some of these chemicals; because of their duration in the stores, have lost their tags and cannot be easily identified. According to management at KARI, the chemicals expired as a result of the then prevailing instability in the country that disabled the research activities at the institute. These obsolete chemicals however, are stored together with chemicals that are currently being used by the institute. Safety measures in place are not adequate enough as workers access the facility without any protective gear.



Obsolete Laboratory Chemicals

4.0 CHEMICAL CHARACTERIZATION

4.1 POPs chemicals

Access to some of the stores with obsolete chemicals and access to some records that relate to types, management and disposal of these chemicals was difficult, the reason for this being the reluctance of management to divulge details on the subject. The study therefore could not determine with evidence any existence of POPs chemicals.

4.2 Other chemicals

Other chemicals that were found in some of the stores include: Bayfidan (triadimenol and N-methyl-2-pyrrolidone), Basamid Granular (Carbofuran), Anil (phenylaminocadmium dilactate), Planete Aster (Hexaconazole) and Drexel (Methyl Bromide + chloropicrin) a plant bed gas fumigant. Some of the stores contain stockpiles of Sopra (Lindane + Parathion) an insecticide whose production was discontinued some years back. There are also stock piles of Pilar (Chlorimuron-ethyl) as well as Ronilap DF; a compound whose chemical name could not be found. Due to lack of sufficient chemical knowledge by the store keepers and the poor state of the stored chemicals, the trade and chemical names of some Nematizide and irritants could not be identified.

4.3 Existing data

There is insufficient data on the obsolete pesticides that are stored at KARI. Some information at the institute could not be accessed by the study team nor is this information available in the public domain. However, according to PAN – Africa (2000), the stores at KARI contained obsolete stocks of Ronstar 2S (Oxadiazon), Stop (N-1-ethyl 1.4 dimethyl 6-dinitrobenzene), Sumithion, (fenitrothion), Gesapax (Ametyn) and Nordox (cupric oxide). The Nordox stocks are believed to have been imported in the early 1980's for seed dressing and the stocks approximated to be 24 tonnes. Some of these chemicals however, have been dwindling due to leakages as a result of corrosion of their containers and disposal (FAO 1990).

FAO (1990), reports that some pesticides were safely disposed of in Uganda; but this report does not mention of the quantities disposed and the definite stores where these stock piles came from. There is evidence to suggest that some of the disposed off chemicals were from KARI obsolete stockpile stores.

Many institutions lack the necessary financial ability and technical skills required to address the problem at hand. According to GTZ (2003), "Companies operating in developing countries typically have limited financial and skilled human resources. The idea of managing chemicals is often at the bottom of organizations priorities." GTZ (1999) observed the need for additional safe guards including protection of stores against the effects of weather, unauthorized access and theft. It further noted that other serious threats could be countered by liquidating uncontrolled pesticides dumps/storage sites in the vicinity of residential areas and transferring the waste to a suitable interim storage area.

There is lack of awareness on the dangers chemicals pose to public health and to the environment. GTZ (2001) observed that, "… many people handling dangerous chemicals in developing countries - pesticides and herbicides in agriculture, industrial chemicals or toxic waste - are unable to read or write at all, or have had very little school education. They have no chance of understanding what they are dealing with. They ruin their health or that of their children, endanger their reproductive capability or poison their drinking water and food, without knowing it. This is a violation of human rights, a violation of the right to freedom from bodily harm and the right to self determination". Many people report and get treatment from small clinics which are usually ill equipped to handle complex chemical problems. According to PAN – Africa (2000) "Pesticide poisoning are not systematically recorded in Uganda and few data exist on the public health impacts of pesticides use." Quoting Morton, Sergeant and Smedley (1993), PAN – Africa (2000) cites a figure of 270,000 cases of acute pesticide poisoning annually, with one percent of the cases being fatal.

However, FAO (1990) recommends governments and industry to "Take all necessary precautions to protect the health and safety of operatives, bystander and the environment". National Environment Management Authority (NEMA) 1998 notes that

there was improper use of chemicals leading to contamination of human and animal food, soil and water cannot be ruled out.

The United Nations (1997) recommended for International organizations, with the participation of Governments and Non-Governmental Organisations to launch training and education projects involving women and children, who are at greatest risk, in order to enable countries, and particularly developing countries, to make maximum national use of international assessments of chemical risk. FAO (1990) proposes the establishment of national or regional information and control centres at strategic locations to provide immediate guidance on first aid and medical treatment, accessible at all times by telephone or radio. It also recommends for governments to collect reliable information about the health aspects of pesticides. FAO (2000) recognises the lack of capacity to handle chemicals and recommends for suitable trained people with adequate resources to be made available to ensure that accurate information is collected. It also calls upon government and industry to reduce hazards by making provision for safe storage and disposal of pesticides and containers at both warehouse and farm level and through proper sitting and control of wastes from formulating plants.

4.4 Data generated by NAPE

The study found out that KARI still stores obsolete chemicals, some of which have been under storage for over 30 years. It was also found out that management of these obsolete chemicals was not adequate enough to ensure public safety and sound environmental management. The poor management of the storage facilities may have resulted into serious impacts on the health of the workers. The study however, did not come across a comprehensive study on the impacts of these chemicals to the surrounding environment and to the workers of the KARI establishment. Some records on obsolete chemicals; especially for those chemicals that were imported in bulk for supply to farmers, were inadequate. Even where they were available, such records were not accessible or available for public use. Access to the storage facilities by the researchers was limited to a few storage facilities, making it difficult to determine, classify and quantify the available stock piles of POPs and other pesticides. However, the study found out that obsolete laboratory chemicals (see appendix) had a clear inventory and better storage facilities.

Today KARI does not import agrochemicals due to liberalisation of chemical import and distribution in the country and therefore it no longer stores large quantities of new agrochemicals. However, the institute has for some time stored different types of obsolete agrochemicals. Some of the storage facilities at KARI were constructed as long ago as from 1939. In one of the stores visited by the team there was more than a tonne of obsolete “Rodent Poison” which according to management had been stored for several years. Reportedly, this chemical was a donation by the EEC to the Government of Uganda for the purpose of controlling rodents. It was observed that, the storage system of this “Rodent Poison” and other chemicals in the stores was not adequate; as the stockpiles were mixed up. With the containers being corroded, there is danger that the different

chemicals in the stores will eventually mix up to form new compounds that would probably be more toxic.

Rodent Poison that has been stored for over 30 years

With the liberalisation of the chemical trade, Kawanda no longer supplies or even handle large quantities of chemicals. According to management, KARI mainly procures small quantities of laboratory chemicals on the liberalised market from chemical suppliers who import them into the country. The procured chemicals are mainly for research and not for supply to the farmers.

4.5 Safety measures at KARI

From the study, it was found out that, there are inadequate measures in place to ensure safety of the workers, the public and the environment. There are no warning signs on the storage facilities to warn the public against the dangers the facilities may pose to their lives. Similarly, the workers are not informed of the risks the chemicals pose to their lives. The study found out that the workers at the station are not provided with protective gear to safe guard themselves against possible risks of contamination. This was proved by the observation that the workers were being allowed to enter and leave the stores without putting on any such protective gear.

These chemical stores are not adequately cemented or the cement has worn away and poses a danger of the already damaged chemical containers giving way to leaching. In the case of chemicals packaged in paper containers, some of the boxes are already torn leaving the chemicals pouring out. There is even no warning sign on the stores to alert the public that the storage facilities contain obsolete chemicals and therefore pose a danger to human life.

5.0 ENVIRONMENTAL, SOCIOECONOMIC AND HEALTH CONSEQUENCES

Impacts of Obsolete Chemicals

Because of lack of awareness about the possible hazards of obsolete chemicals to the environment and public health in the neighbourhoods, the local communities could not identify chemical related problems that affected them. Some of them did not even know that such stores were a health hazard to them.

It was however established that many of the workers had learnt on job about some chemical risks and could only know of facial risks such as burning, itching but not the cancerous effects of the chemicals on their lives. However, they lack the required facilities and skills of handling such dangerous chemicals. Some workers reported having developed some health problems that are symptomatic of chemical pollution. Among the reported health problems experienced by some workers at the station are stomach-aches, headache and respiratory problems. It was further alleged by some workers to the effect that in the 1970s, two members of staff of the stores department had died due to chemical related problems. The victims did not show any facial symptoms, but developed persistent headaches and cough till the time of their death.

The study also found out that some of the chemicals at KARI had been disposed of by the management by burying in the late 1980's. However, management was not in position of disclosing the type and quantities of the chemicals that were disposed. These chemicals were buried within KARI establishment on Kawanda hill to the North-West of the stores; a radius of about 2 kilometres.

According to one of the store keepers at KARI and confirmed by the information gathered from interviews with the public, in the mid 1980s some of the obsolete chemicals were looted with the main aim of securing containers for domestic use. This was done by the local communities near KARI. Information available indicates that these obsolete chemicals were poured out of the containers and allowed to run onto the ground. As a result, crops; including coffee and banana plantations, in the areas where the chemicals were dumped dried up. The chemicals were poured at the western end of the storage facilities and flowed west wards into people's gardens. Today, little is known about the effects of these chemicals on the soils, public health and the environment. This incidence is indicative of the fact that the local communities around KARI are not aware of the potential dangers the stored chemicals and the use of such chemical containers pose to them and to the environment.

6.0 RESPONSIBLE PARTY

According to the International Code of Conduct on the Distribution and Use of Pesticides, governments should take action to introduce the necessary legislation for the regulation, including registration of pesticides and provisions for its effective enforcement, including the establishment of appropriate educational advisory, extension and health-care services. According to the FAO guidelines for the registration and control of pesticides, government and other stakeholders have a responsibility of taking full account of local needs, social and economic conditions and availability of pesticide application equipment. The Government of Uganda has a responsibility of ensuring that obsolete pesticides at KARI are adequately managed for the safety of its people and the environment and to investigate the presence of POPs pesticides. It is therefore the responsibility of NEMA; the National Focal Point for the Stockholm Convention and the National Designated Authority (DNA) for the Rotterdam (PIC) Convention, to draw up a National Implementation Plan (NIP) and adequate strategies for addressing POPs under the Stockholm Convention.

Issues of chemical management are a shared international responsibility, it is therefore a responsibility of all stakeholders including, national and international organizations, governments, pesticide industries/associations and civil society organizations. All these parties have the responsibility of taking action in coordinating efforts to disseminate educational materials of all types to communities, farmers, organizations, agricultural workers, unions and other interested parties. Similarly, affected parties should seek and understand educational materials that are provided to them including calling upon governments, institutions and other stakeholders to act responsibly while managing POPs and other obsolete and dangerous chemicals.

7.0 PLANS FOR CLEANUP

The management and staff at KARI expressed concern for the need of safe disposal of the obsolete chemical stockpiles and the need for help to ensure that there is safe storage and disposal of the stockpiles at the institute. It was however, disclosed that, plans were under way to construct an incinerator at Namalere Agricultural Engineering and Appropriate Technology Research Institute (NAEATRI) that will be used to dispose of the stock piles. There were no other suggested plans or strategies for the clean-up of the affected areas. It was not possible to establish the design and degree of efficiency of the proposed incineration facilities at NAEATRI nor was it possible to get the time frame within which the incinerator would be put in place. Incineration on the other hand would be source of deadly POPs, dioxin and furans, hence this plan should be stopped and look for environmentally friendly technologies.

8.0 CONCLUSIONS AND RECOMMENDATIONS OF NGO (NAPE)

8.1 Conclusions

Stockpiles of obsolete chemicals still do exist at KARI, therefore a "potential hotspot." The issues of safe management and disposal of these chemicals however, remain a major challenge to the Institute, the government and other stakeholders as a whole. So far no adequate plans or measures are in place at the institute for safe disposal of the stored chemicals, let alone improving on the storage facilities so as to minimise the dangers from these chemicals to the workers, public health and to the environment.

Lack of protective gear at KARI has made its workers; especially those working in the storage facilities, vulnerable to chemical accidents and to different forms of chemical contamination. Provision of resources to protect the safety, health and environment of the staff at KARI has been given a low priority. Little effort is done to ensure that the workers and the public in general are safe from chemical related hazards.

From the lack of safety and awareness raising programmes it can be concluded that, the potential risks of such dangerous chemicals to the public and the workers is very high although, the stakeholders seem not to be aware of the problem at hand. This is evidenced from the lack of translated or simplified materials to people who cannot read English and other languages. People's testimonies as having not had any such awareness programmes before are evidence of the lack of such awareness campaigns. However, Uganda has an opportunity to address POPs chemicals by benefiting from support in the form of expertise, finances and awareness-raising under the Stockholm Convention if a NIP is developed. Uganda may also benefit from the wider chemical safety issues that are being discussed in the ongoing intergovernmental UN process, the Strategic Approach to International Chemicals Management (SAICM).

8.2 Recommendations

- The storage facilities and management systems of obsolete chemicals at KARI should be improved so as to reduce health and environmental risks.
- KARI with support from government should carry out an inventory of the obsolete pesticides at the site identifying the type of chemicals, source, and the quantities that are available in the stores, and leave access to the stores and stockpiles to other stakeholders.
- Education and awareness raising programmes; for both the workers and the community around KARI, are paramount for sound chemicals management processes at the institute.
- Plans and mechanisms for removal / disposal of these chemicals and the consequent cleanup activities should be drawn immediately
- The government should explore the opportunities provided under the Stockholm Convention for managing POPs especially in capacity building and acquiring skills and expertise that are not available in the country.

- KARI should carry out a survey to identify spots where the chemicals were buried, with the intention of remediating such sites.

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APPENDICES

A list of obsolete chemicals at KARI

Chemicals in Soil and Soil Management Programme

Chemical	Location	Unit	Capacity	No. of unit	Amount	Quantity	Supplier	Date received
4-Mythylpentan 2-one	Store 3	L	2.5	2	5.0	AR	BDH	> 20
4-Nitrophenol	Store 3	g	500	9	4500.0	AR	Permutt	> 20
Acacia	Store 3	g	500	22	11000.0	AR	BDH	> 20
Albumen	Store 3	g	-	-	-	-	-	> 20
Allyl Thiourea	Store 3	g	500	1	500.0	-	-	> 20
Aluminium Ammonium Sulphate	Store 3	g	500	2	1000.0	AR	BDH	> 20
Aluminium Sulphate	Store 3	g	3	1	3.000.0	AR	H&W	> 20
Aluminium Accetotatrate	Store 3	g	100	1	100.0	AR	H&W	> 20
Aluminium Acetate	Store 3	g	100	1	100.0	AR	BDH	> 20
Alumina	Store 3	g	500	32	16000.0	AR	BDH	> 20
Azarin S.	Store 3	g	10	1	10.0	AR	M&B	> 20
Amino Acetic Acid	Store 3	g	250	1	250.0	AR	BDH	> 20
Amino-2-Naphthol-4-Sulphonic Acid	Store 3	g	10	1	100	AR	BDH	> 20
Amino-Phenol	Store 3	g	25	1	25.0	AR	BDH	> 20
Ammonium Citrate	Store 3	g	500	1	500.0	AR	H&W	> 20
Ammonium Ferric Sulphate	Store 3	g	500	1	500.0	AR	H&W	> 20
Ammonium Fluoride	Store 3	g	3	1	3.000.0	AR	BDH	> 20
Ammonium Fluoride	Store 3	g	500	3	1500.0	AR	BDH	> 20
Ammonium Metavanadate	Store 3	g	500	1	500.0	AR	BDH	> 20
Ammonium Nitrate	Store 3	g	2.5	2	5.000.0	AR	BDH	> 20

Ammonium Oxalate	Store 3	g	500	1	500.0	AR	H&W	> 20
Ammonium Potassium Sulphate	Store 3	g	500	1	500.0	AR	BDH	> 20
Ammonium solution	Store 3	g	3	1	3.000.0	AR	BDH	> 20
Ammonium Sulphate N15	Store 3	g	500	1	500.0	AR	M&B	> 20
Ammonium Thiocyanate	Store 3	g	500	12	6000.0	AR	BDH	> 20
Amyl Acetate	Store 3	g	3	1	3.000.0	AR	H&W	> 20
Anmfix	Store 3	L	25	1	2.5	AR	BDH	> 20
Anthrone	Store 3	L	2.5	3	7.5	AR	BDH	> 20
Anthrone	Store 3	g	10	3	30.0	-	-	> 20
Anti bimping granules	Store 3	g	25	1	25.0	AR	BDH	> 20
Asbestos	Store 3	g	500	1	500.0	-	BDH	> 20
Barium Acetate	Store 3	g	250	1	250.0	AR	H&W	> 20
Barium Carbonate	Store 3	g	500	4	2000.0	AR	BDH	> 20
Barium Chloride	Store 3	g	500	1	500.0	-	BDH	> 20
Barium Chloride	Store 3	g	100	1	100.0	AR	H&W	> 20
Barium Chloride	Store 3	g	500	1	500.0	AR	H&W	> 20
Barium diphenylamine sulphate	Store 3	g	-	-	-	-	-	> 20
Barium Hydroxide	Store 3	g	5	1	5.0	AR	BDH	> 20
Barium Sulphate	Store 3	g	500	2	1000.0	AR	BDH	> 20
Basic Fuchsin	Store 3	g	1	1	1.000.0	AR	BDH	> 20
Benzidine	Store 3	g	100	1	100.0	-	H&W	> 20
Boric acid	Store 3	g	25	1	25.0	-	H&W	> 20
Brucine	Store 3	g	1	1	1.0	-	BDH	> 20
Buffer powder (pH7)	Store 3	g	250	1	250.0	AR	M&B	> 20
Calcium Carbonate	Store 3	g	250	1	250.0	-	H&W	> 20
Calcium Carbonate	Store 3	g	1	4	4.000.0	AR	M&B	> 20
Calcium hydroxide	Store 3	g	500	1	500.0	AR	BDH	> 20
Calcium Lactate	Store 3	g	500	1	500.0	AR	H&W	> 20

Calcium Nitrate Hydrated	Store 3	g	3	6	18.000.0	AR	BDH	> 20
Calcium Ref. Solution	Store 3	g	250	1	250.0	AR	BDH	> 20
Calcium Sulphate	Store 3	g	3	13	39.000.0	AR	BDH	> 20
Calcium Tetrahydrogen Diphosphate	Store 3	g	500	1	500.0	AR	M&B	> 20
Calx Chrorinita	Store 3	g	500	1	500.0	AR	BDH	> 20
Carbon Disulphide	Store 3	g	1	1	1.000.0	AR	BDH	> 20
Carborundum	Store 3	g	3	10	30.000.0	AR	BDH	> 20
Carborunum Powder	Store 3	g	500	1	500.0	AR	BDH	> 20
Camauba Wax	Store 3	g	500	1	500.0	AR	H&W	> 20
Cellulose Acetate	Store 3	g	500	2	1000.0	AR	M&B	> 20
Cervic Sulphate	Store 3	g	500	2	1000.0	-	BDH	> 20
Charcoal granules	Store 3	g	500	1	500.0	AR	H&W	> 20
Chloral hydrate	Store 3	g	500	1	500.0	AR	H&W	> 20
Chloraminet	Store 3	g	250	2	500.0	AR	Cocker Che	> 20
Citric Acid	Store 3	g	500	1	500.0	AR	H&W	> 20
Cobalt Sulphate-Heptahydrate	Store 3	g	2	2	4.000.0	AR	BDH	> 20
Congo red	Store 3	g	100	1	100.0	-	M&B	> 20
Copper (II) Sulphate-Pentahydrate	Store 3	g	-	-	-	-	-	> 20
Cupric Acetate	Store 3	g	250	1	250.0	AR	BDH	> 20
Cyclohexane	Store 3	g	500	1	500.0	AR	H&W	> 20
Cyclohezanol	Store 3	L	2.5	2	5.0	AR	BDH	> 20
D-Manit	Store 3	mls	500	1	500.0	AR	M&B	> 20
Devarda alloy	Store 3	g	500	2	1000.0	-	H&W	> 20
Dimethylamino-Benzaldehyde	Store 3	g	500	6	3000.0	AR	H&W	> 20
Diphenyl Thiocarbcazone	Store 3	g	100	1	100.0	AR	BDH	> 20
Diphenylamine	Store 3	g	25	2	50.0	AR	BDH	> 20
D-Mannitol	Store 3	g	25	1	25.0	AR	BDH	> 20
Eriochrome Black T	Store 3	g	1	1	1.000.0	-	BDH	> 20

Ethanol	Store 3	g	25	1	25.0	AR	BDH	> 20
Ethylenediamine-tetra-acetic Acid	Store 3	g	-	-	-	-	-	> 20
Ferric Sulphate	Store 3	g	500	1	500.0	AR	BDH	> 20
Ferrous Citrate	Store 3	g	500	1	500.0	AR	BDH	> 20
Ferrous Phosphates	Store 3	g	500	3	1500.0	AR	BDH	> 20
Glycerol	Store 3	g	250	1	250.0	AR	BDH	> 20
Glycerol	Store 3	g	1.2	1	12.000.0	AR	BDH	> 20
Granulated Zinc	Store 3	g	500	1	500.0	AR	H&W	> 20
Gum Arabic	Store 3	g	500	1	500.0	AR	H&W	> 20
Hydroxyammonium chloride	Store 3	g	250	1	250.0	AR	H&W	> 20
Hydrochloric acid	Store 3	g	100	1	100.0	AR	H&W	> 20
Hydrochloric Acid	Store 3	mls	500	2	1000.0	-	BDH	> 20
Hydrogen Peroxide	Store 3	mls	2.5	3	7.5	AR	BDH	> 20
Indigo Camine	Store 3	g	500	2	1000.0	AR	BDH	> 20
Iodine	Store 3	g	250	1	250.0	-	M&B	> 20
Iron (III) Citrate-Hydrate	Store 3	g	1	2	2.000.0	-	BDH	> 20
Lamotte Chemical (R-7)	Store 3	g	250	1	250.0	AR	BDH	> 20
Lamotte Chemical (R-7)	Store 3	g	100	8	800.0	-	-	> 20
Lanthanum Chloride	Store 3	mls	5	3	15.0	-	BDH	> 20
Lead Chromate	Store 3	g	250	1	250.0	AR	BDH	> 20
Lithium Sulphate	Store 3	g	250	1	250.0	AR	M&B	> 20
Manganese Oxide	Store 3	g	500	1	500.0	AR	BDH	> 20
Manganese Peroxide	Store 3	g	250	2	500.0	AR	BDH	> 20
Manganese Peroxide	Store 3	g	100	1	100.0	AR	BDH	> 20
Magnesium Acetate	Store 3	g	500	2	1000.0	AR	BDH	> 20
Magnesium Chloride	Store 3	g	500	1	500.0	AR	H&W	> 20
Magnesium chloride	Store 3	g	500	2	1000.0	AR	H&W	> 20
Magnesium Sulphate	Store 3	g	500	1	500.0	AR	H&W	> 20
Magnesium Sulphate	Store 3	g	250	1	250.0	AR	BDH	> 20

Magnesium	Store 3	g	3	2	6.000.0	AR	BDH	> 20
Manganese (II) Sulphate 4-hydrate	Store 3	g	100	1	100.0	AR	-	> 20
Menthanol	Store 3	g	500	1	500.0	AR	H&W	> 20
Merceptoacetic Acid	Store 3	mls	500	1	500.0	AR	H&W	> 20
Mercuric chloride	Store 3	g	500	1	500.0	AR	BDH	> 20
Mercury (II) Chloride	Store 3	g	250	1	250.0	AR	H&W	> 20
Metarphosphoric Acid	Store 3	g	10	1	10.0	AR	BDH	> 20
Methanol	Store 3	g	500	1	500.0	AR	H&W	> 20
Methyl Red	Store 3	g	500	2	1000.0	AR	-	> 20
Molybdenum Trioxide	Store 3	-	25	3	75.0	AR	M&B	> 20
Molybdic Acid	Store 3	g	500	2	1000.0	AR	H&W	> 20
Nitric	Store 3	g	500	1	500.0	AR	BDH	> 20
Paraffin Wax	Store 3	g	500	2	1000.0	AR	-	> 20
Paris Green	Store 3	g	-	-	-	-	BDH	> 20
Perchloric acid	Store 3	g	-	-	-	-	-	> 20
Petroleum ether	Store 3	g	-	-	-	-	-	> 20
Phenathronine	Store 3	L	1	0.5	0.5	AR	M&B	> 20
Phenol	Store 3	g	5	1	5.0	-	BDH	> 20
Phenolphthalein indicator	Store 3	g	500	1	500.0	AR	M&B	> 20
P-Nitrophenol	Store 3	g	50	1	50.0	AR	BDH	> 20
Potassium Cyanide	Store 3	g	500	1	500.0	-	BDH	> 20
Potassium Bromide	Store 3	g	500	9	4500.0	AR	H&W	> 20
Potassium Acid Phosphate	Store 3	g	500	1	500.0	AR	BDH	> 20
Potassium Antimony (III)	Store 3	g	500	1	500.0	AR	BDH	> 20
Potassium Carbonate	Store 3	g	500	1	500.0	AR	H&W	> 20
Potassium Chloride	Store 3	g	1	1	1.000.0	AR	BDH	> 20
Potassium Chloride	Store 3	g	-	-	-	-	-	> 20
Potassium Chloride	Store 3	g	250	1	250.0	AR	BDH	> 20
Potassium Cyride	Store 3	g	500	2	1000.0	AR	BDH	> 20

Potassium Di-hydrogen Phosphates	Store 3	g	3	1	3.000.0	AR	BDH	> 20
Potassium Ferrocyanide	Store 3	g	250	1	250.0	AR	BDH	> 20
Potassium Hydrogen Phosphate	Store 3	g	250	1	250.0	AR	H&W	> 20
Potassium Hydroxide	Store 3	g	500	1	500.0	AR	H&W	> 20
Potassium Nitrate	Store 3	g	3	7	21.000.0	AR	BDH	> 20
Potassium Perchlorate	Store 3	g	250	1	250.0	AR	BDH	> 20
Potassium Periodate	Store 3	-	100	1	100.0	-	-	> 20
Potassium Persulphate	Store 3	g	500	1	500.0	-	-	> 20
Potassium Phthalate Acid	Store 3	g	250	1	250.0	-	BDH	> 20
Potassium Salicylate	Store 3	g	-	-	-	-	-	> 20
Potassium Sulphate	Store 3	g	500	10	5000.0	AR	BDH	> 20
Potassium Thiocynate	Store 3	g	500	2	1000.0	AR	H&W	> 20
Potassium hydroxide pellets	Store 3	g	500	1	500.0	AR	BDH	> 20
Pyradine	Store 3	g	500	1	500.0	AR	H&W	> 20
Pyrogallo	Store 3	g	500	3	1500.0	AR	H&W	> 20
Quinine Hydrochloride	Store 3	g	500	1	500.0	AR	BDH	> 20
Quinol (Hydroquinone)	Store 3	g	1	1	1.000.0	AR	BDH	> 20
Quinol (Hydroquinone)	Store 3	g	1	2	2.0	-	M&B	> 20
Quinoline	Store 3	g	500	3	1500.0	AR	-	> 20
Quinone	Store 3	g	500	1	500.0	AR	-	> 20
Resorcinol	Store 3	g	500	1	500.0	AR	BDH	> 20
Resorcinol	Store 3	g	25	1	25.0	AR	H&W	> 20
Salicyladehyde	Store 3	g	500	1	500.0	AR	BDH	> 20
Selenium reagent mixture	Store 3	g	-	-	-	-	-	> 20
Silver Chloride	Store 3	g	250	1	250.0	AR	H&W	> 20
Sodium Acetate trihydrate	Store 3	g	500	1	500.000	AR	BDH	> 20
Sodium Arsenate	Store 3	g	3	23	69.000.0	AR	BDH	> 20
Sodium Benzoate	Store 3	g	-	-	-	-	-	> 20

Sodium Bisulphate	Store 3	g	1	3	3.000.0	AR	H&W	> 20
Sodium Bisulphate	Store 3	g	500	3	1500.0	AR	BDH	> 20
Sodium Cobaltnitrate	Store 3	g	500	1	500.0	AR	BDH	> 20
Sodium Cobaltnitrite	Store 3	g	500	1	500.0	AR	H&W	> 20
Sodium Cyanide	Store 3	g	500	1	500.0	AR	H&W	> 20
Sodium Dichromate	Store 3	g	200	1	200.0	AR	BDH	> 20
Sodium diethyldithiocarba	Store 3	g	3	6	18.000.0	AR	BDH	> 20
Sodium Dihydrogen Orthophoshate	Store 3	g	100	2	200.0	AR	BDH	> 20
Sodium Hexametaphosphate	Store 3	g	2	2	6.000.0	AR	BDH	> 20
Sodium Hydroxide	Store 3	g	500	1	500.0	AR	H&W	> 20
Sodium Molybdate hydrate	Store 3	g	500	4	2000.0	AR	Harris	> 20
Sodium Oxalate	Store 3	g	3	1	3.000.0	AR	BDH	> 20
Sodium Phosphates	Store 3	g	500	1	500.0	AR	H&W	> 20
Sodium Salicylate	Store 3	g	500	1	500.0	AR	BDH	> 20
Sodium Silicate Solution	Store 3	g	500	1	500.0	AR	H&W	> 20
Sodium Sulphate	Store 3	g	500	1	500.0	-	H&W	> 20
Sodium Tetraborate	Store 3	g	500	1	500.0	-	H&W	> 20
Sodium Tartrate	Store 3	g	500	1	500.0	AR	H&W	> 20
Sorbitol	Store 3	-	-	-	-	-	-	> 20
Strontium Chloride	Store 3	g	250	1	250.0	AR	BDH	> 20
Strontium Chloride	Store 3	g	500	1	500.0	AR	M&B	> 20
Sucrone	Store 3	g	250	1	250.0	AR	H&W	> 20
Sucrose	Store 3	g	200	1	200.0	AR	BDH	> 20
Sulphuric Acid	Store 3	g	250	2	500.0	AR	BDH	> 20
Tin Metal Sticks	Store 3	L	1	2	2.0	AR	Fluka	> 20
Tri-Sodium Citrate	Store 3	g	-	-	-	-	BDH	> 20
TweenR 20	Store 3	g	500	1	500.0	AR	BDH	> 20
Urea Carbonate	Store 3	g	-	-	-	-	-	> 20
Urea (Carbomide)	Store 3	g	500	6	3000.0	AR	-	> 20

Vanillin	Store 3	g	500	4	2000.0	AR	BDH	> 20
Vermiculite	Store 3	g	250	1	250.0	AR	BDH	> 20
Vinyl Alcohol	Store 3	g	500	6	3000.0	-	BDH	> 20
Zinc Acetate	Store 3	g	100	1	100.0	AR	BDH	> 20
Zinc fillings	Store 3	g	500	2	1000.0	AR	BDH	> 20
Zinc Oxide	Store 3	g	500	5	2500.0	AR	BDH	> 20
Zinc Phosphate	Store 3	g	500	2	1000.0	AR	BDH	> 20
Zinc Sulphate	Store 3	g	500	1	500.0	AR	H&W	> 20