Consiglio Nazionale delle Ricerche (CNR) **Istituto per lo Studio degli Ecosistemi**

Implicacions ambientals de la recuperació d'espais urbans per l'agricultura

AGRICOLTURA:

El terme "agricultura" es pot definir com:

ART i CIÈNCIA

ART >>>> LANDSCAPE, ARCHITECTURE, TRADITIONAL PRACTICES

CIÈNCIA >> MODERN PRACTICES, MODELING, FERTIGATION

Ecology: rural BIODIVERSITY - SUSTAINABILITY

Agricoltura .. Wider conceptual approach ….

- ***Farming.***
- *Cultivation and tillage of the soil for food production*
- *Aquaculture,, floriculture, horticultural commodities*
- ***wood, fiber, medical products, dying***
- *the raising of livestock and food processing*
- ***bees, fur-bearing animals,***
- *market, organization, storage or delivery to carriers (*Sec. 1a, Chapter 128, M.G.L. Retrieved September 2, 2010 from http://www.mass.gov/legis/mgl/128-1a. htm).

- **Social- aggregation of different races and cultures, better sustainability of migrants and local population, rise income and wellbeing..**
- **…… others….**

Porqué hablar hoy de agricoltura **urbana** e **periurbana**

1. Le aree urbane ospiteranno **1,4 miliardi di persone** tra il 2011 e il 2030
2. **1 MILIARDO** di persone vivono in baraccopoli.
3. Le città usano **il 60-80 per cento del consumo globale di energia**
4. Le attività economiche delle città sono il **70 per cento del PIL** mondiale.
5. il **70 per cento delle emissioni di gas** a effetto serra proviene dalle città,
6. La comunità ***urbana*** ha un **minore impatto ambientale** procapite rispetto alle aree ***rurali***.

ESPANSIONE DELLA CITTÀ:

In PRATICA … COSA COMPORTA?

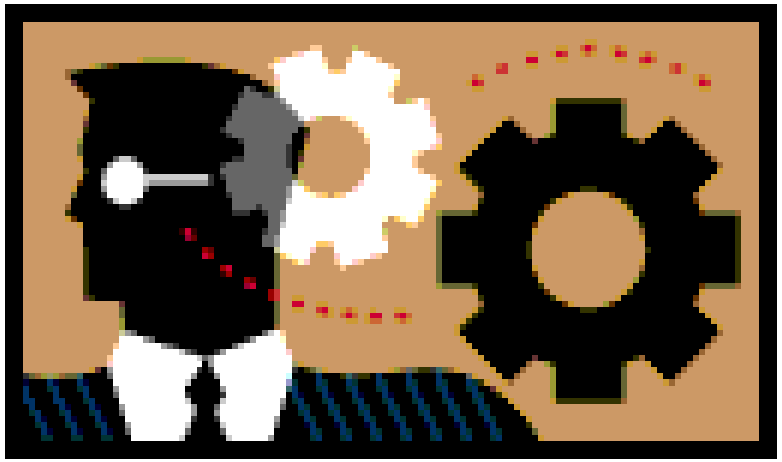
1. **recupero e bonifica** di spazi e terreni abbandonati dall'industria e dall'agricoltura, o altre attività
2. bonifica di **acquiferi superficiali**, sedimenti, wetlands
3. gestire il **ciclo dei rifiuti** e degli scarichi domestici
4. recuperare **risorsa idro-potabile** e suolo agricolo
5. progettare **infrastrutture abitative e ricreative** idonee a ospitare e integrare le comunità urbane e rurali
6. predisporre **strumenti urbanistici e sociali** per accogliere e integrare gli immigranti inevitabilmente in arrivo sempre più in Europa. *(scuole ospedali, mense, aree ricreative, sportive, centri di formazione, ecc)*

Possiamo organizzare una fascia verde (**green belt**) sulla vecchia linea di confine città-campagna.

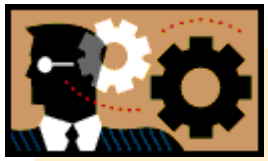
e

realizzare un sistema ***agro-tecnologico*** ad alto **valore** ambientale, economico e sociale.

Questo è possibile mediante l'uso di pratiche agricole tradizionali riadattate in chiave moderna



Agricoltura urbana e periurbana verso la realizzazione del……. grande orto urbano



che deve garantire e soddisfare:

1. L'ambiente e le sue risorse "esauribili"

2. La funzione produttiva dell'agroecosistema

3. la conservazione della biodiversità rurale.

3. L'aggregazione sociale

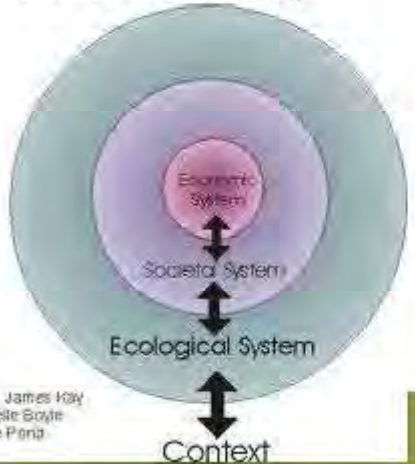
4. Il recupero dei saperi antichi e la loro diffusione

La strategia di un approccio ecosistemico

"the Ecosystem Approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"

(Convention on Biological Diversity, COP 7 Decision VII/11)

- beyond biodiversity
- beyond 'environmental'
- humans inherently part of nature



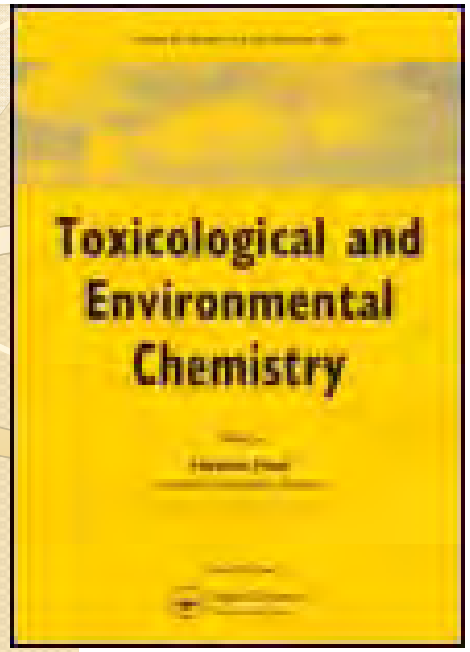
relu
Rural Economy and Land Use Programme

BIRMINGHAM CITY University

tecnologie: naturali
processi : biologici, integrati, sostenibili
matrici :

> estreme e critiche (sedimenti marini)
> ideali non critici (suoli)

Tutte le altre matrici geologiche ricadono fra i due estremi



per rigenerare e bonificare una matrice geologica come il suolo e il sedimento è stata messa a punto una tecnologia completamente biologica e naturale denominata TRIAS: .

A three components system (TRIAS) in the phytoremediation of polluted environmental matrices Veronica Bianchi & Brunello Ceccanti (

To cite this article: Veronica Bianchi & Brunello Ceccanti (2010) A three components system (TRIAS) in the phytoremediation of polluted environmental matrices, Toxicological & Environmental Chemistry, 92:3, 477-493, DOI: 10.1080/02772240903036154
To link to this article: http://dx.doi.org/10.1080/02772240903036154

Marine Sediments
European project AGRIPORT 2009-2012

Harbour of Livorno (centre Italy)

Accumulation basin

875.000m^3/year of dredged sediments contaminated by heavy metals and hydrocarbons

SIMULATION of Marine sediments *treatment* at Pilot-scale, at CNR-ISE Pisa. *AGRIPORT European project 2009-2011*

Conditioning of sterile and polluted sediments is performed with **salt tolerant grass** and **composting** amendment, followed by **simulated rain** to drain salts; **brushes** are used for colonizing deeper strata.
Once recreated the chemical-physical conditions similar to those in a natural soils, **earthworm** may also be introduced to test residual toxicity still present in soil and to enhance **soil microbial activity**,
The mesocosm is regularly monitored through conventional *agro-chemical and bio-physical parameters*. A bioremediation will be completed in a few months.

The challenge is now possible .... With

The three-component, fully natural treatment system works efficiently !!

TRIAS *(Bianchi Veronica and Brunello Ceccanti, 2010)* **.**

Plant- microorganisms – eartworms in action ..!!

STERILE Brackish sediment

Plant cover after remediation and conditioning

The process is fully natural, ecologically sound, technically feasible, economically sustainable and socially acceptable.

Know-how: CNR-ISE and Dept of Civil Eng. of the University of Pisa

AGRIPORT – Eco-Innovation EU project 2008-2010 (field scale)

AGRIPORT originates from advanced multidisciplinary researches **Funded** by European Commission and **Co-funded** by Ministry of the Environment and sea resources of Italy.

Consortium: Italia, Montenegro (south-eastern Europe), Israele

Objective: valorization and recovery for productive-ecological purposes the sedimentary georesources in the Legorn (Italy) and Haifa (Israel) harbors

Metodology: Phytotreatmenty after bio-physical conditioning with the three-components ***TRIAS*** system made at CNR's Labs.

Expected results: to turn marine salty sediment into an ecologically sound ***technosoil*** foerenvironmental uses and plant growing.

BIOREMEDIATION of soil polluted by heavy metals and hydrocarbons in Toscana, Municipalità di S. Giuliano Terme - Pisa

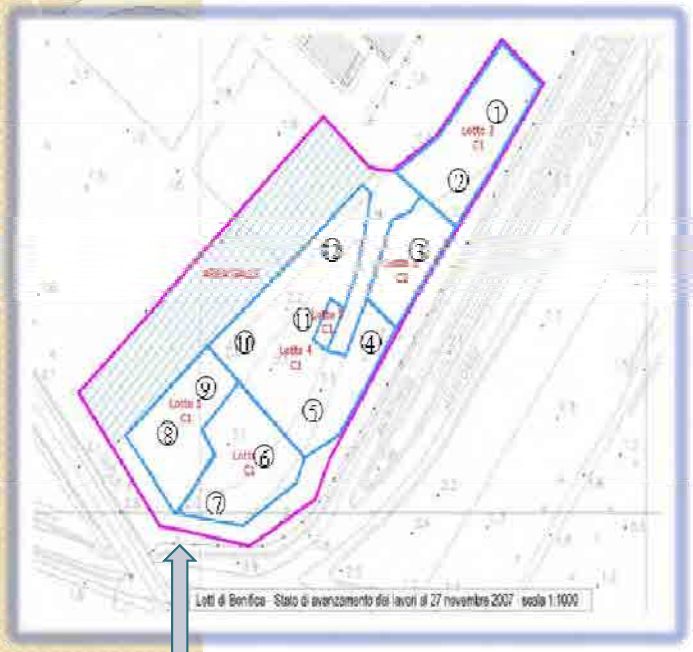
Oil and fuel

Plastic

Electric and iron

Soil (10000 m2) reacts positively to the processing technology TRIAS.

On April 2007, the TRIAS (three-components) technology was applied. 6 steps have been executed for conditioning the soil before TRIAS.



1. Soil removal until clay basement

2. Soil storage

3. Removal of dumped waste with rotor-sieve

4. Control of clay basement pollution

5. Replacing of mixed soil

6. Soil sample collection

Monitoring campaign (Time 0).
Twelve soil samples were collected at 0-60cm depth twice in a year

Tree plantation

Populus nigra (var.italica) and *Paulownia tomentosa* 2 x 2 m with interposed *Cytisus scoparius* 1 x 1 m.

Populus nigra var. Italica
(Lombardy poplar)

Paulownia tomentosa
(Princesstree)

Cytisus scoparius
(Scotch broom)

A vegetated Pond was realized as a System for collecting and depurate (phyto-depuration) rain water flowing from the Bioremediation site

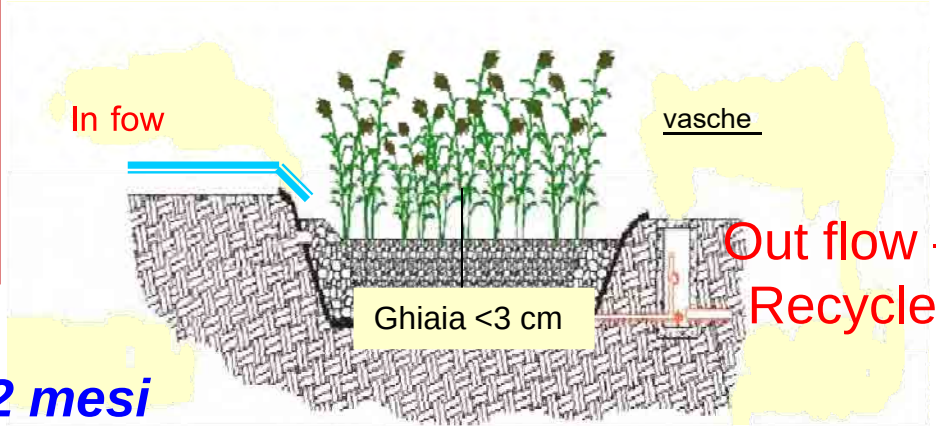
A Reconstructed Wetland

6 month	Unit	**Before** remediation (S)	**After** rem (S-MP)	**After TRIAS** (S-MEP)
pH	-	8.9^{a}	8.3^{b}	8.4^{b}
E.C.	dS m^{-1}	2.3^{a}	2.1^{a}	2.1^{a}
NH_4	mg kg^{-1}	3.5^{a}	2.8^{b}	2.0^{b}
TKN	%	0.16^{b}	0.35^{a}	0.36^{a}
TOC	**%**	**1.6^{b}**	**4.3^{a}**	**4.8^{a}**
C/N	-	10^{a}	12.3^{a}	13.3^{a}
WSC	mg kg^{-1}	700^{b}	1500^{a}	1900^{a}
TEC	mg kg^{-1}	5200^{c}	14000^{b}	18000^{a}
Exch-P	mg kg^{-1}	26^{c}	72^{b}	105^{a}
Tot-P	mg kg^{-1}	600^{c}	720^{b}	850^{a}
DH-ase	**µgINTF $g^{-1}h^{-1}$**	**1.2^{b}**	**1.5^{b}**	**2.8^{a}**
Tot Hydroc.	**mg kg^{-1}**	**6150^{a}**	**3600^{b}**	**2500^{c}**

18 months phyto -REM	Unit	T-Before remediation	T-MP after remediation	**T-MEP after remediation *TRIAS***
pH	-	8.5^{b}	8.9^{a}	9.1^{a}
E.C.	dS m^{-1}	0.16^{a}	0.18^{a}	0.20^{a}
NH_4	mg kg^{-1}	2.0^{b}	1.5^{b}	5.0^{a}
TKN	%	0.18^{a}	0.2^{a}	0.22^{a}
TOC	**%**	**0.9^{c}**	**1.5^{b}**	**2.2^{a}**
C/N	-	6^{c}	8^{b}	11^{a}
WSC	mg kg^{-1}	90^{c}	340^{b}	440^{a}
TEC	mg kg^{-1}	2200^{b}	3100^{a}	3400^{a}
Exch-P	mg kg^{-1}	0.4^{b}	0.06^{c}	18^{a}
Tot-P	mg kg^{-1}	190^{b}	255^{a}	260^{a}
DH-ase	**µgINTF$g^{-1}h^{-1}$**	**0.7^{c}**	**1.2^{b}**	**2.2^{a}**
Tot-Hydroc.	**mg kg^{-1}**	**2600^{a} (0)**	**2200^{a} (16%)**	**750^{b} (70%)**

Know-how: CNR-ISE Fito-stabilizzazione dei fanghi on-line

FITO-stabilizzazione dei fanghi su letti vegetati con *Phragmites australis (cannuccia d'acqua)*
Prodotto*: (BIOFERTILIZZANTE) simil-torba*



1 : carico e condizionamento *1-2 mesi*

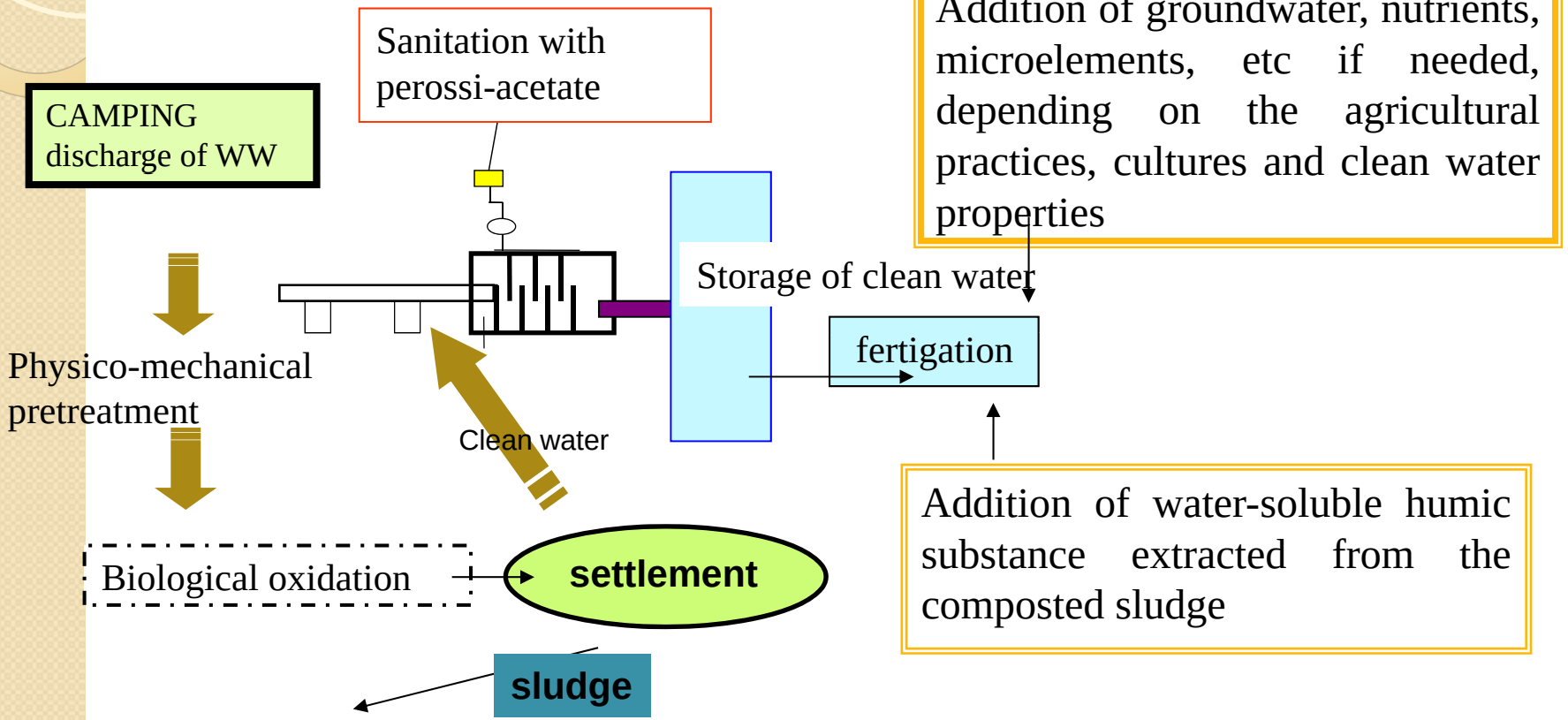
2 : esercizio *8-10 anni*

3 prodotto

fango ▶ fito-remediation ▶ Humus stabile

Utilizzo del prodotto: *Il prodotto è classificato da CNR-ISE come BIOFERTILIZZANTE a norma D.Lgs 152/99 e può essere usato in varie applicazioni pratiche: in opere di bonifica e restauro ambientale; desertificazione, vivaismo, lombricoltura, altro..*

Wastewater treatment: how to *close the cycle at the depuration plants*



Water reuse
Addition of groundwater, nutrients, microelements, etc if needed, depending on the agricultural practices, cultures and clean water properties

Addition of water-soluble humic substance extracted from the composted sludge

Sludge treatment (composted): *conventional plus unconventional methods (phyto-mineralization, vemicompost, compost) according to European and national regulations.*

previous state

Re-adaptation of existing plant

Drainage beds: inert coarse gravel

Planting

Sewage Loading on drainage green filter (*Phragmite a.*) *START-up*

2-4 hours: the only phase of odor emission

Diluted 2-4 % sewage sludge load

Granular bed made by coarse gravel

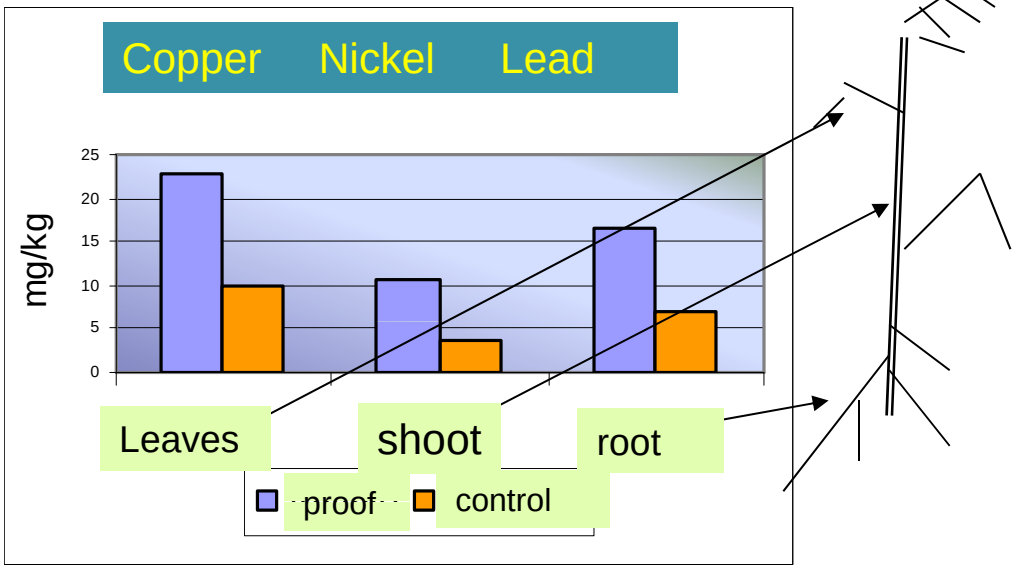
Autochthonous Phragmites australis

Planted filter- in operation

Heavy metals extraction by plants

PHYTO-Treatment operate a sort of bioremediation of sludge:

- 50% cost reduction for sludge treatment and disposal
- 80-90 % volume reduction
- sludge storage for months even years (11 years in our plants)
- Stabilization of organic substance
- Preparation of peat-like organic fertilisers
- Sanitization and removal of metals with plant harvesting
- Odor mitigation at treatment plant in urban areas



Status: this process is now operated at middle-high scale

Altri Casi di Studio al CNR di Pisa. Processo combinato lombricoltura-compost per il recupero dei reflui oleari (Alpechin), dopo assorbimento su materiale ligno-celulosico (paja, estiercol animal, etc)

Il compost è risultato alle analisi, simile ad unatorba humificata asolutamente biologico.
Si usa nelle coltivazioni orticole e per Coltivazioni pregiate: funghi, fiori, vivai
Setas flores viveros

An open-field micro-fertigation system for wastewater re-use

Sistema di fert

(A) fertigation with Clean water at root zone (subirrigation)

Objectives:
- wastewater close cycle
- - Recovery of wastewater nutrients
Save 60-80% ground water pumping
- Save 50% micro-nutrients and chemicals loading
- Soil salinity mitigation by humic substances

Fanghi biologici compostati mediante l'uso di lombrichi (*Eisenia foetida*)

Clean wastewater is injected at 2.0 bar into the fertigation system, at root zone to avoid evaporation (dip sub-irrigation). The clean water was added with humic substances and other essential micro-nutrients. In the CNR plots no additional N, P and micro-nutrients were used.

(B) Vermicomposted Sewage sludge (Eisenia fetida) are used as amendment of melon crops after extraction of water-soluble humic substance, which is added into the irrigation pipes above (A). The extracted vermicompost was added in soil as soil amendement and conditioning.

Moreno Flores Osvaldo

Agricultura Urbana:
Nuevas Estrategias de Integración Social y Recuperación Ambiental en la Ciudad.

1. ***La Agricultura Urbana surge como potencial plataforma de desarrollo local y comunitario, asumiendo el desafío de estructurar sinergias y complementariedad entre la recuperación de los recursos del hábitat y la creación de actividades productivas agro-culturales***

2. *Eso genera un encadenamiento operativo de la* ***dimensión ecológica, económica y social del concepto de sustentabilidad****.*

Revista Electrónica DU&P. Diseño Urbano y Paisaje Volumen IV N°11. Centro de Estudios Arquitectónicos, Urbanísticos y del Paisaje- Universidad Central de Chile. Santiago, Chile. Agosto 2007 Diseño Urbano y Paisaje Año 4 Número 11 2007

http://www.slideshare.net/fredyrmenam/11-agricultura-urbana

Le soluzioni …….. I progetti in corso

Figura 1: Transformación del Paisaje Urbano a través del desarrollo de Agricultura Urbana, en Cuba; un hábitat periurbano degradado y económicamente marginal, como tantos existentes en nuestras ciudades latinoamericanas.

Osvaldo Moreno Flores
Arquitecto Magister en Paisaje Medioambiente y Ciudad.
Doctorando en Arquitectura y Urbanismo. UNLP Chile
Enseñanza superior

Le soluzioni …….. I progetti in corso

compost

agua

biodiversidad

biorremediacion

Altri Casi di Studio al CNR-ISE di Pisa
Monitoring and Management of wetlands

in the S. Rossore Park - Tuscany

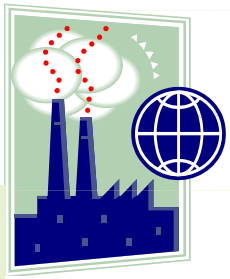
Le **esperienze** che si presentano muovono da tre esigenze diverse:

1. Conoscere il potere (auto)depurativo dei corpi idrici interni.
2. Controllo delle acque marine e del carico di nutrienti nella pianura costiera pisana.

Fiume Morto
e canali adduttori

Lago salmastro - Le Tamerici.

durante la fase de diseño de la zona urbana se debe aplicar una estrategia combinada al menos en 5 pasos



problemas

objectivos

solució

➢viabilidad y resultados

Bioremediation advantage

- ✓It is a natural and *environmentally* friendly process.
- ✓*Restoration* of the biological characteristics of soil: biologically active soil.
- ✓It is performed an *in situ* technology without having to move soil somewhere else.
- ✓Limited potential risks for living organism and infrastructure
- ✓*Cheaper* than traditional physical and chemical remediation technologies.

Conclusioni

1. Questo work-shop ha messo in evidenza la multidisciplinarietà del tema
2. L'agricoltura periurbana non è più un argomento astratto o materia per soli nutrizionisti o ecologisti
3. Al contrario è fonte di reddito per i giovani e le mini imprese e uno strumento di integrazione sociale per I migranti

1. !!! le amministrazioni locali, la scienza e i saperi tradizionali del mondo agricolo sono fortemente coinvolti !!!
2. le associazioini di categoria insieme ai presidi sanitari sono chiamati a svolgere un ruolo di ***vigilanza e formazione***.