10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Contents

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Page

CONTRIBUTIONS (in alphabetic order)

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Use of SDA-products from coal fired power plants as source of sulphur in agriculture

H. M. PAULSEN, S. HANEKLAUS AND E. SCHNUG (GERMANY)

Irrigation of arable lands with waste water of a sugar beet factory - Legal aspects and ecological impact -

H. M. PAULSEN, M. KÜCKE AND E. SCHNUG (GERMANY)

S uptake and yield responses of crops grown on an S-deficient soil amended with industrial co-product gypsum

S. PEACOCK, E. J. EVANS, J. M. MONAGHAN AND D. L. RIMMER (UNITED KINGDOM)

Data catalogue for the characterisation of organic wastes

H. TH. PROPFE (GERMANY)

Treatment of potato with metal complexes regained from wastes

R. SCHMIDT, E. SZAKÁL, D. BRÜCKNER AND P. SZAKÁL (HUNGARY)

Waste-derived zinc and copper compounds for zinc and copper nutrition of sugar beet

R. SCHMIDT, L. NAGY, P. REISINGER, P. SZAKÁL AND Z. CZABARKA (HUNGARY)

The Influence of sewage sludge on yield and chemical composition of plants

Z. SPIAK (POLAND)

Effect of copper-amin-complex produced from waste on yield and bread-making quality of wheat

P. SZAKÁL AND R. SCHMIDT (HUNGARY)

Production of copper-tetramine-hydroxide complex from waste containing acidic copper-chloride and testing of this complex for fungicide effects

P. SZAKÁL, S. PÉCSI AND R. SCHMIDT (HUNGARY)

Tsibulski

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

SOURCES OF RECYCLED PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES

W. Werner

Institute of Agricultural Chemistry, University of Bonn

The purpose of the new „Waste Avoidance, Recovery and Disposal Act“ is to promote is to promote closed substance cycle waste management in order to conserve natural resources and to ensure environmentally compatible disposal of wastes. The special requirements of this closed substance cycle waste management in the area of agricultural fertilisation are defined in this act, too.

The paper presents a survey of by-products, residues or waste materials from industrial processes that are carriers of plant nutrients and could be classified as potential fertilisers. Some of these nutrient containing residues are already used as convential fertilisers, some others are still inconventional products, although they meanwhile have gotten the legal registration as a fertiliser or will get this registration as „secondary raw material fertiliser“ according to the new legislation within a short time.

The paper is dealing with the following nutrient carrying residues/wastes:

- **Liming residues** from**:** iron and steel industries, sugar industry, soda production, gelatine production, process water treatment, desulphurisation processes, brown coal power stations.

- **Nitrogen containing residues** from: plastic production, starch industry, breweries, biotechnological processes (i.e. enzyme and citric acid production).

- **Phosphorus containing residues** from: iron and steel industry, metal industry (phosphating slimes), starch industry, biotechnological processes.

- **Potassium containing residues from**: starch industry, cement industry, stone industry, biotechnological process.

- **Sulphur containing residues** from: phosphoric acid and fertiliser industry, power stations, salt works.

It is assumed that most of these potential fertiliser materials only have or could only get a local importance for agriculture as nutrient carriers because of their limited amounts and/or their physical handling characteristics.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

LEGAL AND ADMINISTRATIVE ASPECTS OF RECYCLED PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES

P. Oswald

Federal Ministry of Agriculture, Rochusstr. 1, 53123 Bonn, Germany

The viewpoint of use of fertilisers changed strongly within the last decades and is regarded critically by some groups. The German '*Fertiliser Law'* of 1962 provides the possibility to approve different types of fertilisers by law with non-limited legal force. In the course of the legal and administrative harmonisation within the EC the German *Fertiliser Law* was extended in 1977. The *Fertiliser Law* regulates the important aspects such as use of fertilisers, registration of fertilisers, labelling and package, tolerances, restrictions, taking of test samples, analytical methods, supervision and compensation in case of sewage sludges. The different decrees of the *Fertiliser Law* specify the practical conversion of the legal directions. The decree '*Düngeverordnung*' contains the regulation for the amount of fertilisers applied on the basis of good agricultural practice and takes environmental and in special water protection into account.

The recycling of plant nutrients from industrial processes requires the examination according to both the *Fertiliser* and *Waste Law* under national and European point of view. The EC guideline (91/156/EWG) distinguishes between wastes for recycling and disposal. In a European data catalogue wastes are listed. The use of wastes for fertilisation on agricultural farmland in Germany is regulated by the *'Kreislaufwirtschafts- und Abfallgesetz'*.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

AGRONOMIC ASPECTS OF RECYCLED PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES

T. Stuczynski* & R. L. Chaney**

*Institute of Soil Science and Plant Cultivation, Pulawy, Poland; **Environmental Chemistry Laboratory, ARS-USDA, Beltsville, USA

Industries world-wide are generating increasing amounts of by-products and wastes of various chemical and physical properties. Continuous landfilling of these waste materials may cause enormous increase of disposal cost and serious environmental problems. On the other hand, the agronomic characteristic of such industrial wastes as coal combustion by-products, phosphogypsum, food and wood industry waste makes them potentially valuable as soil amendments by providing nutrients or conditioning soil physical and chemical properties. Potential agricultural benefits from land application of industrial by-products include alleviating soil trace elemental deficiencies, soil pH modification, and increasing needed nitrogen, phosphorus, calcium and sulphur, infiltration rates, depth of rooting, and drought tolerance. The lack of current utilisation of most of these by-products is caused by their diversity and variability of chemical composition often associated with uncontrolled environmental and phytotoxicity effects. An agricultural characterisation of various by-products will be discussed, including definable risk and benefits to the soil/plant system. Special attention will be given to crop quality/productivity and soil quality status as affected by land application of various industrial by-products.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

ASPECTS OF SOIL CONSERVATION IN RESPECT TO THE APPLICATION OF RECYCLED PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES

Hüttl, R. F. and Vetterlein, D.

Lehrstuhl für Bodenschutz und Rekultivierung, BTU Cottbus, P.O. Box 101344, D-03013 Cottbus

Especially sewage sludge and biogenic municipal refuse compost are discussed to be applied in agriculture and reclamation. Due to their high content in organic matter they might have positive effects on soil functions related to carbon content in the soil like biological activity, soil physical properties and nutrient supply. However application also involves the risk of unbalanced nutrient supply, accumulation of nutrients and heavy metals in the soil and loss of nutrients from the soil profile as a result of leaching or volatilisation.

A number of examples are given to discuss the extent to which soil properties have been altered by the application of sewage sludge or compost depending on the rate and number of applications. Special emphasis is given to long-term effects of such applications as they are crucial for evaluation on reclamation sites.

Finally some preliminary data are presented from a recent field experiment on two representative substrates of the Lusatian open cast mining area (containing lignite; without lignite). The application of compost and sewage sludge is compared to mineral fertiliser application and control treatment.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES: A PERSPECTIVE OF DEVELOPING REGIONS

G. Sparovek

Soil Science Department of "Luiz de Queiroz" Agriculture College, CP 9, CEP 13.418-900, Piracicaba (SP), Brazil. FAX +55 194 34-3242. Email GSPAROVE@carpa.ciagri.usp.br

The agricultural systems as well as the social and economical organisation of developing regions have specific characteristics that make the recycling of nutrients from industrial processes of especial interest. The high variability in relation to inputs, technology and productivity allows side by side low input traditional farming systems and high input large scale farming directly linked to industrial processes. The credit and subsidies are usually restrict and the environmental awareness and surveillance are low.

In the low input farming systems frequently the most limiting factor are nutrient deficiencies. The availability of low cost sources of nutrients easily and safe to handle can improve significantly the productivity and the labour need for food gain. Several industrial residues have relatively high concentrations of nutrients and if properly treated may be prepared for use in agriculture avoiding its deposition in less adequate systems or environments. The transfer of these residue originated fertilisers to the farmers may be associated with technology transfer.

Considering large scale farming which is usually linked to an industrial process like sugar cane, fast growing forests and citrus the problem is associated to the amount of residues that are produced. The Brazilian yearly residue generation by the production of sugar and alcohol from sugarcane is shown beneath.

Early production of sugarcane for industrial purposes in Brazil		
Cultivated area	Mean productivity	Total production
3.200.000ha	60 Mg/ha	192.000.000 Mg
Residues		
Soot		3.072.000 Mg
Ash		1.152.000 Mg
Bagasse		6.720.000 Mg
Vinasse		100.992.000 m^3

In this case the challenge is the development of procedures to manage, standardise and distribute the residues transforming it in a feasible source of nutrients for agriculture or animal feeding. Several examples are available related to sugar and alcohol industrial plants producing organo-mineral fertiliser and animal rations, cellulose industries producing a standardised fertilisers for horticulture, breweries producing an organic compost and orange juice plants recycling residues on the production fields.

These procedures aggregate value to the residues and this may be the best (or most ingenious) way to avoid its improper (accidental or not) disposal with serious environmental consequences.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

ECONOMIC ASPECTS OF RECYCLED PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES

Ch. Noell

Department of Agricultural Economics University of Kiel

As a consequence of the new recycling and waste management law in Germany agriculture is assumed to be playing an important role in the recycling chain in the future. Many by-products and residues from various industries will be offered to agricultural for fertilising or feeding purposes. As will be shown a number of co-ordination problems will result from the increasing integration of agriculture into the recycling chains of modern industrial economies. I has to be taken into account that the most important variables in all scenarios - quantities and qualities of available recycled plant nutrients - are still more or less unknown. Only rather broad estimations can be made in the present state. The competitive position of recycled plant nutrients from industrial processes in the fertiliser market will be strongly effected not only by

ecological factors but also by economic factors. The impact of costs of collection, processing and distribution of the raw materials, their contents of specific nutrients and toxic agents as well as the acceptance of these materials by farmers and consumers will be discussed in an industrial organisation framework. Furthermore the competitive behaviour of the fertiliser industries, recycling industries and waste management industries may also play an important role. Main purpose of the paper is to gain some initial insights into possible (or hypothetical) scenarios of future developments in the use and acceptance of recycled plant nutrients from industrial processes in Germany.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

RECYCLED PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES AS RESOURCES FOR MANUFACTURED FERTILISERS

Ingrid Steén
Kemira Agro Oy, Copenhagen, Denmark.

In a sustainable society non-renewable resources should be substituted to renewable to as great extent as possible. Where this is not possible recovery, reuse and recycling should be implemented. In past times agricultural production was analogous to recycling of nutrients. Crop products were consumed on farm or in the nearby towns and the waste, i.e. the nutrients, transported back to farmland. The majority of the nutrients was recycled. However, the growth of cities and the introduction of water as the carrier of waste from households and industries resulted in the break-up of this traditional recycling loop.

In the recent past, as a consequence of increasing concern regarding the environment and exploitation of natural resources, legislation and action programmes to promote recycling have been adopted in many countries. Kemira Agro supports the development towards a more sustainable society and is actively seeking alternative resources for the manufacture of mineral fertilisers. Waste and by-products from various industrial processes and waste from municipalities have traditionally been deposited at landfills, composted or directly (unprocessed) used as nutrient sources for agricultural production. However, more efficient utilisation of resources is necessary and some initiatives and projects on the subject of nutrient recovery are discussed in the paper.

It should, however, be borne in mind that if the substitution of resources is to be successful, a number of criteria has to be met and a number of questions has to be answered. Some of the topics to be considered are discussed in the paper, such as; liability; cost-effective technical solutions; energy efficiency of recovery and transport of resources (raw material); traceability of resources contained in the finished products; consistent products over time and composition; consistent quality of raw material, volumes and availability; product quality and finally; the public perception of “waste” being used as a nutrient source for food production.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 1

MIXTURE OF WASTE WATER FROM PIG-BREEDING FARM AND SLAUGHTER-HOUSE AS A SOURCE OF PLANT NUTRIENTS

A. Belic

University of Novi Sad, Faculty of Agriculture, Institute of Water Resources Management, 2100 Novi Sad, Trg D. Obradovica 8, Yugoslavia

The development of the livestock raising and the food industry in Vojvodina is characterised by construction of large-capacity farms and slaughter-houses with the wet discharge technology. Treatment and disposal of the wastewater thus generated have not been solved in an adequate way. In the majority of cases such waters are collected and temporarily stored in the lagoons. Discharge of the lagoons and permanent disposal of these wastewater on the soil is unorganised, and is carried from time to time.

To obtain a better insight into the composition of the mixtures of wastewater originated from pig-breeding farms and slaughter-houses collected in the lagoons in a three-year period nineteen parameters of wastewater quality have been analysed four times a year. The aim was to determine the contents of the components useful for the plant growth, and identify the potentially harmful substances in these wastewater from the aspect of their potential usage for irrigation.

The results indicate significant presence of nitrogen, phosphorus, and potassium, as well as organic matter in these wastewater, so that they can be considered as potential source of plant nutrients. At the same time, high values were obtained for some parameters (e.g. sodium) which can have undesirable effects. Therefore, one has to be cautious when recycling of plant nutrients from the food industry wastewater is concerned.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 2

AN EFFECT OF LAND USE ON THE LEACHING NITRATES IN THE SMALL AGRICULTURAL CATCHMENT

H. Damaskova[1] and J. Simunek[2]

[1]Institute for Soil and Water Conversation, Zabovrska 250, 156 27 Prague 5, Czech Rep.

[2]US Salinity Laboratory, 450 Big Springs Road, Riverside, CA 92507, USA

The small catchment concept is an important tool in modelling flow and solute transport phenomena that take place in the soil cover.

Agricultural activity and atmospheric deposition cause significant sources on the areal pollution. Nitrate is the main form of nitrogen in water. The annual $N\text{-}NO_3$ atmospheric deposition ranging between 15 and 24 kg/ha presents about 25% of a rate of applied fertilisers in the Czech Republic. Nowadays the application of nitrogen fertilisers decreased from 130 kg/ha in 1989 to 80 kg/ha in 1994. This presentation is focused on modelling water and nitrate movement in one/two-dimensional region to evaluate transport for NO_3 concentration through a small catchment. The SWMS-2D, CHAIN -1D models are useful tools to provide the hydrologic and transport response to the actual course of weather during an annual cycle. The CHAIN-1D model was implemented to evaluate the vertical solute transport involved in a sequential first-order decay reactions. The solution applies to the three-species nitrification chain $NH_4\text{-}NO_2\text{-}NO_3$. Generally, the distribution of nitrate concentrations depends on the hydraulic characteristics of the soil, water content and the mean pressure head in the root zone. The maximum leaching of NO_3 is in the winter period when transpiration is zero. Arable land was more prone to leaching of nitrates than grassland.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 3

EFFECTS OF SOME ORGANIC MATTERS AND WASTES ON SOIL PRODUCTIVITY AND GROWTH OF SOYBEAN

Ö. L. Elmaci and M. Secer

Soil Science Department Ege University, 35100 Bornava/IZMIR, Türkey

Effects of the bone, fish meal and city wastes on soil productivity and plant growth were investigated in a pot experiment conducted with soybean. The materials mentioned above were added to soil in seven different combinations with 5 replications. 1. Control, 2. Bone meal, 3. Fish meal, 4. City-wastes, 5 Bone meal+N, 6. Fish meal+N and 7. City wastes+N. Inorganic N was given as $(NH_4)_2SO_4$ form. The experiment was consisted of 70 pots. The half of them was inoculated with *Rhizobium Japonicum* and the other half was non-inoculated During flowering stage; bone meal+N increased the N content of stems at 5% significance level. Ca content of leaves, the fresh weight of leaves and stems were highest in fish meal application. Fish meal combined with N increased Mn content of leaves. Addition of city wastes alone had an increasing effect of Na content of soils and Zn of leaves while city wastes+N increased K, Fe, Cu and Zn of soil. Inoculation had positive effects on the Mg content of soil, fresh weight of stems and leaves and Zn content of leaves.

At the ripening stage, bone meal+N increased Mn content of soils considerably in inoculated pots. The bone meal+N, fish meal, fish meal+N applications increased significantly total N and protein % of grain. The amounts of K, Na, Ca and Fe in soil were highest in the city waste+N application.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 4

SUITABILITY OF INDUSTRIAL ORGANIC RESIDUES FOR RECULTIVATION OF POST MINING LANDSCAPES IN LUSATIA

R. F. Hüttl and Doris Vetterlein

Lehrstuhl für Bodenschutz und Rekultivierung, BTU Cottbus, P.O. Box

Organic residues like compost and sewage sludge have a high potential of providing plant nutrients and carbon sources for the establishment of microbial activity and transformation and buffering processes in dump substrates. These substrates are characterised by lack of organic matter, apart from lignite, low biological activity, low sorption capacity, low water holding capacity and very low pH values in the lignite containing substrate type.

Within a field experiment on two representative substrates on the Lusatian strip mining area (containing lignite, without lignite) the application of compost and sewage sludge is compared with mineral fertiliser application, as is common practice, and with a control not receiving any amendment. The field trial was established in spring 1996 and the plots were planted to *Secale multikaule* as a test crop and *Pinus silvestris*. During a three year study period parameters for assessment of water and nutrient cycling are measured with a special focus on heavy metal translocation and microbial C and N turnover. The development of soil properties over the years is addressed by chemical and micromorphological investigations. In addition the question of pyrite oxidation, a special aspect of the lignite containing substrates, is addressed in laboratory experiments

Results of the first vegetation period after application will be presented and discussed.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 5

EFFECT OF DIFFERENT KINDS OF URBAN SEWAGE SEDIMENTS ON THE ELEMENTAL CONTENT OF PODSOL-LUVISOL SOIL & LEACHING CHERNOZEM OF RUSSIA

V. Kasatikov

Russian Research Institute Organic Fertiliser and Peat, Vladimir Region, Russia

Analysis were hold with aerobic-stabilised non-reagentic USS & USS, that have passed stage of mechanical dehydration with use of $CaCO_3$ & $FeCl_3$. Sediments were applied for bread grains in field experiments on two contrast soil-podsol-luvisol sandy soil with humus content 1.6% & leaching chernozem with humus content 6%. An applying sediments Ag, Cd, Co, Cr, Cn, Ni, Pb, Zn, Mn and other heavy metals were contained in quantities 7-30 times exceeding MPC of elements in soil.

Effect of USS on elemental soil content was examined according to coefficient of concentration Kc =cak/ct, characterising correlation between elemental concentration in experiments variant and concentration of this element in control and Zn = >... kc-(n-1), summarising meaning of Kc.

An applying of non-reagentic and reagentic sediments in examining soil gross content of HM in soil depends on their level in USS and soil. On this account reagentic USS, flokkulated $CaCO_3$ and $FeCl_3$ enlarges HM level in soil at lower extent. An spite of soil type, kind of USS, it's dose and time of presence in soil. USS, on the first turn, promotes growth of concentration of HM, being used in halvanical production (Cr, Ni, Zn, Cu, Cd, Pb and Ag). With such doses of USS as 7-10 t/he of dry substance, their effect on elemental soil content by meaning of Kc is equal to affect of mineral fertiliser (N60-90 P60-90 K60-90). Effect of organic-mineral system on the base of USS on the elemental content of podsol-luvisol soil and leaching chernozem is more effective than separate effects of USS and mineral fertilisers.

Accumulation of mobile HM forms extracting by ammonium-acetate buffer with pH=4.8 to great extent depends on agrochemical soil characteristics; USS production technology, that have influence on metal mobility in USS and further on in soil. Content of mobile HM forms grows 2.5 times more intensive than their gross content.

For chernozem, having average-loamy mechanical content, level of Zc mobile forms 2-2.5 times execs Zc of gross content, reducing after applying of reagentic USS in soil.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 6

URBAN SEWAGE SLUDGE IN RUSSIA AGRICULTURE

V. Kasatikov
AU - Russian Research Institute Organic Fertiliser and Peat, Vladimir Region, Russia

From 2.5 mln mt of dry USS not more than 10% are used as fertiliser. Removal of USS to urban dumps results in irretrievable loss of nutritional elements, on the first turn, of N and P.
Depending on existing technologies of sewage being purification on purification stations, USS that are being produced in Russia are devided into 3 types of sewage sludge thermofilic fermentated, mesofilic fermentated and aerobic stabilised.
The lost type of USS is the most prevalent. Seach type of USS is devided into reagentic and non-reagentic according to their physical and physico-chemical characteristics.
At the present time, together with initial USS, compost of USS-peat mixture and USS-lignine mixture are used as fertilisers. They differ from USS favourable physical characteristics, less P-content in peat-silt compost and N, P - in USS-lignine mixture compost.
USS-peat compost mixture are devided into two subcategories:

a) peat-silt compost from mixture of peat and non-reagentic sediment in ratio 1:1 by mass.
b) peat-silt compost from mixture of peat non-reagentic and reagentic sediments, FeCl, CaCO by 20% and 5% to the dry sediment mass and ratio for peat:non-peagentic sediment : reagentic once is next - 1:(0.5-0.7):(0.3-0.5) by mass.

An contrast to USS in peat compost minimal content of N is equal to 1.2%, P-2.0%. Together with peat-silt composts production of composts on the basic of lignine and USS allows to use both categories of organic wastes as fertiliser with minimal level of trace metal group content in compost.
USS and each kind of organic fertiliser content on its base, producing in Russia are standardised by humidity, ashes content, reaction (pH), nutritional content of element N, P and trace metal group content Cd, Co, Mn, Ni, Hg, Pb, Cr, Zn and level of radioactivity.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 7

EFFECT OF MUNICIPAL SEWAGE SLUDGE ON TRACE METAL MOBILE FORMS CONTENT IN SOIL IN CONDITIONS OF MODELLING EXPERIMENT

V. Kasatikov, S. Saburov and V. Runik

AU- Russian Research Institute Organic Fertiliser and Peat, Vladimir Region, Russia

Mobility of TM in content of SS & peat-silt composts is determined by sort of metal, physico-chemical characteristics of soil and SS, metal concentration in content of SS and composts.

Analysis were hold in model experiment on the podzol-luvisol sandy soil. Single SS doses applying in the experiment are equal to 3 and 10 mt per he on dry matter. The basis of the experiment is three-factor: $CaCO_3$-exposition with quantity of variants on each factor equal to 4*4*6. Soil samples for geochemical analysis were chosen in each two month of soil composting with $CaCO_3$ (dolomite meal), SS with t=25°C and humidity 60% of total field moisture capacity. In soil samples Zn, Cu, Ni, Cd, Cr3+ were identified in 4 consequent extracts ammonia-acetate buffer with pH 4.8, 3% KCl, ammonia-acetate buffer with pH 4.2, H_2O_2, 2 n HCl. The result after extractions exposed 48-94% reduction of Zn and Cu gross content with single close apply of SS (3, 10 mt/he). For Ni and Cr these changes made up 21% from initial. Application of $CaCO_3$ as dolomite meal in close 3-9 mt/he did not affect gross content of metals in composting soil samples. By extent of accumulation of metals in soil they are disposed in the following decreasing rank: Ni > Cr > Cd > Zn > Cu, in accordance with the level of metal concentration in SS:

Intensity of extracting of different elements from soil by consequent extracts is determined by their lability. The main factors limiting present process are physical and physio-chemical characteristics of soil and SS, composting time. The most labil are Zn, Cu, Cd. Adding of lime brings to drowth on Zn, Cu, Cr - content in soil; elements, bring part of organic - mineral combinations and transforming in dissoluble condition after treatment by H_2O_2.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 8

IRRIGATION OF ARABLE LANDS WITH WASTE WATER OF A SUGAR BEET FACTORY

Paulsen, H. M., Kücke, M. and Schnug, E.

Institute of Plant Nutrition and Soil Science, Federal Agricultural Research Centre, Braunschweig, Germany

Waste water of the washing circle of sugar beet factories can be recycled to agriculture in a certain dosage. The waste water may substitute potassium fertilisers and lime.

For applying waste water on soils the legal aspects of the German water resources law and of the waste water levy law have to be considered. A correct sewage farming requires a management determined by the storage capacity of the soils and nutrient demand of the plants.

In a field study the effect of long-term waste water irrigation of a sugar beet processing factory on the chemical composition of arable soils, leachates and ground water were investigated.

The results show that irrigation has a liming effect on soils. Samples of drainage water from fields under waste water irrigation are characterised by higher concentrations of some alkali and alkaline earth metals. Furthermore oxygen demanding substances are found to be translocated in the soil to drainage tube level. In contrast the nitrate content of leachates from fields under waste water irrigation is lower than in samples of soils never irrigated with waste water. Altogether the ability of these soils to decompose the organic substances of the waste water can be regarded as very high. In locations with deep ground-water tables and adjusted to the demand and limits given by binding capacity of soils and nutrient demand of plants no negative impact on the ground water is to be expected by this type of waste water treatment.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 9

DATA CATALOGUE FOR THE CHARACTERISATION OF ORGANIC WASTES

H. Propfe

Gütegemeinschaft Bodenverbesserung, Düsseldorferstr. 9-11, 68219 Mannheim

Technical requirements are an essential regulative instrument for the utilisation of organic wastes in different parts of agriculture and soil improvement. The proof of usefulness and harmlessness is a precondition for the correct utilisation in accordance with the legal regulations and the demand for a sustainable development in agriculture.

The difficulty is, that most of the handled wastes are mixed together from a large number of single products. There is a demand for a better characterisation of these wastes in respect to possible negative effects.

Physical and chemical data of more than 500 agricultural usable wastes are presented in a first edition of a data catalogue. These 500 products are characterised by listing all available data of nutrients as well as the content of possible contaminants like heavy metals and hazardous organic products.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 10

AVAILABILITY OF PHOSPHORUS IN COMPOSTS

O. Traore[1], S. Sinaj[1], E. Frossard[1] and J.M. Van De Kerkhove[2]

[1]Group of Plant Nutrition, Institute of Plant Sciences, Swiss Institute of Technology (ETH), Versuchsstation Eschikon 33, Schweiz; [2]SITA, Paris, France

Composting is an attractive method for organic wastes disposal. Because composts contain significant concentrations of organic matter and nutrients (N, P, Ca..), they have been used as fertilisers or soil amendments for years. However, very limited information exist on the forms and availability of P in these organic materials. The objective of this work was to measure the availability of phosphorus in three different composts. Three raw materials (household refuses, sewage sludge, food waste) were sampled after different time of composting (between 0 and 180 days), air dried and analysed for their total P, mineral P and available P content. P availability was assessed both by routine chemical extraction (CO_2 saturated water, acetate EDTA, $NaHCO_3$) and by an isotopic exchange kinetic method (Fardeau, 1993). Results of the isotopic method were then interpreted by a pluricompartmental analysis. In the household refuse compost and in the sewage sludge compost between 0.3 and 11% of the total P was rapidly isotopically exchanged (and therefore rapidly plant available), while between 48 and 85% of it could not be isotopically exchanged during a year. On the contrary between 57 and 9% of the total P was rapidly isotopically exchanged, respectively after 0 and 120 days of composting, in the compost exclusively made from food wastes. Therefore compost type and composting time may both significantly affect P availability.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 11

THE INFLUENCE OF SEWAGE SLUDGE ON YIELD AND CHEMICAL COMPOSITION OF PLANTS

Zofia Spiak
Agricultural University of Wroclaw, ul. Grunwalozka 53, Poland

Some researches hare pointed on that municipal and , in some cases, industrial sewage sludge may be a valuable source of nutritive elements for plants; may favourably influence physical, chemical and biological properties of soils. However, the value of sludge as a fertilizer has to be estimated not only in terms of changes in the chemical composition of plants.

Vegetative experiments with six municipal-industrial sewage sludge originating from six different sits on quantity and quality of the yield of oats, and of mustard as an aftercrop was carried out.

In the experiment the sludge affected unfavourably the chemical composition of plants leading to a growth of the zinc, lead, cadmium and nickel concentration. The results obtained allow to conclude that the fertilizing value estimation of sludge cannot be done exclusively on the basis of the growth of yields, not taking into consideration their quality.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 12

THE EFFECT OF EFFLUENT MUD FROM THE TREATMENT PLANT OF OLIVE OIL MILLS ON GENERAL MICROBIAL ACTIVITY AND SPECIAL MICROBIAL GROUPS

M. C. Engel, N. Okur and T. Elmaci

Agriculture Faculty, Aegean University, Soil Department, Izmir/Turkey

In a laboratory experiment, three soils with different textures were treated with effluent mud at two rates (with nitrogen and without nitrogen). CO_2-production (soil respiration) was assayed after 7, 14, 21 and 28 days of incubation, dehydrogenase activity after 35 days. As special microbial groups, *Azotobacter* and aerobe cellulose-decomposing bacteria were also counted.

At the high rate (4 t/ha) with nitrogen, soil respiration increased average 5.8 fold in all soils and percent of mineralisation of organic C was 67.9 in sandy, 75.4 in clay and 76.3 in loamy soils. Application of effluent mud was also enhanced dehydrogenase activity. This increase in enzyme activity was attributed to the enhanced microbial activity which was stimulated with higher nutrients and organic matter content of mud. Growth of *Azotobacter* and aerobic cellulose-decomposing bacteria were stimulated at the low mud rate (3 t/ha). Effluent mud without nitrogen was increased 256.6 fold *Azotobacter* in clay soil, whereas these increases in the applications with nitrogen were only 18.7 (in sandy soil) and 4 fold (in loamy soil).

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 13

RESPONSE OF MUSTARD TO SULPHUR THROUGH GYPSUM

A. K. Gupta and D. K. Jain

Department of Agronomy Rajasthan Agricultural University Campus Jobner - 303 329, India

Gypsum ($CaSO_4 . 2 H_2O$) which has been using for long as a soil amendment, is becoming popular as an inexpensive indigenous source of sulphur in Indian agriculture. The commercial material has varying amount of impurities and generally contains 14-15 per cent sulphur. In a field experiment to study response of four varieties of mustard *(Brassica juncea L. Czern* and *Coss*) to sulphur, gypsum was used to supply 50, 100 and 150 kg S ha^{-1}. The soil was loamy sand with pH value 8.4 and available sulphur 0.0034 per cent. The organic carbon (0.19%) and total nitrogen content (0.0185%) was low. Results showed that application of 50 kg S significantly increased plant height, dry matter and seed yield over control. Each successive unit also proved significantly superior to its preceding level with respect to above parameters. Application of S also enhanced the nitrogen, phosphorus and sulphur content and their uptake by the crop. Increased oil content and seed yield resulted in 25, 17 and 10 per cent increase in the yield of oil due to application of 150, 100 and 50 kg S over control. The highest seed yield of 1.64 ha^{-1} was obtained from variety 'varuna' (T-59) which was 10, 17 and 23 per cent more than that from Rohini, Vardan and Vaibhav, respectively. Economic analysis revealed monetary advantage of 18 per cent by applying 150 kg S compared to no sulphur.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 14

EXPLORING POSSIBILITY OF SULPHATE FERTILISATION WITH SALT PRODUCTION RESIDUES

Paulsen, H. M., Gupta, A. K. and Schnug, E.

Institute of Plant Nutrition and Soil Science, Federal Agricultural Research Centre, Braunschweig, Germany

Residual precipitation from brines are available in a huge quantity as by-products of common salt producing industries. In Austria and Germany they are frequently used as soil amendment. However, these are viewed as potential source of sulphur, an element whose deficiency has become widespread. In a multilocation field trial on rapeseed using two formulations of the by-product were compared to commonly available sulphate and elemental sulphur fertilisers.

In general the results show a quick plant availability of applied sulphate sulphur and sprayed emulgated elemental sulphur. These products were superior to granulated elemental S-fertilisers. The tested salt mining residuals are quite comparable to sulphate containing fertilisers and may be used as a substitute for high priced elemental sulphur fertilisers. Besides the former has soil ameliorating properties (20% - 30% CaO, 6 - 11 % MgO).

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 15

USE OF SDA-PRODUCTS FROM COAL FIRED POWER PLANTS AS SOURCE OF SULPHUR IN AGRICULTURE

Paulsen, H. M., Haneklaus, S. and Schnug, E.

Institute of Plant Nutrition and Soil Science, Federal Agricultural Research Centre, Braunschweig, Germany

Flue gas desulphurisation is done by lime reactions in wet or semi-wet procedures. The spray drying process (SDA) is a semi-wet procedure. Lime solution will be sprayed into the exhaust of a burning plant before or after removing the fly ash. The product of this process is a dry and fine powdered material containing sulphur mainly bound as $CaSO_3$. Due to its content of fly ash the products may contain impurities of environmental important elements.

While gypsum is predominantly used in the building industry or as a filling compound, products from the spray drying absorption process are only partly utilised. The use of desulphurisation products as sulphur fertilisers in agriculture could cover the sulphur supply of the plants and would simultaneously contribute to appropriate recycling of these residues.

In a field trial series on 4 sites in Northern and Central Germany the effect of five SDA-products with different fly ash contents on the sulphur nutritional status of oilseed rape, rye, wheat and barley was evaluated. The results show that all tested products are suitable for improving the sulphur nutritional status of the plants. The sulphite-sulphur is available immediately and doesn't affect plant-growth negatively. To prevent accumulation of undesired elements in soil it is necessary to determine the influence of SDA-products on the content of environmental important elements in soil. Direct use of these fine powdered materials in fields requires fertiliser spreaders with worm-augers and dust protective facilities. Granulation of the products or mixing the products with animal slurry are other possibilities of application.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 16

YIELD RESPONSE AND S UPTAKE OF CROPS GROWN ON AN S-DEFICIENT SOIL AMENDED WITH INDUSTRIAL CO-PRODUCT RED GYPSUM

S. Peacock[1], E.J. Evans[2], J.M. Monaghan[1] & D.L. Rimmer[2]

[1]Department of Agricultural & Environmental Science and

[2]Department of Agriculture, The University, Newcastle-upon-Tyne NE1 7RU, UK

Gypsum can be used to supply sulphur to S-deficient crops, particularly as current fertilisers contain virtually no S, and SO_2 emissions have decreased by ~ 40% during the past two decades due to pollution control measures in the UK. This study the use of an iron-rich gypsum coproduct ('red gypsum') from an industrial process in the manufacture of titanium oxide pigment. Iron oxide in soils are known for their surface activity, and the presence of iron oxides in this material make it potentially more effective as a fertiliser than a pure gypsum, due to the retention of plant nutrients.
Greenhouse and field trials were established on an S-deficient soil to determine the effects of red gypsum and other forms of gypsum on grain yield and plant tissue S of three crops of contrasting S demand and to assess whether the red gypsum is as effective as pure gypsum.

For all three crop types, there was no significant response to the gypsum treatments on either dry matter yield or seed yield. In the oilseed rape field trial, biomass S uptake from gypsum amended soils was significantly higher than the control, and leaf S concentration was significantly above the critical level. There were no significant differences in S uptake in the winter wheat trial. In the spring wheat greenhouse trial, grain S content indicated no S deficiency present for any treatment, but there were significant differences for the N:S ratio between the amended soils and the control, indicating no S deficiency for the amended soils and S deficiency for the control soils.

These results suggest that the red gypsum material is an effective S-amendment in an S-deficient soil for a crop with a high S demand such as oilseed rape, and may be suitable for amending S-deficient

soils for a spring wheat crop. There is no evidence to suggest however, that red gypsum is more effective as a soil amendment than a pure gypsum.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 17

TREATMENT OF POTATO WITH METAL COMPLEXES REGAINED FROM WASTES

Schmidt, R, Szakál, E., Brückner, D. & Szakál, P.
Pannon University, Agricultural Faculty Mosonmagyaróvár, Hungary

We used copper and zinc complexes regained from wastes for the zinc and copper nutrition of potato in the form of foliar application.

We established that the copper complexes as a result of their fungicide and batericide effect safeguarded good protection against Phytophtora infestans and Erwinia carotovora. The leaf resistance level of the potato plants increased due to the application of zinc and copper complexes.

The propagation quality of potato tubers was positively influenced by the copper-tetramin-hydroxide treatments. When this compound was applied the number of tubers with excellent seeding quality increased.

The copper and zinc complexes increased significantly the proportion of larger tubers and the number of tubers suitable for propagation.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 18

THE EFFECT OF PIT COAL ASH APPLICATION ON SEED GERMINATION AND PLANT GROWTH OF WINTER CEREAL PLANTS

S. Stankowski and M. Stosio

University of Agriculture, Department of Biometry, Szczecin, Poland

In the field experiment, conducted on heavy soil, the effect of pit coal ash in four doses (0,50, 100 and 150 t/ha) on seed germination of barley, rye, triticale and wheat cultivars was investigated. The successive effect of ash application on seed germination and plant growth was estimated in laboratory trials conducted in plastic pots.

Reaction of cultivated species in the field experiment was different. Increase of ash dose from 0 to 100 t/ha increased seedlings number of wheat, but at the highest dose germination capacity decreased. For the other cereals germination remained at similar level, irrespective of ash dose from 0 to 100 t/ha. Germination increased upon increase of the dose up to 150 t/ha, only. Successive effect on seed germination was not observed.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 19

EFFECT OF COPPER-AMIN-COMPLEX PRODUCED FROM WASTE ON THE YIELD AND BREAD-MAKING QUALITY OF WHEAT

P. Szakál & R. Schmidt

Pannon University, Agricultural Faculty Mosonmagyaróvár, Hungary

According to FAO tests carried out in many countries, including Hungary, soils and products show significant deficiency of copper. Copper deficiency in plants hinders growth and nitrogen intake. These nutritional disorders cause demaging effects in wheat.

We used copper-tetramin-hidroxide produced from waste to compensate the microelement deficiency. For environmental reasons we applied the complex on the foliage of the plants.

In plot and large scale experiments we also proved that the treatments at booting and flowering both largely increased the yield and quality of wheat. At the same time we succeeded increasing the copper content of the flour to an optimum level.

Moreover the treatment decreased infection caused by seed-borne diseases.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 20

PRODUCTION OF COPPER-TETRAMIN-HIDROXIDE COMPLEX FROM WASTE CONTAINING ACIDIC COPPER-CHLORIDE AND TESTING OF THIS COMPLEX FOR FUNGICIDE EFFECTS

P. Szakál, S. Pécsi & R. Schmidt

Pannon University, Agricultural Faculty, Hungary

Waste, containing copper-chloride comes from the production of microelectronics plates. This waste is treated in an membrane reactor with ammonium gas. After extracting chloride ions the waste is further treated by ammonium gas in order to get copper-tetramin-hidroxide.

Copper compounds are very important in plant protection. Therefore we examined this effect with agar-agar diffusion method and with spore-sprouting. Our experiments proved that the produced complex better prevented the development of fungi than the copper-oxi-klorid 50 WP used as a control.

As the result of our work we have produced a more effective product than those known.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poster Session I

Poster No: 21

WASTE-DERIVED ZINC COMPOUNDS FOR THE ZINC NUTRITION OF SUGAR BEET

R. Schmidt and P. Szakál

Pannon University, Agricultural Faculty, Hungary

A significant area of the Hungarian agricultural lands is deficient in zinc. In a former survey the 60% of the country's area proved to be deficient in zinc. Since sugar beet is one of the most significant cash crops in Hungary and is sensitive to zinc deficiency it is important to work out efficient methods for zinc nutrition.

At the manufacturing of ion exchange resins a large amount of zinc containing waste is produced. Using suitable chemical and technological procedures these wastes can be transformed into amin complexes that are appropriate for plant nutrition and do not contain harmful anions.

We carried out experiments for the foliar application of zinc for sugar beet. The results proved that due to the improved zinc nutrition the raw and the extractable sugar content increased. The experiments showed that hazardous wastes with suitable methods can be transformed into useful materials that can be reintroduced into geochemical circles.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Poter Abstracts: keine Anmeldung

The influence of saturation mud, manure and mineral fertilizers on chemical traits improvement and maize grain yield on Kosovo and Metohia's Pseudogley soils

M. Brkovic[1], N. Deletic[1] and Maja Cuvardic[2]

[1]Faculty of Agriculture, Pristina; [2]Faculty of Agriculture, Novi Sad, Yugoslavia

Degraded acid soils in Kosovo and Metohia are placed on about 60% of the total arable land. Acid degraded soils make many difficulties for crops growing, and low yields are permanently reached by crops grown on such soils.

This study was aimed to establish the best measures for improvement of these soils physical, chemical, biological and productive properties, as well as to investigate possibilities of saturation mud recycling.

For this research we established long-term stationary field trials. In order of these soils revitalization we used industrial remains (saturation mud) of a sugar-house, manure and mineral fertilizers. During the study we observed physical, chemical and biological changes of the soil, as well as maize grain yield.

The five year results of the study showed significant changes of soil properties. Saturation mud influenced change of pH value in nKCl from 3.91 to 5.83, and decreased hydrolitic acidity (Y_1) from 30.66 to 6.05 ccm. Content of free Al ion decreased to minimum. The level of adsorption complex saturation with the alkali rose from 9.00% to 75.04%. The applied complex amelioration measures influenced increase of maize grain yield by 210% comparing with control. Saturation mud used alone increased maize grain yield by 136%. Application of complex measures for soil chemical amelioration enabled reaching of such yield which was on the level of middle-fertile soils.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

Energy biomass production with meatworks' effluent irrigation in New Zealand

Landin Guo

31 Ada Street, Palmerston North, New Zealand

Abstract fehlt.

The Reduction of risk contamination of plants by heavy metals with the sorbents

Nikolaj Kharitonov

Agroecology Institute Dniepropetrovsk Agrarian University, Ukraine

The effectiveness of heavy metals detoxication largely depends on the combinality of mineralogic and granulometric composition of soils and rocks and protective functions of the plants. Meantime some industrial regions of the Ukraine encountered the processes connected with the soil degradation due to its aerotechnogenic pollution by heavy metals (HM).

The investigations were performed in the conditions of laboratory, green-house and micro-field experiments.

For example green-house experiment was made on the ordinary medium-loamy black soil with soya as test. The salts of zinc, copper, lead, cadmium, nickel and cobalt were brought in doses of 1 and 5 MPC (maximum permissible concentration).

The minerals tested were zeolite, glauconite and montmorrilonite clay.

The results obtained have indicated high buffer capacity of black soil.The strongest buffer ability of black soil to heavy metals is discovered for lead, copper, zinc and cadmium.

Addition to untread black soil heavy metals in the model experiments have showed that bigger negative influence on the unrease and phosphatase activity of soil have copper, cadmium and zinc ions.

The total phytotoxic action of heavy metals led to the reduction of soya yield in the variant of 1MPC HM by 25%, in the variant of 5MPC HM by 49%, in comparison with the control variant. The zeolite additive acted better than glauconite for the increase of the plants' bioproductivity which was equal in the variant (5 MPC HM + zeolite) to 90% of the control value.

10th International Symposium of CIEC
RECYCLING OF PLANT NUTRIENTS FROM INDUSTRIAL PROCESSES
9 - 11 December 1996

The estimation of sewage irrigation possibilities for degradated territories by mathematical modelling method

D. Kowalski

Department of Water Supply and Waste Water Disposal, Lublin Technical University, ul. Nadbystrzycka 40, 20-618 Lublin, Poland

Exploitation of groundwater intakes provides to depression of water level in big cities and economic centers area. Peat soil, especially sensitive for dehydration, located round this territories can be subject to degradation. The sewage irrigation can break down that process, but it can provide to groundwater pollution.
The article will present the way of drainage spacing calculation, protecting from pollution movement, from furrow or basin irrigation, to deeper water layers, by numerical simulation way. The author intend also to present the assumtions of started research project providing to empirical verification of used mathematical models.

The lawn grass in the improvement of ecological situation of technogenic territories

Yuri V. Licholat
Dniepropetrovsk State University, Department of Biology and Ecology, Dniepropetrovsk, Ukraine

Casts of chemical males works and transport which contain organic and unorganic toxic substances are basic sources of air, soil and water pollutants of industrial regions.
Toxic action of pollutants for environment decreases of nature components ability of self regulation, violates ecological equality between components in ecosystems, break condition of plant communities. In the course of choosing the assortment of plants for this objective the preferance in given to the lawn grass, posessinc wide ecological plasticity, which allows them to grow successfully under different condititons, preserving high ornamental qualities. In

conditions of industrial contamination the water interchange and composition of surface lipids of leaves were index stability of lawn grasses. The recommendation sanitation of highly developed industrial region, worked out by us, stipulate the creation of perennial polyfunctional turf covering at the expense of classical kinds (Festuca rubra L., Lolium perenne L.) and local thick-bushed (Festuca subcata Hack, Festuca orina L.) and rhizome (Bromus intermis (Leys.) Holub, Agropyron repens (L.) Beaus.) weeds.

The influence of sewage sludges on the state of heavy metals in soils and accumulation in crops

I. O. Plekhanova
Department of Soil Science, Moscow State University, Russia

Sewage sludge application to soils provide the increasing of nutrient for crops, but it leads to contamination of soils by heavy metals. The addition of sewage sludge to soil leads to increasing of heavy metals content. Mobile forms concentration coefficients proved to be 2-10 times higher than those for the totals. Heavy metals accumulation in crops depends on their concentration in soils and on the biological properties of crops (the differences are 5-10 times). The using of peat and ceolite decrease the entrance of heavy metals into crops on 10-15%.

The most rational way of agricultural using the soils contaminated by sewage sludges is the cultivate the crops which have low coefficients of accumulation of heavy metals and with using simultaneously the meliorants, such as peat, lime and ceolite. The using of sewage sludges must be strictly controlled on the heavy metal content and dose of application.

Dust of electric steel-smelting furnace as a fertiliser

Valeriu Tsbulskiy, I. Shiskow & V. Penov
Odessa Agricultural Institute, Ukraine

During the smelting of the steel from scrap-iron the waste is produsedd-dust, which consists of useful (Zn, Mn, Mg) as well as harmfull elements.

As results of our research we were able to establish:

a) at which concentration of the dust contact of soya, maize and cabbage seeds with dust does not decrease derminating power of seeds and does not depress sprouts;

b) application of the dust (up to 400 kg/hectar) does not affect negatively the dynamics of phosphates in the soil as well as the nitrification;

c) application of the dust (100 kg per hectar and more) increases cabbage crop and powdering of soya beans (at certain concentration of the dust) allows to increase the yield.

Amount of microelements and their efficiency in soody podzolic soils

Rima Veitienè

Vezaiciai Branch of the Lithuanian Agricultural Institute, 5845 Vezaiciai,
Klaipeda District, Lithuania

At the Vezaiciai Branch of the LIA over the period 1962-1993 the amount of microelements and their efficiency on various agricultural crops was investigated in differently fertilized soil with different acidity values.

It was established that various crop management practices (fertilizing, liming) improved a poor soddy - podzolic soil which consequently resulted in a slightly better micronutrient regime. However, agricultural crops sensitive to micronutrient deficiency ought to be treated with micronutrient fertilizers.

Field experiments were conducted in the Vezaiciai Branch of the LIA to evaluate the efficiency of nitrophoska enriched with microelements on the fooder beets and spring barley. Nitrophoska enriched with boron, molybdenum, cooper and zinc showed no advantage over ordinary nitrophoska.

Comparative study on biogas slurry in combination with rhizobium inogulation and growth etumulant on groundnut (Arachis hypogaese)

G.L. Jain and S.C. Teli

Rajasthan Agricultural University, Beechhwal, Rikaner - 334 002 Rajasthan, India

The experiment was conducted with an objective to determine efficacy of biogas cow-dung slurry and new Rhizobium strain for source of N in addition to newly developed growth stimulants. The application of starter dose of N @ 20 kg/ha through urea (21.8 q/ha). Between organic manures of N - nutrition, slurry proved more effective as it significantly improved kernel yield by 10.8 per cent over FYM (18.3 q/ha) application. Significant increase in kernel yield to the extent of 5.9 per cent was observed under the influence of seed inoculation with HLL strain compared to inoculation with IGR-6 strain. The crop under the influence of triacontanol based growth substances, i.e. mixtalol and vipul produced significantly higher kernel yield. The increases were to the extent of 1.8 and 1.1 q/ha respectively, over control (17.9 q/ha). Thus, it is concluded that biogas slurry a product from biogas plants can be used as a source of organic manure. The new Rhizobium strain and mixtalol granule or vipul spray can be recommended for use in groundnut.