Recycled Organics in Catchment Management

Final Report

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Department of
Environment and Conservation (NSW)

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Abbreviations and acronyms

ANL	Australian Native Landscapes
AS4454-2003	Australian Standard for composts, soil conditioners and mulches
BOD	Biochemical Oxygen Demand
CMA	Catchment Management Authority
CROA	Centre for Recycled Organic in Agriculture
CSM	Camden Soil Mix
DEC	Department of Environment and Conservation NSW
DIPNR	Department of Infrastructure, Planning and Natural Resources
DLWC	Department of Land and Water Conservation
LSD	Least Significant Difference
N	Nitrogen
NATA	National Association of Testing Authorities (Australia)
NH_4-N	Ammonium Nitrogen
NO_3-N	Nitrate Nitrogen
NSW DPI	NSW Department of Primary Industries
OC	Organic Carbon
P	Phosphorus
RO	Recycled Organics
TSS	Total Suspended Solids

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Executive Summary

This project is a joint collaboration between NSW Department of Primary Industries and Department of Environment and Conservation NSW. The main aims of the project are:

To determine desirable product specifications for composted recycled organics (RO) products for use in runoff and erosion control in water catchments in NSW.

To determine the benefits to water quality and catchment health of the strategic use of RO products for runoff and erosion control by replicated and demonstration field trials

To evaluate the use of RO products for runoff and erosion control in catchment areas as a viable market option for the RO industry.

Australia generates substantial quantities of urban wastes annually. To reduce the quantity of organic material going to landfill and to beneficially reuse the resources within them, Australian State governments have legislated to reduce or ban garden organics from landfills. This has accelerated the pace of compost-recycling of garden organics and some market segments, such as landscaping and urban amenity, are now faced with an oversupply of RO products. The markets identified for the products have mainly been in urban landscaping, intensive horticulture, viticulture and agriculture. However, RO products may potentially be used for rehabilitating large areas of degraded farming land and natural catchments, which has come about largely through unsustainable human activities and attendant soil erosion.

Soil erosion is a serious threat to sustainable agricultural production as well as a major problem for watershed management and conservation of the natural resource base. Soil erosion and deposition cause not only on-site degradation of land resources but also off-site problems such as down-stream sediment deposition and pollution of water bodies by various nutrients and toxic agrochemicals.

In Australia, there is little documented information on the use of RO products in the rehabilitation of degraded land in water catchments. The previous Department of Land and Water Conservation (DLWC) has traditionally used a layer of cereal straw or meadow hay (5-10cm) as an erosion blanket, which is over-sown with a seed mixture of exotic pasture grasses and legumes. When available or economically feasible, native grasses and shrubs (planted as tube-stocks) have also been used for longer-term revegetation. However, in recent years, the protracted drought and the concomitant high price of cereal straw and meadow hay, the previous DLWC has used a composted soil conditioner produced from garden organics and biosolids as an alternative. The composted soil conditioner was incorporated into the top 10cm of soil and over-sown with the usual seed mixture. The results, however, have been variable, depending on the site and the climatic conditions after the application of the RO materials. Consequently, the aim of the present project was to scientifically validate the benefits of using RO products in catchment management.

Two trial sites were established in the project. A replicated field trial was conducted at the DPI's Centre for Recycled Organics in Agriculture (CROA), Camden, and the other at Bungonia on a private property, located in the upper part of the Shoalhaven catchment. At Bungonia, a larger-scale non-replicated demonstration trial was also established to show-case various locally sourced RO products on the 1.5 ha degraded gully system. Composted RO products were also applied to the whole site to accelerate revegetation and to stabilise the gully.

CROA site

At CROA, two rainfall simulations were carried out on the trial plots: (a) without vegetation and (b) after some vegetation had been established. The first rainfall simulation at CROA evaluated the effect of two rates of coarse mulch (2.5cm and 5cm depth) and soil conditioner (1cm and 2.5cm depth) as “erosion control blankets” for the control of runoff and soil erosion. The other rainfall simulation assessed the effect of the RO materials in promoting vegetation and their subsequent impact on runoff and erosion control.

The results of the first rainfall simulation at CROA showed that all RO treatments as well as the conventional treatment were equally effective in reducing soil erosion compared to the control treatment (bare soil). However, the runoff volumes from the RO-treated plots were no different to that from the control plots. This could be due to the short period between the application of the RO materials and performing the rainfall simulations as there would not have been enough time for any incorporation of the organic matter by soil fauna. Moreover, the period had little natural rainfall and there would not have been much microbial activity in the soil-RO material interface to improve the soil structure. As such, the infiltration rates would have been similar in all treatments.

The nutrient loads in the runoff from the RO treated plots were generally low, highlighting the inherently low concentrations of nutrients like nitrogen (N), phosphorus (P) and soluble organic carbon (OC) in those materials. However, the higher rates of application of the mulch and soil conditioner led to significantly higher levels of soluble OC in the runoff compared to the control or the lower rates used. Despite this, the higher concentration of soluble OC did not correspond to an increase in BOD, suggesting the higher application rates would not have any adverse effect on water quality.

In the second rainfall simulation at CROA, which occurred after vegetation establishment, the runoff data were highly variable and not statistically significant. This again could be due to the drought conditions, which caused more severe cracking of the soil in some plots than in others. As such, there was greater water infiltration in those plots with the large cracks. The amount of suspended sediment in the runoff from the control plots, however, was significantly greater than from the other treatments. It was noticeable that the absolute amounts of soil lost from the control plots were about half those in the first rainfall simulation, probably because of the vegetation cover.

Bungonia site

At Bungonia, only one rainfall simulation was conducted on revegetated plots. As the results of the first rainfall simulation at CROA revealed that the lower rates of mulch and soil conditioner, were as effective as the higher rates, it was decided to evaluate these products only at the lower rate on the Bungonia site. The results at Bungonia demonstrated that the 2.5cm layer of coarse mulch and the 5cm straw layer reduced soil loss significantly compared to the control and soil conditioner treatments. The results of soil conditioner treatments, however, were anomalous as most of the fine dry material had been blown away by strong winds in the drought, leaving a soil surface similar that of the control. It was noticeable that soil loss was inversely proportional to the amount of vegetation cover in the various treatments, highlighting the value of vegetation cover for effective soil erosion control. Whilst the runoff data were not statistically significant, there was a strong trend to lower runoff in the mulch and straw treatments. The nutrient loads exported in the runoff at the Bungonia site were also low and would not be expected to adversely affect downstream water quality.

In general, it may be concluded that relatively low rates of the RO products applied to the soil surface are as effective as the conventional method of using cereal straw for erosion control. At the CROA site, for example, the mulch (2.5cm depth) and soil conditioner (1cm depth) reduced soil loss under very heavy rainfall events by up to 85%. The soil conditioners, however, were not effective at Bungonia because they dried to a powder in the drought conditions and were blown away by strong winds. In such situations, the materials would have to be incorporated. However, the project did not investigate this aspect of application. The low nutrient status of these materials ensured that there would not be any detrimental effects on the water quality of the runoff. More work is required to further refine the specifications for the types of RO products used in catchment rehabilitation, as well as the rates of use and the methods of application for the most efficient use of these products. Two major specification requirements identified during this project by landholders and catchment managers are that (a) the materials have to be composted to comply with AS4454-2003 and preferably batch-tested and (b) the limit of contamination by light plastics have to be at least 10 times less than the AS4454-2003 requirement. These more stringent specifications were met by the RO producers in this project.

These scientific trials have clearly demonstrated the benefits of using RO products in catchment management. However, the widespread adoption of RO products will depend on their costs compared to straw or hay, the cost of freight to the sites and the cost of application of the materials. At present, the costs of using the RO products to rehabilitate the surrounds of a small flume (400m^2) have been estimated, after discussions with DIPNR and DEC, to be comparable to or slightly more than that of the conventional method ($850 or $950 versus $840). However, in order to justify the relatively high cost, these materials will have to be used strategically to target the most at-risk areas of the degraded landscape. Additional consideration of the broader environmental benefits, such as reduced soil erosion, nutrient exports and impacts on downstream water quality, as well as decreased pressure on landfills, is required to promote the more widespread use of RO in catchment rehabilitation.

1. Introduction

Australia generates substantial quantities of urban wastes annually and is among the top 10 solid waste generators within the Organisation of Economic and Cooperative Development (OECD) countries (OECD 1999). To reduce the pressure on shrinking landfill space near densely populated metropolitan areas and on environmental grounds, Australian State governments have legislated to reduce or ban garden organics from landfills e.g. Waste Avoidance and Recovery Act (2001). This has accelerated the pace of compost-recycling of garden organics and some segments of the RO industry are now faced with an oversupply of RO products. The markets identified for the products have mainly been in urban landscaping, intensive horticulture, viticulture and agriculture (NSW Waste Boards 1999). However, RO products may potentially be used for rehabilitating large areas of degraded farming land and natural catchments, which has arisen as a result of inappropriate land management and subsequent soil erosion.

Soil erosion is a serious threat to sustainable agricultural production as well as a major problem for watershed management and conservation of the natural resource base (UNEP 2000). Soil erosion and deposition cause not only on-site degradation of land resources but also off-site problems such as down-stream sediment deposition. Suspended sediments in water bodies affect water quality and cause pollution because of the various nutrients and toxic agrochemicals adsorbed on the sediments. The sediments also cause loss of reservoir storage capacity and eutrophication of water bodies (Clark 1985).

The most critical factor in protecting soils from erosion by water and wind is the maintenance of ground cover that is fixed or in close contact with the soil surface (e.g. trees, shrubs, pasture, plant residues and forest litter). Any event that reduces the protective ground cover increases the risk of soil loss. Excessive clearing of vegetation, conventional bare cultivation of agricultural land, stubble burning, together with overgrazing by introduced animals, has led to structural damage to much of the topsoil in NSW resulting in continuing soil erosion (Erskine et al. 2002). Bushfires also remove both the native plants and the vegetation litter covering the ground, exposing these areas to erosion. The subsequent lack of ground cover increases the intensity of water run-off and hence soil erosion, because no vegetation or litter is present to moderate the raindrop impact on the bare soil or to slow the flow rate of run-off water across the ground. The former Department of Land and Water Conservation (DLWC 2000) has estimated that more than 35% of the NSW landscape is affected by some form of water erosion. It is not surprising, then, that about 11% of the Sydney catchment is now severely affected by sheet and rill erosion. In recent years, more new gullies have formed in the Sydney water supply catchments in the Blue Mountains in the wake of bushfires.

The restoration of degraded landscapes depends on the reinvestment of soil carbon and nutrient resources into the soil. RO products are valuable sources of organic carbon and can improve soil health, thereby promoting more consistent and rapid vegetation establishment. The organic matter in the RO products has the potential to improve water infiltration and retention in soils (Ross et al. 1991). Improved plant establishment leads to the addition of more organic carbon from the plant residues and the development of a rooting system through the soil, which contribute to minimising run-off and mitigating soil erosion. In many overseas countries, the use of RO products for land rehabilitation is increasingly being considered as a technical solution to reversing environmental degradation and promoting re-establishment of vegetation cover (US EPA 1997; Rissie and Faucette 2001).

Research in the United States has shown that any disturbed or excavated site with a slope of 25% or less can be protected from erosion by an application of a layer of RO product of 25-75mm depth, with the higher rates being used on steeper slopes (Goldstein 2002a,b). Some gradual slopes may require as little as 25mm depth. Particle sizes should be a mix of fine grades (10-13mm) and coarse grades (50-75mm). A mixture ratio of 3:1 (fine: coarse) has been recommended in many studies. Coarse grades may be larger if rapid vegetation establishment is not a primary goal. For steeper slopes, more aggressive techniques like netting and hydro-seeding in conjunction with stickers or “tackifiers” may be necessary to hold the RO products in place (Norland 2000).

Rainfall simulation studies in the US and Europe have shown that runoff and sediment loss are usually reduced significantly and water quality improved compared to degraded areas untreated with RO products (Bresson et al. 2001; Ros et al. 2001). Further, there is usually little export of heavy metal contaminants or nutrients into the runoff water, if the RO products are derived primarily from “yard wastes” or garden organics. If biosolids are used in the compost production, there may be some concern regarding the export of nutrients like phosphorus and nitrogen. As such, in Australia at least, RO products conforming to the Australian Standard (AS 4454-2003) should be used to ensure that the environmental risks are minimised, if not eliminated (Standards Australia 2003).

In general, there are three basic methods of using RO products in erosion control: erosion control blankets, vegetation establishment blankets and filter berms (Rissie and Faucette 2001). Each method has its advantages and will depend on the slope of site, amount of potential rainfall, activity around the site and intended vegetation establishment. In many cases, more than one method can be used in combination. For steeper slopes, filter berms are used to slow the rate of water flow and filter out the soil sediments and pollutants. Specifications for RO products used in erosion control normally include particle size, moisture content, organic matter content, pH, soluble salt content and synthetic inert contents e.g. plastics, glass, etc. In the United States, special specifications for compost blankets and filter berms have been developed for various locations e.g. housing development sites, highway projects, etc**.** (US EPA 1997; Anon. 2000; Rissie and Faucette 2001). However, the vastly different climatic conditions of continental USA have required modifications to these specifications to suit local needs.

In Australia, RO products are manufactured principally from municipal garden organics sourced from kerbside collections. In NSW, over 1.3 million tonnes of organic materials are composted per year by over 60 licensed and quality assured composting facilities (DEC 2004a,b). However, there is little documented information on the use of RO products in the rehabilitation of degraded land in water catchments in Australia. The previous Department of Land and Water Conservation (DLWC) has traditionally used a layer of cereal straw or meadow hay (5-10cm) as an erosion control blanket, oversown with a seed mixture of exotic pasture grasses (cocksfoot, tall fescue and ryegrass) and legumes (white and subterranean clovers). When available or economically feasible, native grasses and shrubs (planted as tube-stocks) have also been used for longer-term revegetation. In recent years, with the advent of a protracted drought and the concomitant high price of cereal straw and meadow hay, the previous DLWC has used a composted soil conditioner produced from garden organics and biosolids as an alternative. The composted soil conditioner was lightly incorporated into the top 10cm of soil to serve as a vegetation establishment blanket and oversown with the usual seed mixture. The results, however, have been variable, depending on the site and the climatic conditions after the application of the RO materials (Frank Exon, personal communication).

Although some specifications for RO products for use in erosion control have been developed in some overseas countries e.g. USA, there has been no research conducted in Australia to characterise the types of composted RO products or their performance in reducing runoff, soil loss and the export of polluting nutrients into water catchments (Wong and Malik 2004). The main objective of this project is to provide scientific performance data to verify the usefulness of specific locally-produced RO products for catchment management in NSW. In the longer term, guidelines for the optimal and economic use of composted RO products may be formulated from the information obtained in this project.

2. Scope of the research

A literature review was carried out to examine the most promising RO materials and methodologies used overseas and in Australia for erosion control. This review served as a guide to the selection of specific composted RO products and trial options for the project. Owing to time and resource constraints, only a composted mulch and a composted soil conditioner with the most desirable characteristics identified from the literature review were chosen for the first trial at CROA. Various depths of the materials were trialed. Information gathered in this experiment formed the basis for modifying treatments and/or including additional RO materials for the replicated trial at the second site. At this latter site, a demonstration trial was also set up by applying various locally-sourced RO materials on larger non-replicated plots to showcase the materials.

Measurements of runoff and soil loss were carried out using a rainfall simulator. The quality of the runoff water was analysed for the presence of the different forms of nitrogen (N), phosphorus (P) and organic carbon (OC), as well as the biochemical oxygen demand (BOD). The requirement that all the RO products used conformed to AS 4454-2003 ensured that there would be no weed, pathogen or heavy metal contamination. The laboratory analyses would, therefore, indicate the likelihood of any off-site pollution of the catchment. Another requirement by the Sydney Catchment Authority was that water leaving the degraded trial site had to be monitored when there were large rainfall events to ascertain the level of nutrients leaving the site.

3. Trial Sites

3.1 Centre for Recycled Organics in Agriculture (CROA) site

NSW DPI’s Centre for Recycled Organics in Agriculture (CROA) is located near Camden, NSW, in the Sydney Catchment. A trial site on the side of a hill was selected for one of the replicated trials. The site had been cleared of native vegetation over a hundred years ago and is now a kikuyu paddock used for grazing cattle. The soil type was a Red Chromosol (Isbell 1996) with a topsoil layer of 20-30cm. Earthworks were carried out by officers of the Department of Infrastructure, Planning and Natural Resources (DIPNR) in September, 2003, to remove the topsoil from the trial site, create a slope of about 10% for the plots and construct contour banks above and below the plots for erosion control. The stripping of the topsoil to expose the subsoil was to simulate a degraded site for the experiment. An irrigation system was installed so that vegetation may be established in the trial plots in case of prolonged drought. Further, it ensured that there would be a ready supply of water for the rainfall simulations.

3.2 Bungonia site

The second trial site was on a sheep property called “Maxwell Park”, owned by Mr. and Mrs. A. Davey, near the town of Bungonia, NSW, in the upper reaches of the Shoalhaven catchment. The property has had severe gully erosion and widespread soil degradation, and offered many potential sites for a demonstration trial and a replicated experiment. The chosen site was one where earthworks to remediate an eroded gully had already been carried out by DIPNR just prior to inspecting the site. The soil in the upper slopes of the gully was classified as a Red Kurosol, whilst the gully was a yellow Sodosol, which was characterised by a sodic B horizon (Isbell 1996). The Sodosol is prone to erosion and was located in a point of weakness in the landscape. However, due to the extensive earthworks in reforming the gully, large areas of the site would now be classified as an Anthroposol (Isbell 1996). There was a sufficiently large area of uniform slope to accommodate both the demonstration trial as well as the replicated trial. The owner had sown the area with a cereal and grass seed mix but there was little vegetative establishment because of the drought. As a requirement for rehabilitation, the owner also fenced the area off to prevent stock access.

4. Methodology

4.1 Replicated field trial at CROA

The replicated trial at the CROA site was set up in early November, 2003. The trial was set out as a randomised complete block design with six treatments and four replicates (Figure 1). The treatments were as follows:

1. Control
2. Conventional (5cm depth of wheat straw)
3. Coarse mulch (2.5cm depth)
4. Coarse mulch (5cm depth)
5. Soil conditioner (1cm depth)
6. Soil conditioner (2.5cm depth)

The soil conditioner was supplied by Camden Soil Mix (CSM), Camden, NSW, and the coarse mulch (Vine Mulch®) was supplied by Australian Native Landscapes (ANL), Badgery's Creek, NSW. The mulch and soil conditioner had been batch-tested by Sydney Environmental and Soil Laboratory Pty Ltd and a visual inspection of the RO products was made for gross plastic contamination before using the products. Coarse mulches, in particular, had severe problems with unacceptable levels of visual contaminants and an experiment was carried out by DEC to assess the acceptable level of visual contamination by light plastics in the RO products. This was to provide more stringent specifications of mulch products for use in catchment management, in line with the expectations of landholders, DIPNR and the various Catchment Authorities. It was decided that a level 10 times less than the level complying with AS 4454-2003 would be required. The specifications of soil conditioners and coarse mulches for this project are set out in Appendices 1 and 2.

Figure 1: The trial plots used at the CROA site

4.2 Replicated field trial at Bungonia

The treatments at Bungonia were slightly different to those used at CROA in that an additional soil conditioner (NitroHumus®) was included and only the lower rates of both the mulch (2.5cm) and soil conditioners (1cm) were used. This was because the rainfall simulation results at CROA had shown earlier (see Results) that the lower rates of application of the RO products were as effective in erosion control as the higher rates of both the mulch and soil conditioner. There were five treatments and four replicates in this experiment:

1. Control (bare soil)
2. Conventional (5cm depth of wheat straw)
3. Coarse mulch (2.5cm depth)
4. Soil conditioner 1 (1cm depth)
5. Soil conditioner 2 (1cm depth)

The coarse mulch was ANL's Vine Mulch® and the soil conditioners were supplied by CSM (Soil Conditioner 1) and ANL (Soil Conditioner 2, NitroHumus®). After the application of the RO products (Figure 2), all the plots were sown with DIPNR's "regen seed mix" to provide vegetative cover.

Figure 2: The trial plots used at the Bungonia site

4.3 Rainfall simulations

The rainfall simulator was of a similar construction to those that have been used routinely and successfully by Queensland DPI (Figure 3). The area of the plot on which rainfall was to be measured was 0.75m x 2m. There was a buffer of 1m on all sides of this inner plot area. Three sides of the inner plot were hemmed in by metal guards so that rainfall outside this area would not be collected into the collecting tray at the bottom end of the plot (Figure 4). The runoff in the tray was sucked into a calibrated plastic reservoir using a vacuum cleaner attachment. The volume was measured every minute over the 30 minute duration of each rainfall simulation. Water samples (600ml) were collected at 5 minute intervals, bulked and four samples (2x500ml and 2x750ml aliquots) placed in 1L clean plastic bottles. One 500ml sample was sent to a NATA-accredited laboratory for nutrient analysis while the other was archived in a cold room (4ºC). One of the 750ml samples was sent to another laboratory for BOD analysis and the other sample archived in a freezer. Two rainfall simulations (67mm/hr, equivalent to a one year in 10 rainfall event) were performed on the CROA trial plots: (1) without vegetation to determine the effectiveness of the RO products as “erosion control blankets” for immediate runoff and erosion control and (2) after vegetation had established to determine the effectiveness of the RO products in re-vegetating the site and controlling runoff and soil erosion. The water used in the rainfall simulations was domestic tap water from the Camden municipal supply. At Bungonia, one rainfall simulation was carried out (54mm/hr, equivalent to a one year in 10 rainfall event for the site), after vegetation had established. As the site at Bungonia is remote, town water from Goulburn, was carted to the site to ensure that there was no confounding of the water quality results.

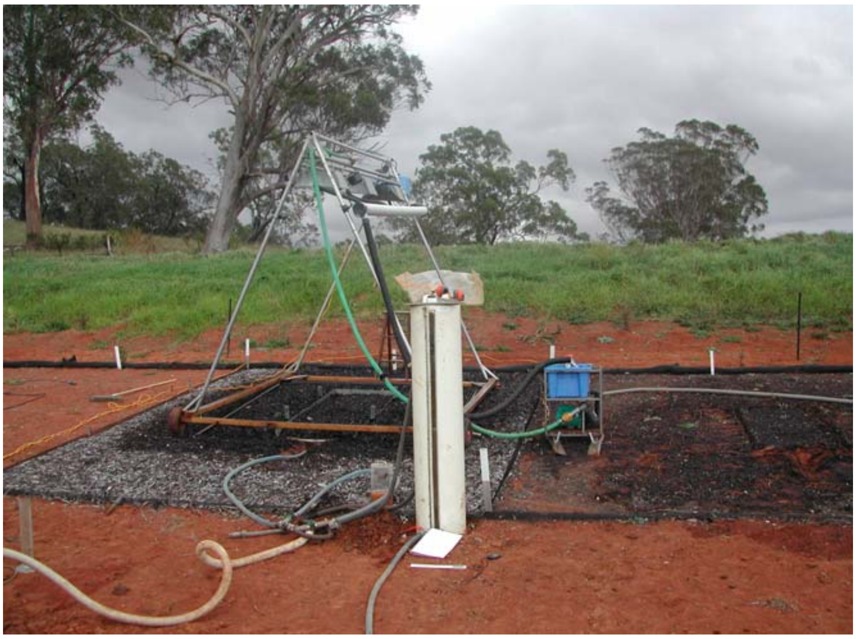

Figure 3: The rainfall simulator used in the field trials

Figure 4: The rainfall simulation plot area (as hemmed in by the 3-sided metal guard, with the collection tray at the front end of the plot)

4.4 Assessment of vegetative cover

The plots at CROA were sown with a pasture seed mix (DIPNR's "regen seed mix") comprising ryegrass (cv. Roper), tall fescue (cv. Demeter), cocksfoot (cv. Currie), phalaris (cv. Sirosa), white clover (cv. New Zealand), subterranean clover (cv. Woogenellup) and crimson clover (cv. Dixie), to provide vegetative cover after the first rainfall simulation. The seeding rate was 80kg/ha. The plots were fertilized with a slow-release fertilizer for turf (Scotts "Sierrablen", N:P:K-22:2.3:8.4) at the rate of 50kg/ha. The percentage vegetative cover was assessed to determine the value of the RO products in re-vegetation compared to the conventional practice of using cereal straw. The percentage area colonized by vegetation was assessed visually by randomly throwing a 30cm square quadrat onto the plot and estimating the amount of cover to the nearest 5%. Four assessments were made. Hand cuts of vegetation within two of the quadrats were made to obtain fresh weights and the samples were dried at 80ºC to obtain dry weights of the samples.

4.5 Laboratory analyses

Water samples were stored at 4ºC until they were couriered in cooled insulated containers to the NSW DPI's Analytical Laboratories at Wollongbar, NSW. The samples were analysed for N (total, NH_4, NO_3), P (total, dissolved), OC (total, dissolved) and total suspended solids. Separate frozen water samples were sent to Envirocheck Laboratories, Campbelltown, for determination of the biochemical oxygen demand (BOD).

4.6 Statistical analysis

The results were analysed using a one-way ANOVA analysis in Microsoft Excel, and statistical significance was established at $P \leq 0.05$, unless otherwise stated.

4.7 Demonstration trial

A demonstration trial was established on larger plots (4x10m) to gauge the performance of different RO products sourced from the Sydney Basin, after they had been applied to the site (Figure 5). Eight different RO products were evaluated:

1. ANL's NitroHumus®
2. ANL's Vine Mulch
3. CSM's Composted Mulch
4. CSM's Soil Conditioner
5. Soilco's GO Soil Conditioner
6. Soilco's GO Unscreened Mulch
7. Soilco's GO Forest Mulch
8. Grow Mix's Vitagrow

These non-replicated plots served an educational role for field days and other site inspections by interested stakeholders. No rainfall simulations were conducted on the demonstration plots.

Figure 5: The demonstration plots at the Bungonia site (as outlined by the white pegs)

4.8 Re-vegetation of the whole Bungonia site

Subsequent to the establishment of the demonstration plots, various RO products were also used to rehabilitate the whole 1.5 hectare site to create a stabilised water course. As well as hand spreading, a commercial spreader was used to spread the mulches and soil conditioners over the whole site (Figure 6). Various coarse mulches were used on the gully floor and the gully sides while the higher areas were mostly treated with soil conditioners (Figure 7). Although the site had already been sown with cereal rye and other grass seeds by the landowner before the commencement of the trials, the "regen seed mix" was sown into these areas. In time, the site would be planted with tube stocks of local native tree species to further rehabilitate the site into a natural water course.

1. Prior to application of RO products

2. Applying the RO products to the site

3. One week after application

4. Two months after application

5. Four months after application

6. Six months after application

Figure 6: The process of rehabilitating the gully at Bungonia

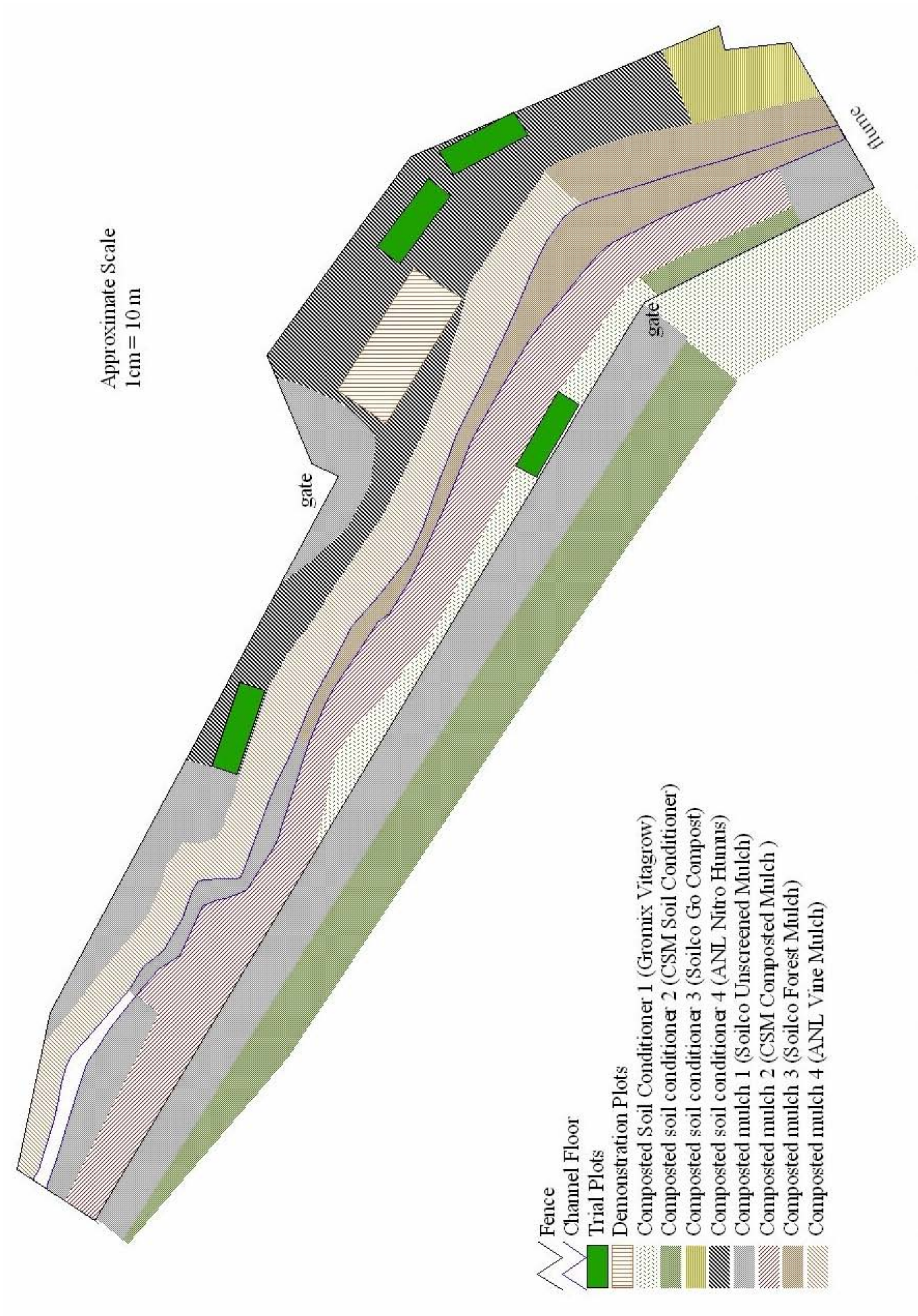

Figure 7: The trial plan for the Bungonia site

4.9 Nutrient Monitoring at Bungonia

Over a period of several months at the Bungonia site, a process of nutrient monitoring took place, to ascertain the concentrations of particular nutrients, namely N, P and OC, entering and leaving the site. Samples were taken on three occasions after substantial rain from a number of different points on site. These samples were placed in clean 1L plastic bottles, refrigerated at 4ºC, and sent to NSW DPI's Analytical Laboratories at Wollongbar, NSW, for analysis.

4.10 Project Management

The project was run over a period of 17 months from November 2003 to April 2005. Over this period, seven major milestones were targeted to ensure the project was managed efficiently. These milestones and the schedule for their management are shown in Table 1.

Table 1: Schedule for the management of the field trials.

	Nov 03				Mar 04					Aug 04			Nov 04					Apr 05
Establishment of CROA trial	■																	
First rainfall simulation at CROA					■													
Establishment of Bungonia trials							■	■	■	■								
Measurement of vegetation cover at CROA													■					
Second rainfall simulation at CROA													■					
Measurement of vegetation cover at Bungonia																		■
First rainfall simulation at Bungonia																		■

5. Results and Discussion

5.1 CROA

5.1.1 First rainfall simulation

Runoff volumes from all the treatments were not statistically different (Figure 8). This could be due to the extremely dry soil conditions, preventing any biological activity and incorporation of organic matter into the soil by soil animals to improve soil structure and increase water infiltration. There was also no vegetation in the plots at this stage to provide root channels for water infiltration.

Soil loss, as indicated by total suspended solids in the runoff water, was significantly higher in the control plots (Figure 9). Soil loss in the other treatments was not significantly different. This meant that all the RO products performed as well as the conventional method of using wheat straw for erosion control. Further, the low rates of both the soil conditioner and mulches were as effective as the high rates.

Filtered and unfiltered total nitrogen concentrations in the runoff water were significantly higher in the soil conditioner treatments than in the other treatments (Figures 10 & 11). Soil conditioners generally have higher nutrient concentrations than mulches (Dorahy et al. 2005), which may explain this result. Similarly, there was a lack of vegetation to absorb the readily available nutrients after application. Soil conditioners have been specifically used as “vegetation establishment blankets” to rapidly establish vegetative cover on bare soil. The mean NO_3-N and NH_4-N concentrations in the samples also reflected this result (Figures 12 & 13 respectively). The N readings, however, are comparatively low compared to runoff from fertilized agricultural land (Smith et al. 2001).

Filtered and unfiltered total phosphorus concentrations in the runoff water were also significantly higher in the soil conditioner treatments than in the other treatments (Figures 14 & 15). Again, this could be due to the higher P concentrations in soil conditioners (Dorahy et al. 2005) or a lack of vegetation to take up any available nutrients after application. The total P levels in the other treatments were low and not significantly different to the control treatment.

Total organic carbon and total dissolved carbon concentrations were significantly higher at the high rate of the soil conditioner and coarse mulch application (Figures 16 & 17). The other treatments were not significantly different to the control treatment. It appears that the low rates of the RO products used in this experiment presented less risk for total carbon and total dissolved carbon export from the site.

The low BOD results of all the treatments were not statistically different to that of the controls (results not shown).

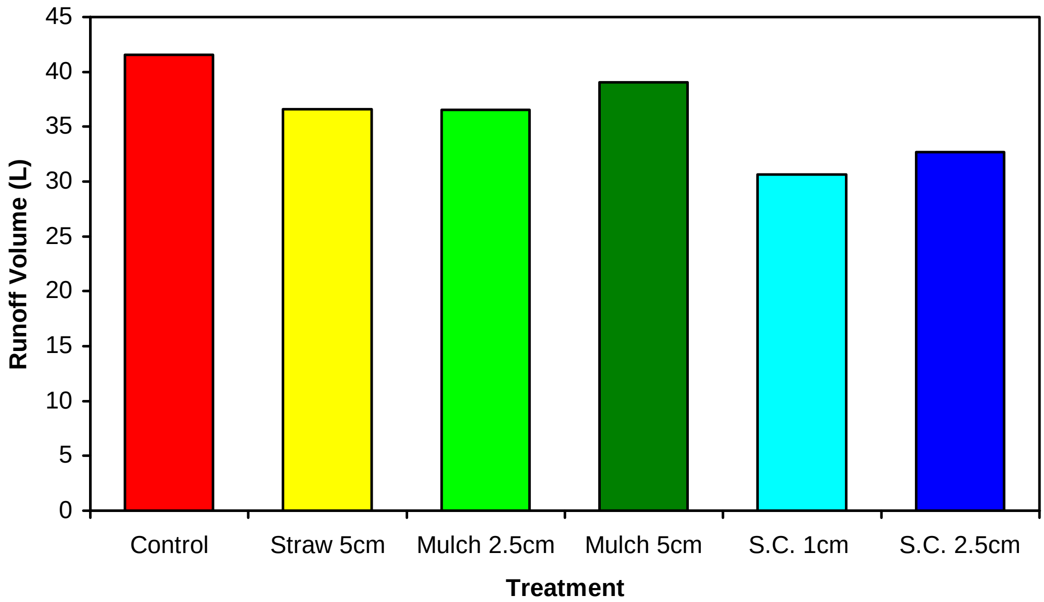

Figure 8: Average total runoff volume for CROA rainfall simulation no. 1

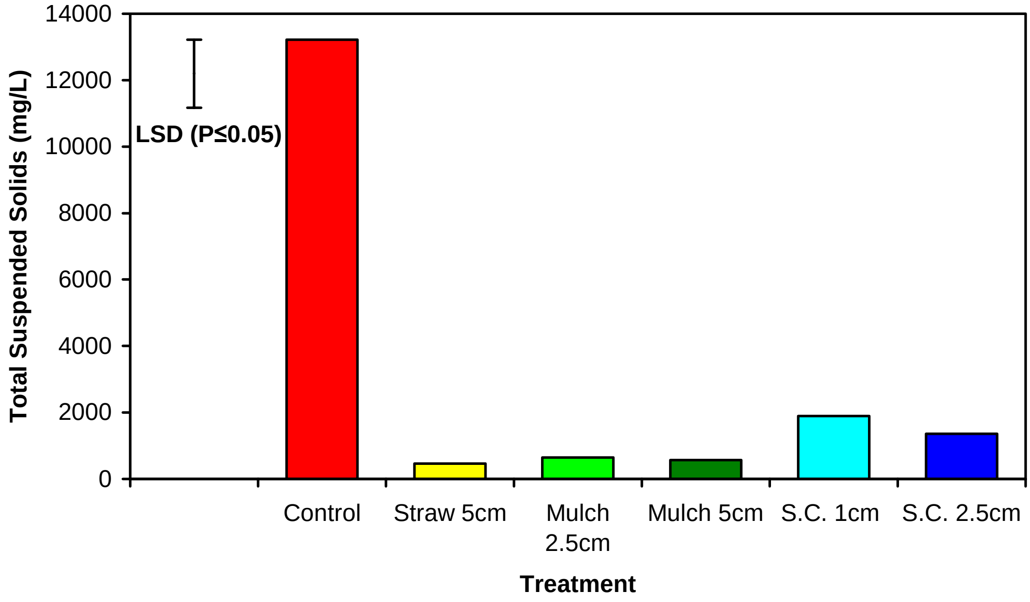

Figure 9: Average total suspended solids concentrations in water samples from CROA rainfall simulation no. 1

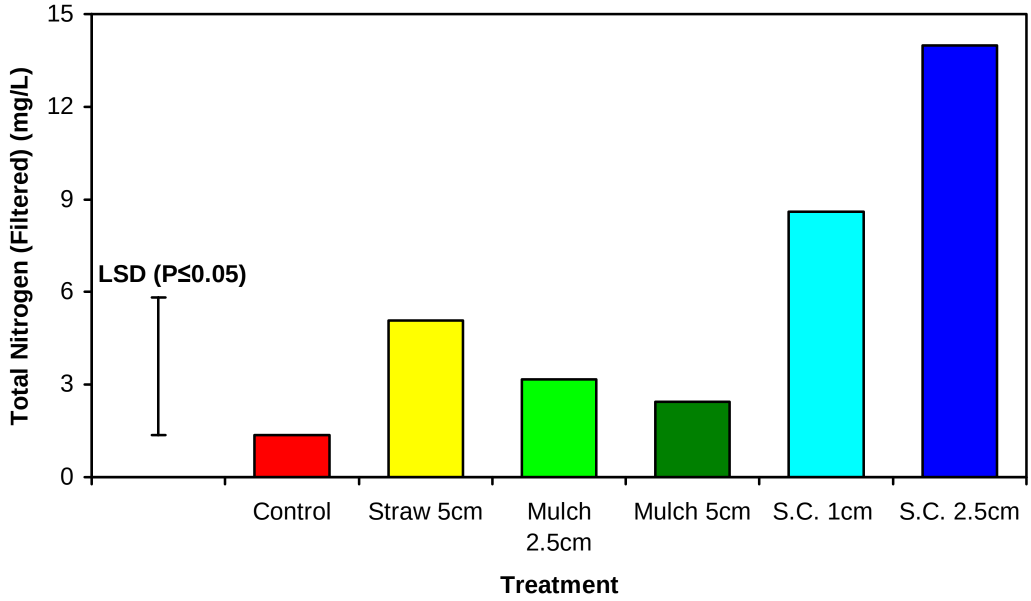

Figure 10: Average total nitrogen (filtered) concentrations in water samples from CROA rainfall simulation no. 1

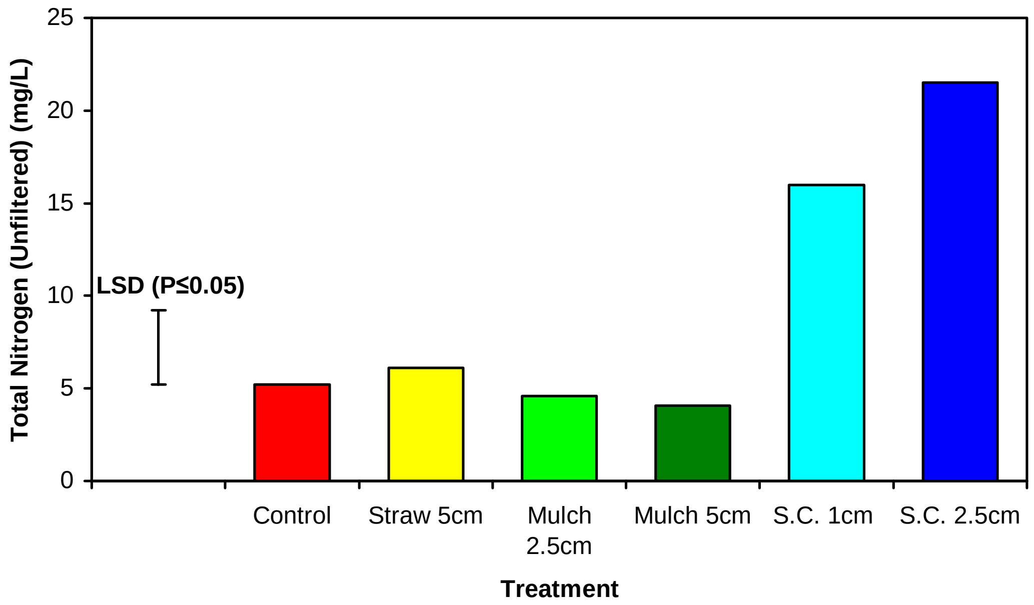

Figure 11: Average total nitrogen (unfiltered) concentrations in water samples from CROA rainfall simulation no. 1

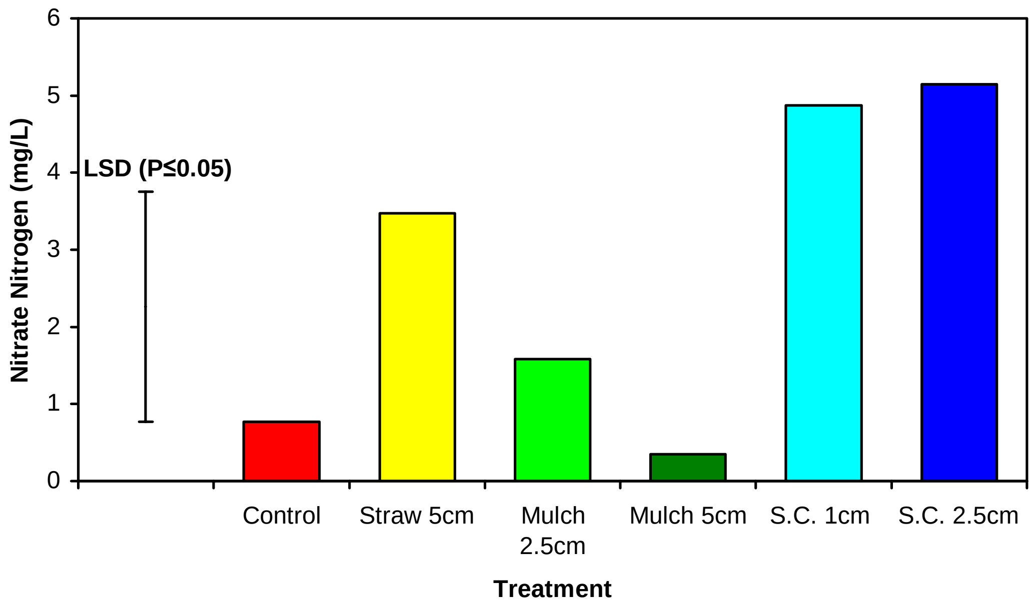

Figure 12: Average nitrate nitrogen concentrations in water samples from CROA rainfall simulation no. 1

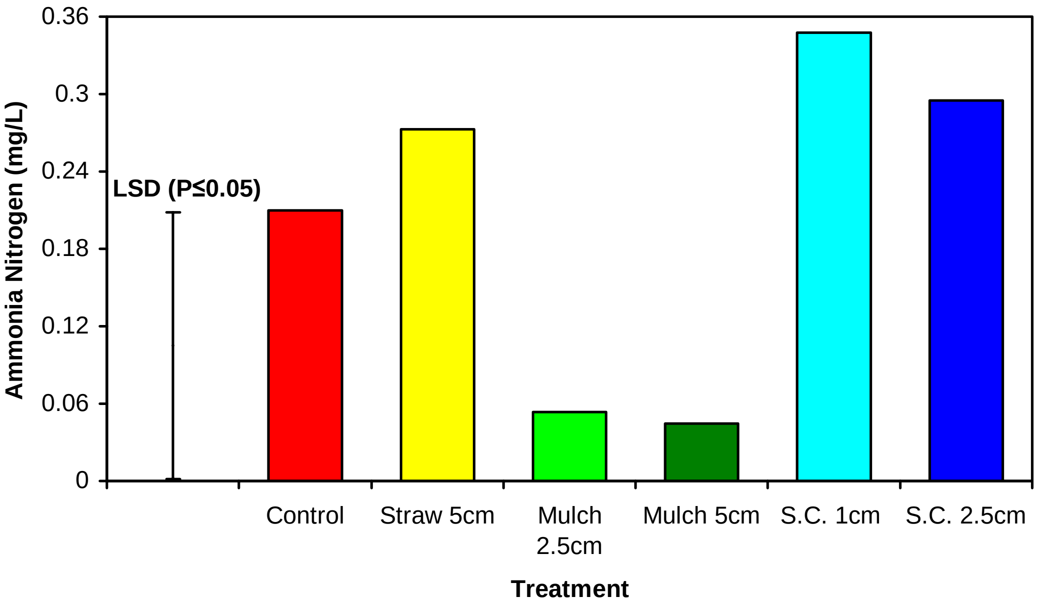

Figure 13: Average ammonia nitrogen concentrations in water samples from CROA rainfall simulation no. 1

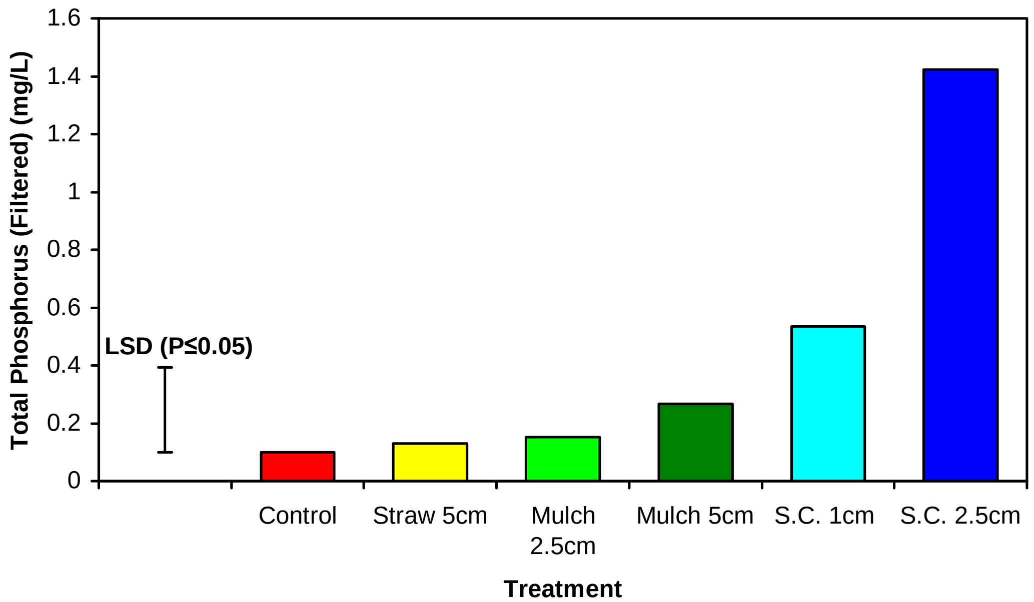

Figure 14: Average total phosphorus (filtered) concentrations in water samples from CROA rainfall simulation no. 1

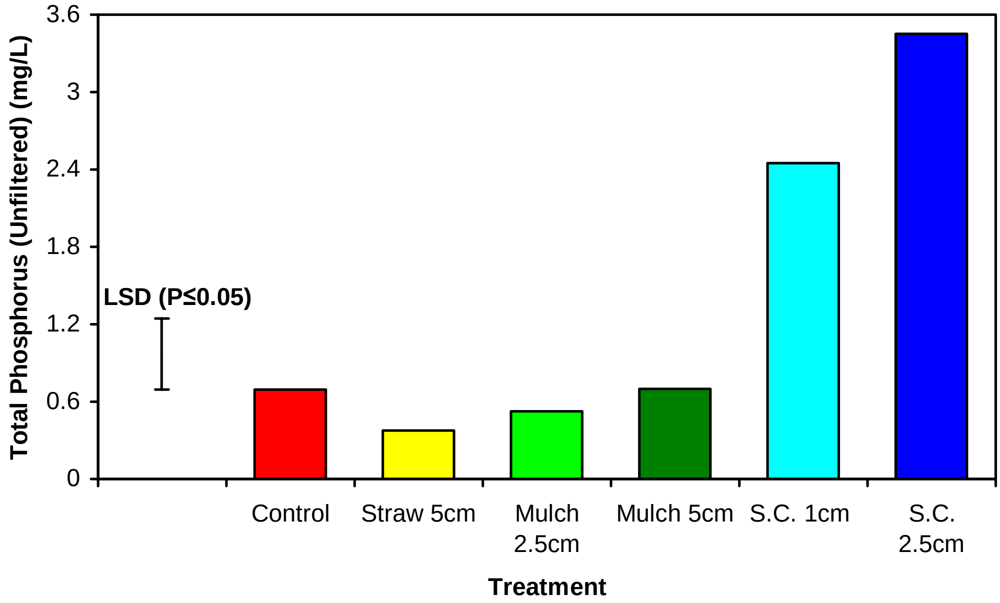

Figure 15: Average total phosphorus (unfiltered) concentrations in water samples from CROA rainfall simulation no. 1

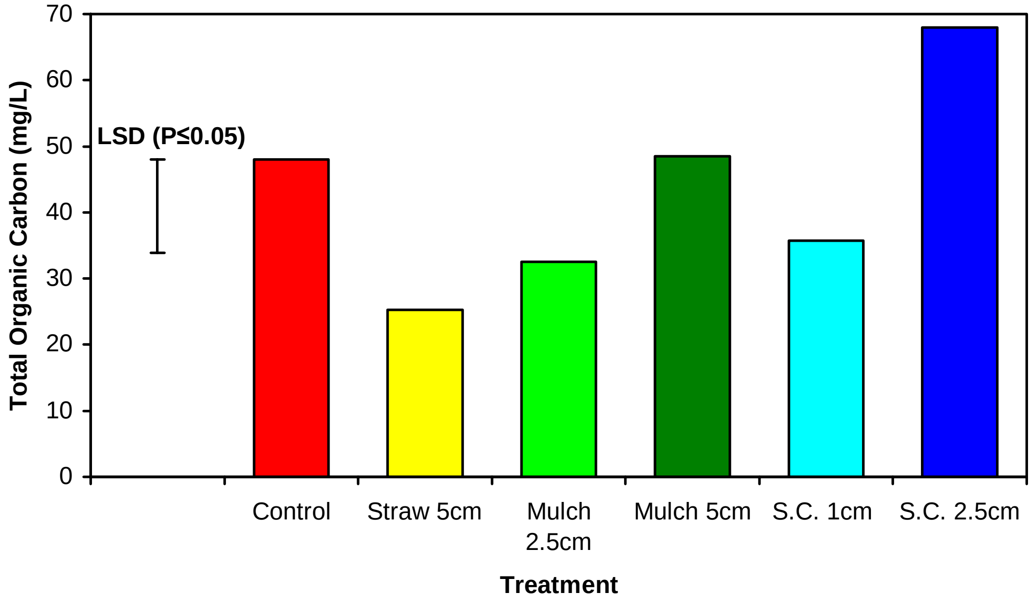

Figure 16: Average total organic carbon concentrations in water samples from CROA rainfall simulation no. 1

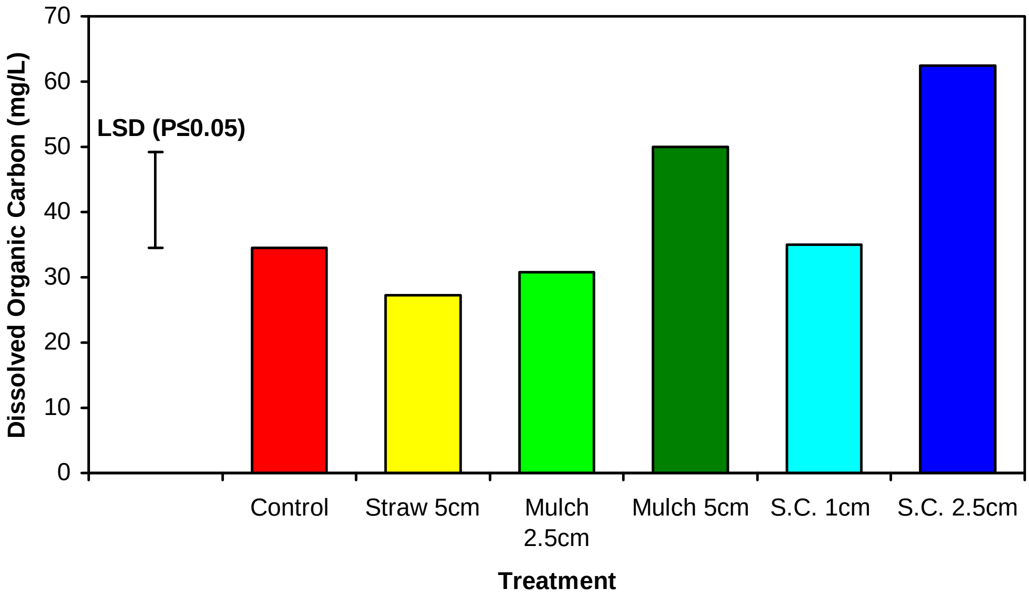

Figure 17: Average dissolved organic carbon concentrations in water samples from CROA rainfall simulation no. 1

5.1.2 Second rainfall simulation

The second rainfall simulation was carried out 8 months after the plots were sown with pasture seed and some vegetation had been established. The runoff volumes from the various treatments were not statistically significant (Figure 18). The mean total suspended solids concentrations from the control plots was again significantly greater than those of the other treatments (Figure 19) but soil loss in the control treatment was about half that in the first rainfall simulation. This was probably due to the presence of about 30% vegetation cover in the control plots. Total N concentrations in all the treatments were low and not statistically significant (results not shown). Filtered total P was significantly higher in the treatment with the high rate of soil conditioner while the P levels in the other treatments were low and not statistically different to the control (Figure 20). Total OC in the runoff from the treatment with the high rate of mulch was significantly greater than the other treatments (Figure 21) while the total dissolved OC was significantly greater in the treatments with the high rate of mulch and soil conditioner (Figure 22). Nutrient levels were generally much lower in the runoff in the second rainfall simulation, possibly indicating the role of the vegetation in absorbing those nutrients from the RO products and soil**.** The low BOD results of all the treatments were again not statistically different to that of the controls (results not shown).

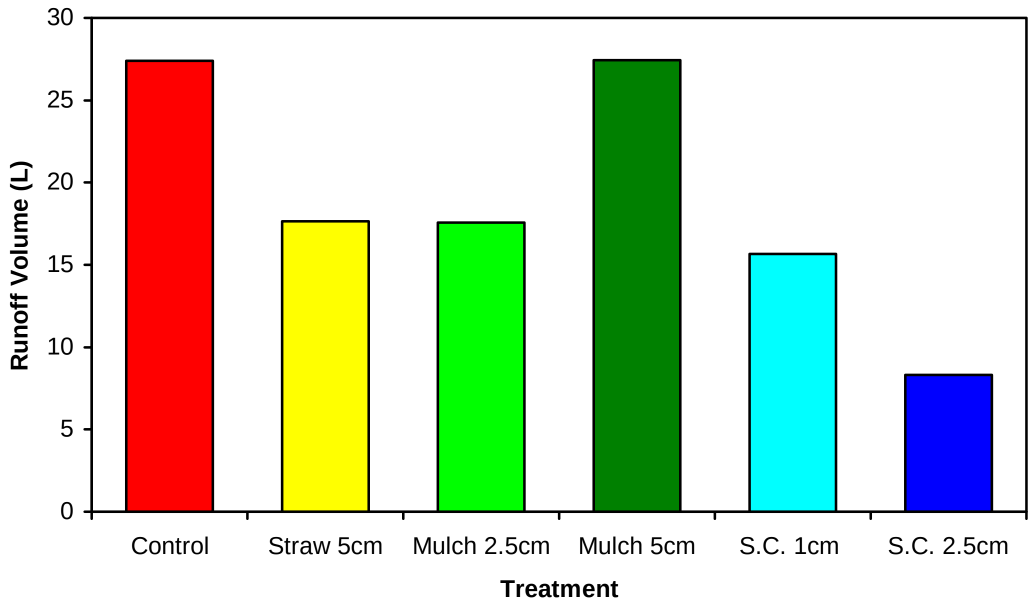

Figure 18: Average total runoff volume for CROA rainfall simulation no. 2

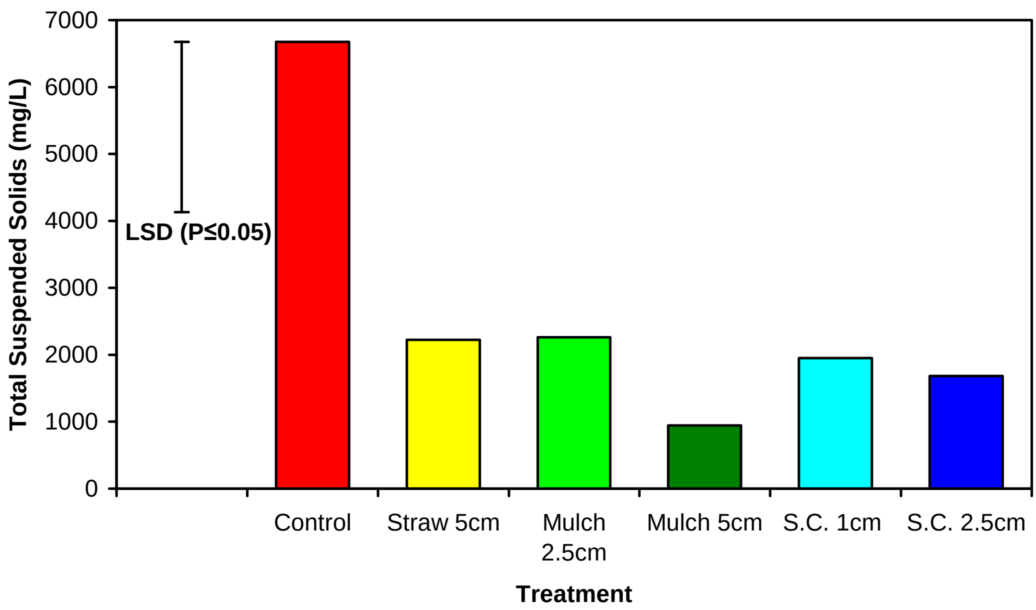

Figure 19: Average total suspended solids concentrations in water samples from CROA rainfall simulation no. 2

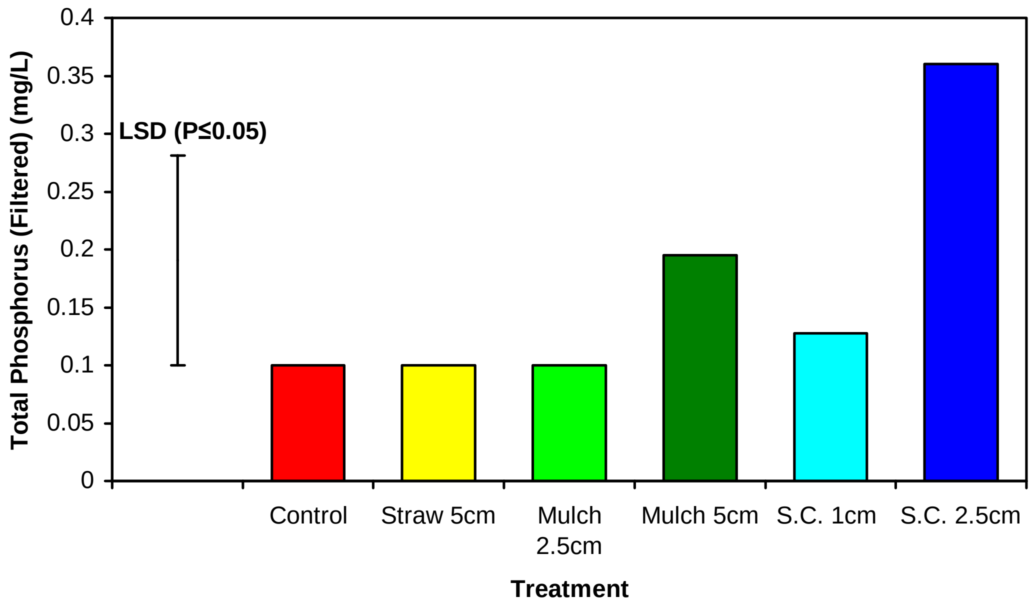

Figure 20: Average total phosphorus (filtered) concentrations in water samples from CROA rainfall simulation no. 2

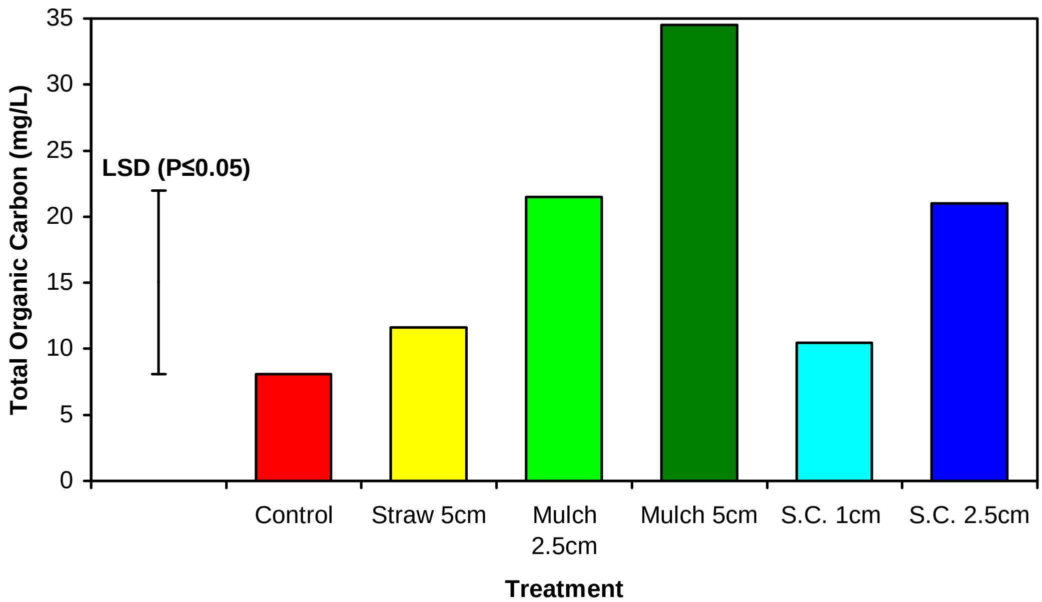

Figure 21: Average total organic carbon concentrations in water samples from CROA rainfall simulation no. 2

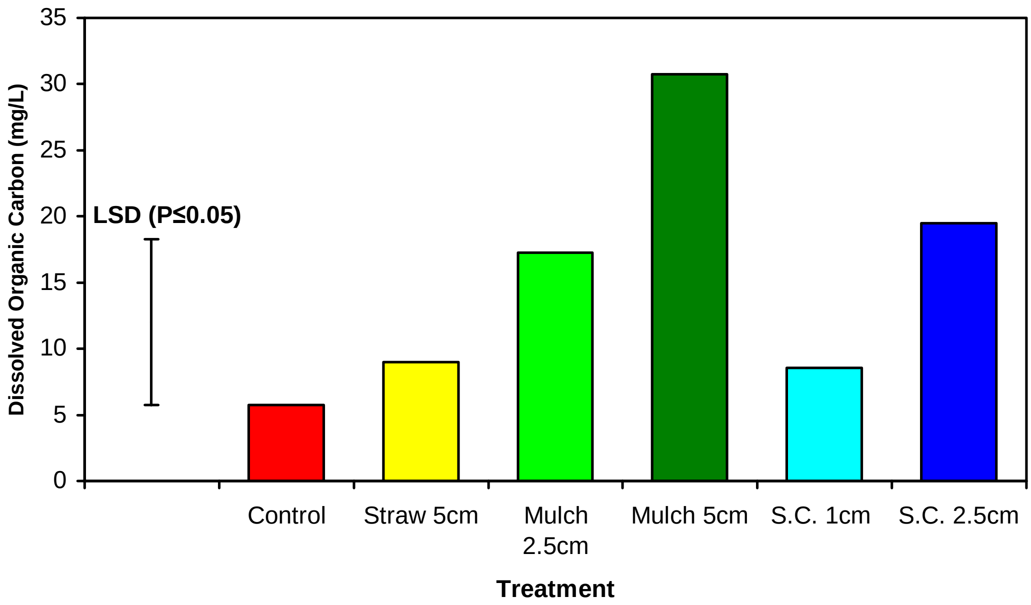

Figure 22: Average dissolved organic carbon concentrations in water samples from CROA rainfall simulation no. 2

5.1.3 Vegetation cover

The visual differences in vegetation cover are shown in Figure 23. The greatest amount of vegetation cover was observed in the two rates of soil conditioner plots followed by the low rate of mulch and the conventional straw treatment (Figure 24). The high rate of mulch and the control plots had significantly less vegetation cover than the other treatments. Whilst the 5cm thick layer of mulch was effective in reducing soil erosion and controlling weeds, it also reduced the establishment of pasture seedlings. The dry matter production of the various treatments reflected the same trend as the vegetation cover (Figure 25).

1. Control

2. Soil Conditioner (1cm)

3. Coarse Mulch (2.5cm)

4. Coarse Mulch (5cm)

Figure 23: Differences in vegetation cover between treatments at the CROA site

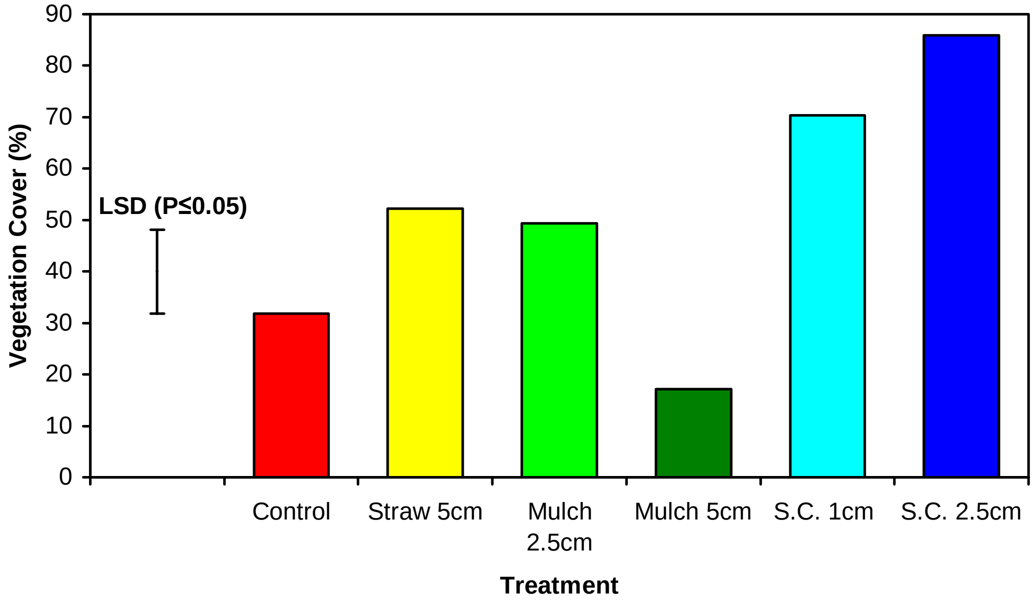

Figure 24: Average vegetation cover on CROA plots

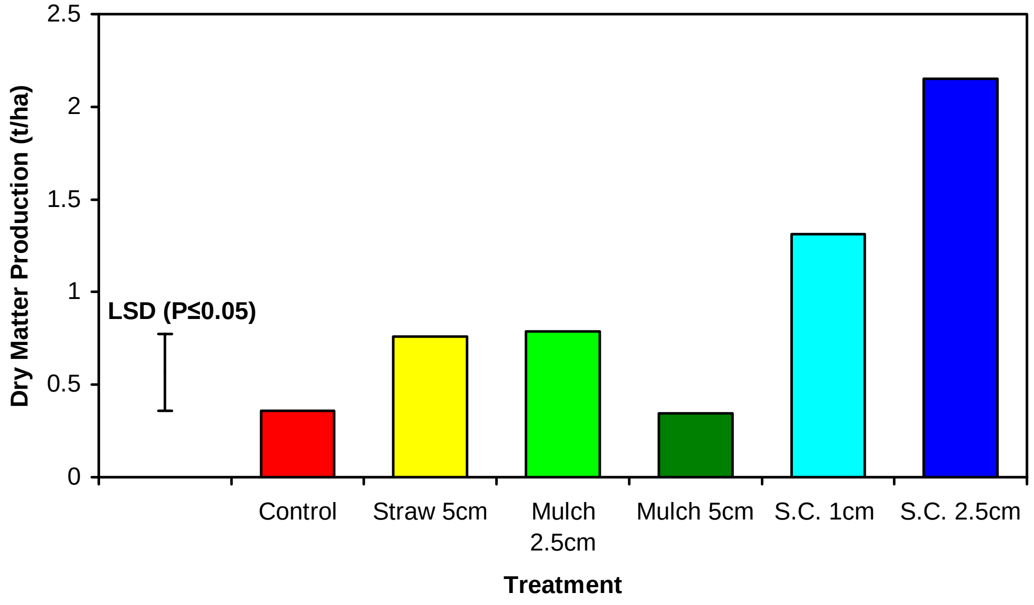

Figure 25: Average dry matter production from CROA plots

5.2 Bungonia

5.2.1 Rainfall simulation

The rainfall simulation was carried out after the establishment of vegetation. The runoff results showed that there was a strong trend for lower runoff volumes in the mulch and straw treatments but was not statistically different at $P \leq 0.05$ (Figure 26). The soil loss results showed that there was significantly more soil lost from the control and soil conditioner plots than the other two treatments (Figure 27). The results of the soil conditioner treatments appear anomalous but could be explained by the fine dry materials of the soil conditioners being blown away by strong winds in the drought, leaving a soil surface similar that of the control. Nitrogen levels were relatively low and were significantly lower in the straw and mulch treatments than the other treatments (Figures 28 & 29). Unfiltered total phosphorus in the runoff was also relatively low and was significantly lower in the straw and mulch treatments than the other treatments (Figure 30). Total organic carbon and total dissolved organic carbon in the runoff were significantly higher in the mulch treatment than the other treatments (Figures 31 & 32). Although the figures are on the high side, the low BOD results of all the treatments, which were not statistically different to that of the controls (results not shown), suggest that the values are not detrimental to water quality.

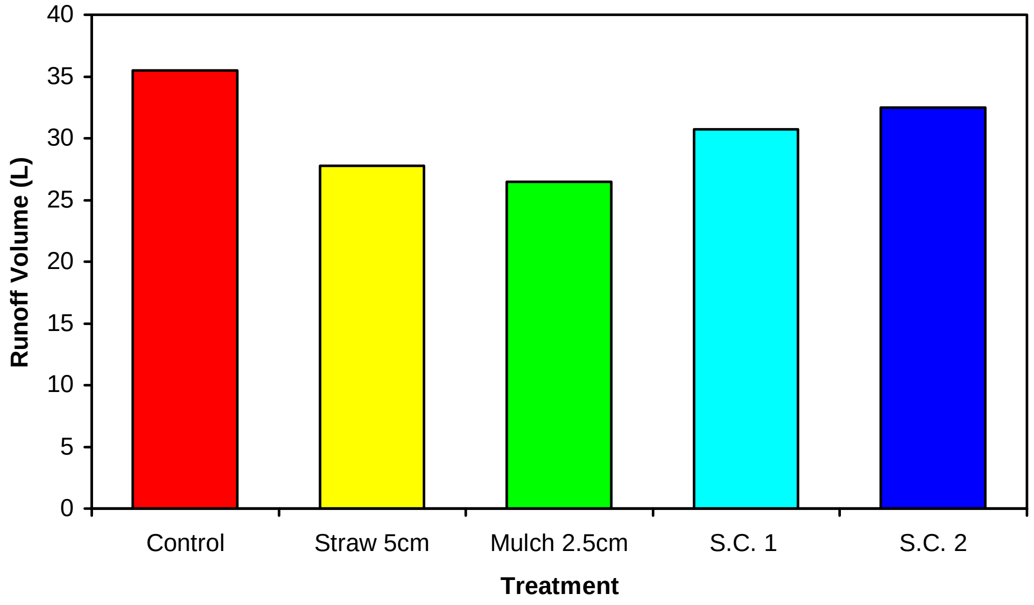

Figure 26: Average total runoff volume from Bungonia rainfall simulation

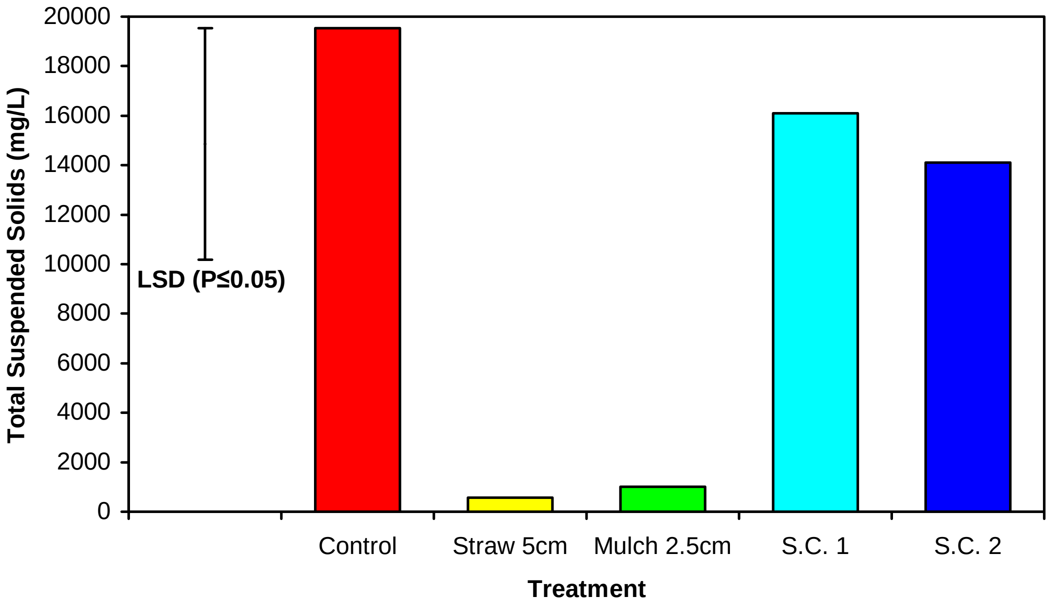

Figure 27: Average total suspended solids concentrations
in water samples from Bungonia rainfall simulation

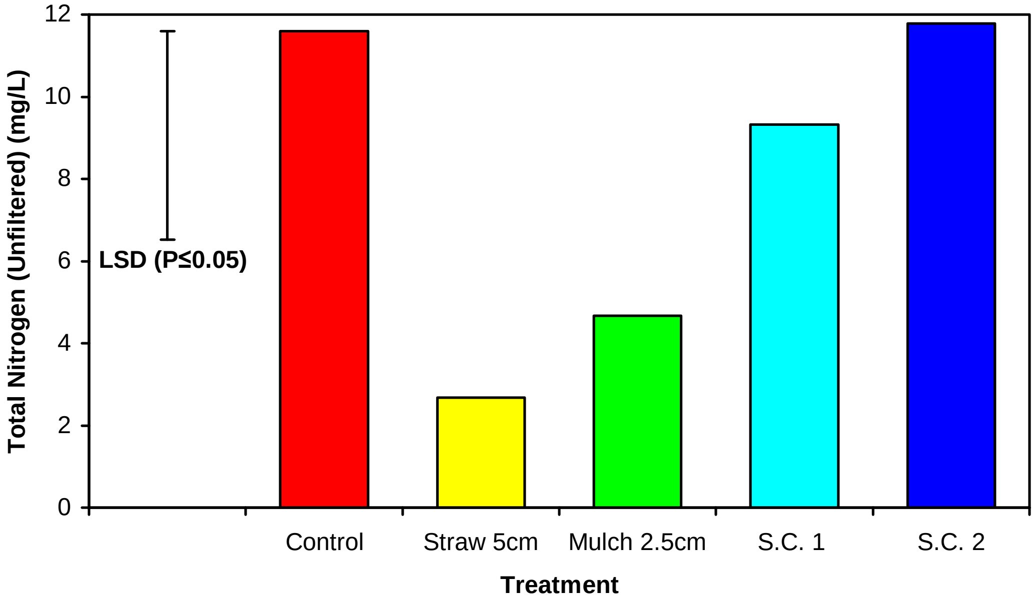

Figure 28: Average total nitrogen (unfiltered) concentrations
in water samples from Bungonia rainfall simulation

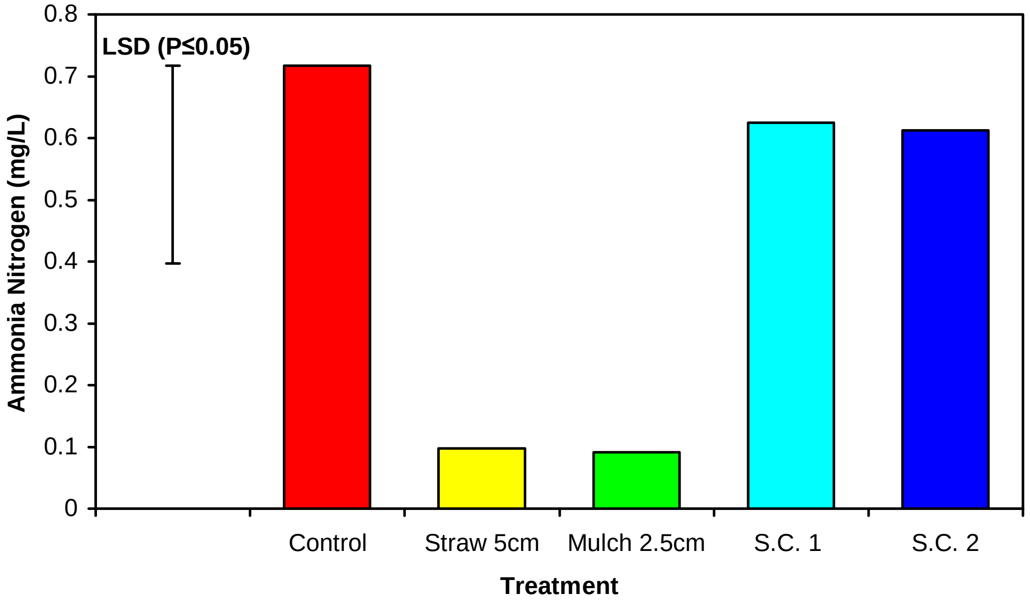

Figure 29: Average ammonia nitrogen concentrations in water samples from Bungonia rainfall simulation

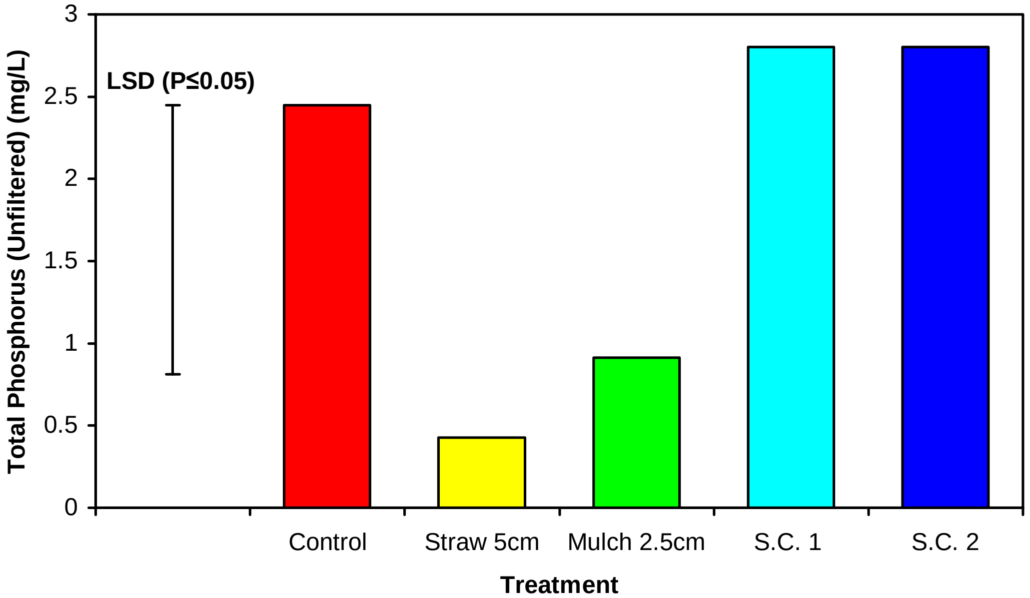

Figure 30: Average total phosphorus (unfiltered) concentrations in water samples from Bungonia rainfall simulation

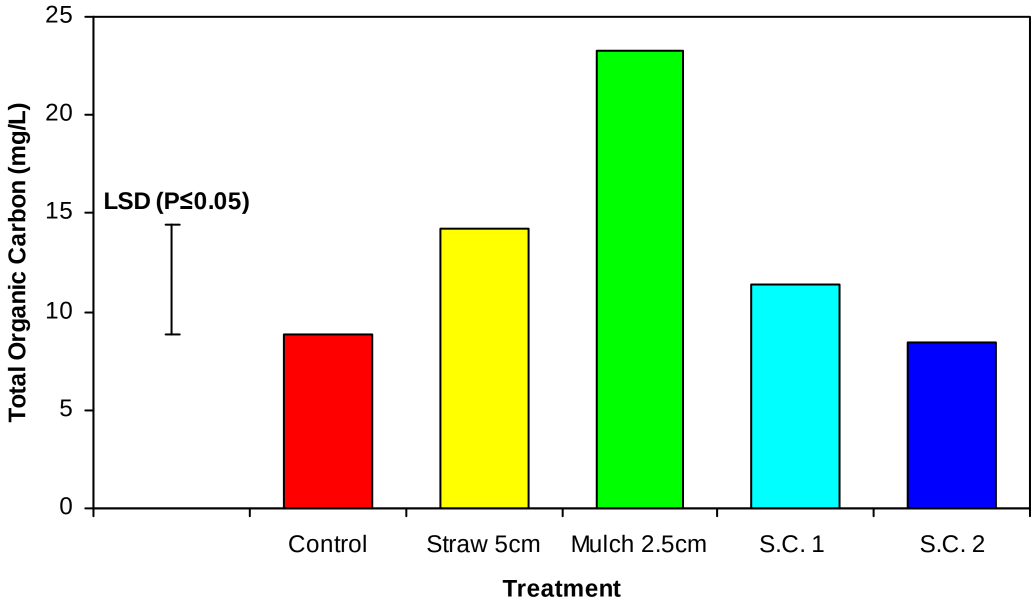

Figure 31: Average total organic carbon concentrations in water samples from Bungonia rainfall simulation

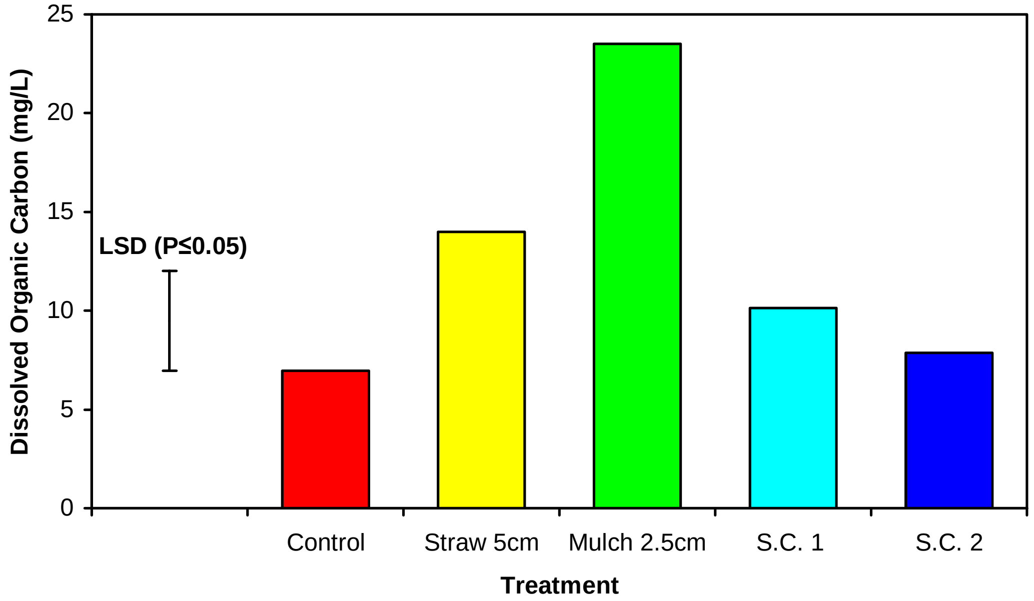

Figure 32: Average dissolved organic carbon concentrations in water samples from Bungonia rainfall simulation

5.2.2 Vegetation cover

The mulch and the conventional straw treatments had significantly greater vegetation cover than the other treatments. The amounts of vegetation cover in the control plots and the plots with the two types of soil conditioners were not significantly different. Figure 33, shows the differences between two of the treatments, namely the mulch (left) and a soil conditioner plot (right).

The percentage areas of vegetation cover of the various treatments are shown in Figure 34. The dry matter yields, however, were highly variable because of some grazing by kangaroos prior to sampling and were not statistically significant (results not shown).

Figure 33: Vegetation cover on a mulch plot (left) and a soil conditioner plot (right) at the Bungonia trial site

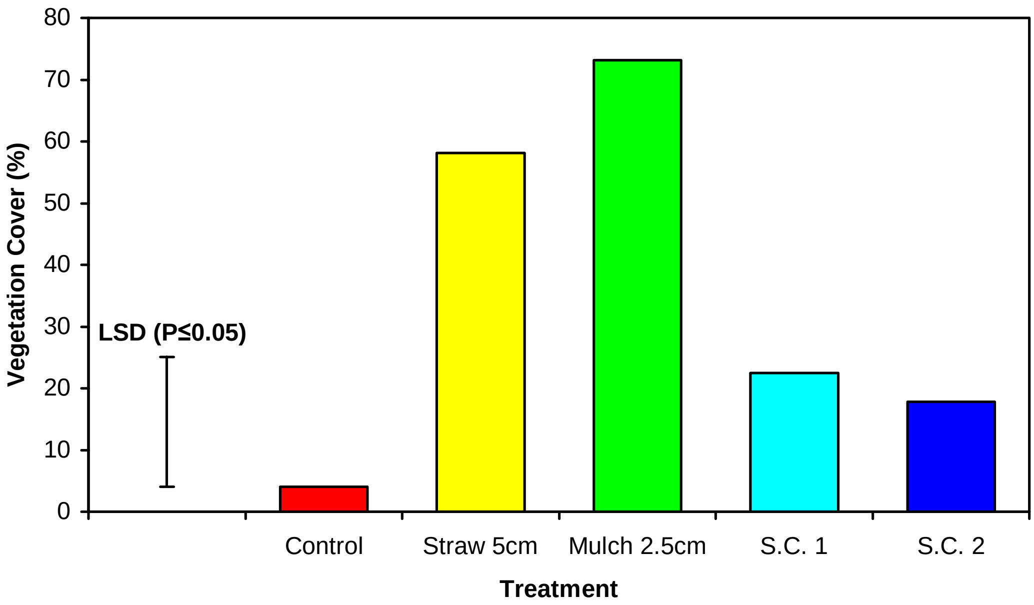

Figure 34: Average vegetation cover on Bungonia replicated plots

5.2.3 Nutrient monitoring

The results from the on-site nutrient monitoring at Bungonia are presented in Table 2. The results generally demonstrate low concentrations of nutrients throughout the site, suggesting that the risk of environmental degradation downstream is quite low.

Table 2: The results of the nutrient monitoring at Bungonia.

Sample Location	Date	TSS mg/L	Total N mg/L	Total P mg/L	Total OC mg/L
Top of Flume	4/3/05	34	1.8	0.12	17
Bottom of Flume	4/3/05	9	1.2	<0.1	16
Gully Floor (North)	4/3/05	46	2.7	0.18	30
Top of Flume	18/3/05	22	1.8	0.15	16
Bottom of Flume	18/3/05	4	1.2	<0.1	15
Top of Flume	15/5/05	354	1.8	0.13	10
Bottom of Flume	15/5/05	32	1.2	<0.1	16
Gully Floor (North)	15/5/05	365	5	0.78	35

5.2.4 Other qualitative observations

Along the floor and walls of the gully, coarse mulch was applied to reduce the velocity of water flow during rainfall events, thus aiding in vegetation establishment and erosion control. Whilst in the first four months after application, the mulch substantially aided in the establishment of sown vegetation, a high intensity rainfall event (29mm of rainfall in a few hours) on January 21, resulted in an estimated depth of 20cm of water flowing along the gully floor. During this rainfall event, mulch applied to the gully floor was washed away down the gully and accumulated behind installed straw filter bales at the northern end of the gully system.

This experience demonstrates that in areas that are likely to receive concentrated water flow, mulches may not be suitable for erosion control unless they are anchored in place with a product like hessian netting.

6. Economic considerations

For this project's essentially two-year trial period, a detailed cost-benefit analysis was not carried out because it was not possible to quantify the dollar value of the long-term benefits of the use of RO materials for erosion control, water quality and catchment management. In the short term, however, an evaluation of the economics of using RO products at the various rates of application compared to the conventional method of using pasture hay or cereal straw could assist landowners and catchment managers decide on whether its use is justified. This was done by comparing the costs of the various materials delivered to the site, the application costs and the cost of pasture seed and slow-release fertilizer with those of the conventional method.

An example is summarised in Table 3:

Assumptions

The costs of materials are the current prices and include freight to the site. The prices would vary depending on the cartage distance from the RO producer.

The rates used are those found to be effective in this project as well as from the experience by DIPNR of incorporating soil conditioners. This example compares a meadow hay mulch blanket (5cm depth) with an incorporated soil conditioner (10m³ equivalent to 2.5cm depth if applied to the soil surface) and a 2.5cm layer of composted mulch applied as an erosion control blanket. The soil conditioner rate was the minimum found effective in promoting rapid re-vegetation of a disturbed site (Mark Jackson, personal communication). Normally, DIPNR uses a much higher rate, often twice the rate chosen for this example.

The area selected for remediation is 400m² e.g. the surrounds of a small flume.

Table 3: Estimated costs of using meadow hay compared to a composted soil conditioner or a composted mulch for rehabilitating the surrounds of a small flume in NSW.

	Cost ($)
Conventional method	
Two round bales of meadow hay @ $160 per round bale	320
Manual application (2 man days)	320
Pasture seed plus fertiliser	200
TOTAL	**840**
RO product 1	
10m³ of a soil conditioner (NitroHumus®) @$40/m³ delivered	400
Application costs (using a bulldozer)	300
Pasture seed	150
TOTAL	**850**
RO product 2	
10m³ of a composted mulch @$25/m³ delivered	250
Application costs (using a mulch spreader)	500
Pasture seed plus fertiliser	200
TOTAL	**950**

The above figures, *which only serve as a guide,* were arrived at after discussions with Messrs Aaron Smith and Steve Watts of Hawkesbury Nepean CMA, and Dr Mark Jackson (DEC). The high price of meadow hay was because of the prolonged drought and in normal years would be less than half the price. The exercise showed that the RO products were cost competitive at present with conventional materials like meadow hay. However, there are many factors e.g. freight, low priced hay, etc. that could alter the comparisons.

7. Conclusions

The field trial at CROA has shown that as little as a 1cm layer of a soil conditioner and a 2.5cm layer of a coarse mulch, applied to the surface of degraded land, can be used to reduce soil loss and help revegetation. However, at the Bungonia site, only the 2.5cm layer of mulch reflected the results obtained at CROA. This was because most of the finer soil conditioners applied to the surface of the plots was blown away by strong winds in the drought. This highlights the need to modify product specifications depending on particular environmental conditions at each particular site to maximise the beneficial effects of the RO materials. For example, for the windy site at Bungonia, the soil conditioners may need to be incorporated or at least applied in conjunction with a coarse mulch to prevent them being blown away during dry periods before the establishment of vegetation. The coarse mulch in the experiment, however, remained where it was applied and provided effective erosion control and vegetation establishment.

At CROA, where a 2.5cm and a 5cm layer of coarse mulch were used, the higher rate was shown to severely reduce revegetation while the 2.5cm layer did not. As such, a 2.5cm layer of mulch was considered an optimal rate for mulches and was borne out by the results at Bungonia. The higher rate of soil conditioner used (2.5cm layer versus 1cm layer) at CROA was also found to be supra-optimal since it released larger amounts of organic carbon and other nutrients into the runoff water. Although the higher rate was chosen as an experimental treatment, it may be economically prohibitive in practice.

At both sites, the concentrations of total N, total P, total OC and BOD in the runoff water in all treatments were relatively low, when compared to short-term critical trigger values developed by the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) for surface waters suitable for general purpose farm use and irrigation in agricultural situations (ANZECC & ARMCANZ 2000, see Table 4.2.11). As such, the nutrient loads arising from the use of these RO materials would not adversely affect the quality of the water draining into catchments. This is not surprising as the nutrient levels of composted RO materials derived from garden organics are known to be low. The nutrient levels were comparable to those in naturally forested catchments (Cornish 1980; 1989) or in catchments with agricultural enterprises (Stevens et al. 1999; Smith et al. 2001; Cornish et al. 2002) Application of coarse mulch in areas that are likely to receive concentrated flows of runoff is not recommended unless it is anchored in place.

The use of composted RO products complying with the Australian Standard for composts, mulches and soil conditioners (AS4454-2003) ensured that there were no problems with introducing weeds, pathogens and heavy metals into the catchment waters. This contrasts with the conventional method of using cereal straw or meadow hay, which may harbour undesirable weed seeds. In addition to the above specifications, it was deemed necessary to include a new specification for a level of contamination by light plastics of one-tenth that specified by AS4454-2003 to ensure that the visual contamination is acceptable to landowners and catchment authorities.

As the RO materials were mostly low in plant nutrients, a slow-release fertiliser was added to the RO materials in the trials to assist in revegetation. However, this did not add significantly to the nutrient load in the runoff and may be a way to supply the newly sown grasses and clovers with the necessary nutrients for rapid establishment. This would allow the use of extremely nutrient-poor coarse mulches for erosion control as well as revegetation.

In general, the RO products performed as well as the standard conventional method of using cereal straw in combating erosion and revegetating degraded land. However, more work needs to be done at various locations in NSW to validate their use. In the final analysis, it would come down to the economics of using RO products compared to cereal straw or meadow hay. Preliminary calculations suggest that the low rates used may be economic if used strategically in the most degraded situations.

The response from landowners and catchment managers to the results presented at two field days suggests that they are prepared to use the RO products as an alternative to cereal straw. However, landowners are likely to require some assistance/contribution from State Government Departments, such as DEC and relevant CMA’s for purchasing and applying RO products. This would help account for the environmental benefits associated with improving land condition in important catchments around Sydney and promoting the beneficial re-use of organic materials, which would otherwise be lost to landfill. It may also serve as an incentive for regional areas to recycle their garden organics for use in catchment management.

8. Field Days and Publicity

To create greater awareness of the research findings from the project, two field days were held: one at CROA on 10th June, 2004 and the other at Bungonia on June 24, 2005. The field days were attended by 66 participants at CROA (Appendix 3) and 54 participants at Bungonia (Figure 35, Appendix 4). Major stakeholders of the project, including catchment managers, compost producers, landowners and personnel from NSW DPI and DEC attended the field days.

The CROA field day and the first rainfall simulation results were publicised in NSW DPI's extension publication, *Agriculture Today* (Appendix 5). A scientific paper will be also be prepared for publication in a peer reviewed journal, based on the results presented in this report and those arising from the continuation of this project up to October 2006.

Figure 35: The field day at the Bungonia site

9. Recommendations

Further studies should be carried out to assess the longer-term benefits of using compost in catchment management by conducting a second rainfall simulation at the Bungonia trial site, after the plots have been vegetated with tube stocks of native trees and shrubs. It may also be necessary to investigate the most appropriate application methods for different locations and soil types in NSW. In this study, the RO materials were all applied to the surface of the soil without incorporation. It is possible that the application of a 1cm layer of soil conditioner on the surface of degraded soil followed by a 2.5cm layer of coarse mulch over the soil conditioner may serve both as an erosion control blanket as well as a vegetative establishment blanket. The studies have shown that a 2.5cm layer of coarse mulch on its own was highly effective in erosion control and did not inhibit vegetation establishment. Where the slope is conducive to mechanical incorporation of the soil conditioner, the incorporation of the material would add organic material to the soil and should hasten vegetation cover.

It would be useful to develop a technical guideline for catchment managers in NSW on how to use compost in catchment works. The guidelines should include specifications for compost destined for catchment rehabilitation and procedures for monitoring sites to ensure catchment health is maintained. Based on the guideline developed, technical training for catchment managers in the form of workshops and field days on how to successfully use compost in catchment management would accelerate the adoption of the technology.

In order to justify the cost of using composted RO products for catchment management, they should only be used strategically to target the most at-risk areas of the degraded landscape e.g. the surrounds of a flume. This is unlikely to create a large demand for RO products and so additional funding mechanisms/assistance programs will be required to substantially increase the quantity of RO products used for rehabilitation purposes.

The RO industry should work with other stakeholders to develop particular specifications for RO products used in catchment management to build landowner confidence in using the material. For example, there is an immediate requirement to stringently reduce the amount of contamination of the RO materials by unsightly light plastics. The RO industry should have a standard of quality assurance higher than AS4454-2003 for the products destined for catchment rehabilitation if there are not to be serious repercussions for the increased use of these materials in the future.

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Acknowledgements

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Appendices

Appendix 1

Specifications of composted mulches for catchment management in the project

Product	Composted mulch
Major ingredients	Composted garden organics
Standard	Product shall meet all specifications of AS 4454 (2003) except for the following: – Plastics – light, flexible or film > 5 mm (≤ 0.005% w/w dry matter) – Glass, metal and rigid plastics > 2mm (≤ 0.05% w/w dry matter) – Copper and zinc levels shall not exceed Grade B levels in NSW EPA (1997) Environmental guidelines – use and disposal of biosolids products. Levels of copper shall not exceed 375 mg/kg and zinc 700 mg/kg – Particle size shall not exceed 40 mm.
Quality assurance	1) Specify whether the product is certified under AS 4454 (2003) by a third party certification body (e.g. SAI Global Assurance Services Ltd). If so, please supply the product certification licence number. 2) The specific batch of product shall be batch tested according to the above Standard and shall meet all additional specifications. The batch test certificate demonstrating compliance shall be supplied on delivery. Rejection of the delivery will occur if such documentation is not provided and payment will not be made.
Quotation	1) The quotation shall identify that the product will meet the above requirements. 2) The quotation shall include the following items separately a) product cost, b) delivery cost and c) GST

Appendix 2

Specifications of composted soil conditioners for catchment management in the project

Product	Composted soil conditioner
Standard	Product shall meet all specifications of AS 4454 (2003) except for the following: – Plastics – light, flexible or film > 5 mm (≤ 0.005% w/w dry matter) – Glass, metal and rigid plastics > 2mm (≤ 0.05% w/w dry matter) – Copper and zinc levels shall not exceed Grade B levels in NSW EPA (1997) Environmental guidelines – use and disposal of biosolids products. Levels of copper shall not exceed 375 mg/kg and zinc 700 mg/kg
Quality assurance	1) Specify whether the product is certified under AS 4454 (2003) by a third party certification body (e.g. SAI Global Assurance Services Ltd). If so, please supply the product certification licence number. 2) The specific batch of product shall be batch tested according to the above Standard and shall meet all additional specifications. The batch test certificate demonstrating compliance shall be supplied on delivery. Rejection of the delivery will occur if such documentation is not provided and payment will not be made.
Quotation	1) The quotation shall identify that the product will meet the above requirements. 2) The quotation shall include the following items separately a) product cost, b) delivery cost and c) GST.

Recycled Organics in Erosion Control and Catchment Management

Field Day

The Department of Environment and Conservation (NSW) and NSW Agriculture are collaborating on a two-year project in conjunction with Sydney Catchment Authority and the Department of Infrastructure, Planning and Natural Resources to evaluate the use of recycled organic products for erosion control in catchment applications in NSW.

Supporting the development of markets for quality recycled organic products manufactured from a range of recovered organic materials is a priority for the Department of Environment and Conservation (NSW). Use of recycled organic products, such as composted mulches and composted soil conditioners, that comply with Australian Standards have the potential to protect degraded soils from loss of sediment and nutrients, can enhance plant establishment and can improve the quality of water catchments in NSW.

A field day will be held at NSW Agriculture's Centre for Recycled Organics in Agriculture on Thursday 10th June 2004 to showcase the positive effects of using recycled organics for erosion control compared to conventional treatments.

Participants will be provided with an up to date overview of new erosion control strategies using recycled products that can apply to disturbed soils in catchments areas, urban land and agricultural land.

The field day will be of particular interest to:

- State Government Authorities responsible for catchment management and catchment policy;
- Local Government Catchment Protection Officers;
- Landholders;
- Landcare groups;
- Stormwater and catchment industry associations; and
- Manufacturers of recycled organic products.

Expected outcomes from the field day

Participants in the field day will be provided with an overview of:

- What are recycled organics products?
- What are these products made from?
- How the use of recycled organics can reduce soil loss, nutrient movement and improve run-off water quality in areas subject to erosion
- How the use of recycled organics can benefit the environment
- Scientific performance assessment of recycled organic products in erosion control compared to conventional treatments
- How recycled organic products can be used in erosion control applications.

When?

Thursday 10th June 2004, 9:30 am - 1.00 pm

Where?

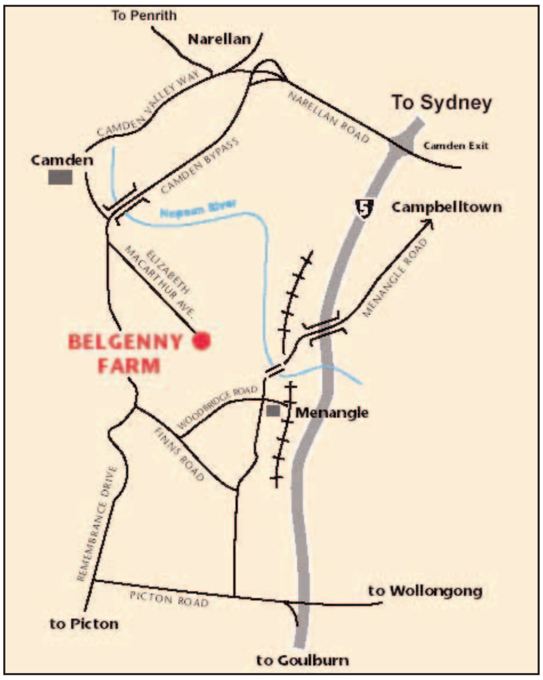
The field day will be held at Belgenny Farm, Centre for Recycled Organics in Agriculture, NSW Agriculture, Elizabeth Macarthur Avenue, Camden NSW 2570.

Belgenny Farm is approximately 60 minutes drive from Sydney. A map is shown over page.

How to register

There is no cost to attend the field day. To attend, RSVP to Mark Jackson, Department of Environment and Conservation (NSW) on (02) 8837 6010 or email mark.jackson@resource.nsw.gov.au by close of business Tuesday 3rd June 2004.

Time	Program - Workshop
09:30 - 10.10	Registration, tea & coffee at 'The Granary', Belgenny Farm.
10:10 - 10:20	Welcome and introduction to field day 'Recycled Organics in Catchment Management'. Mr Darren Bragg, Department of Environment and Conservation (NSW)
10:20 - 10:35	Why use recycled organics in catchment management? An overview of the project. Dr Trevor Gibson, NSW Agriculture
10:35 -10:55	Comparing performance: recycled organics vs conventional erosion control treatments. Dr Percy Wong, NSW Agriculture
10:55 -11:05	Cost benefits of using recycled organics and further work. Dr Mark Jackson, Department of Environment and Conservation (NSW)
11:05 -11:15	Questions
11:15 -12:15	Guided tour of the scientific trial site at the Centre for Recycled Organics in Agriculture. Mr Martin Gilmour and Dr Percy Wong, NSW Agriculture
12:15 -13:00	Light lunch at 'The Granary', Belgenny Farm



Compost in Erosion Control and Catchment Management

The Department of Environment and Conservation (NSW) and NSW Department of Primary Industries are collaborating on a three-year project to evaluate the use of compost for erosion control in catchment applications in NSW.

Supporting the development of markets for quality composts manufactured from a range of recycled organic materials is an area of work for the Department of Environment and Conservation (NSW). Use of composts, such as mulches and soil conditioners have the potential to protect degraded soils from loss of sediment and nutrients, can enhance plant establishment and can improve the quality of water catchments in NSW.

A field day will be held at the large-scale catchment trial site in Bungonia to demonstrate the positive effects of using compost for erosion control compared to conventional erosion control treatments.

Participants will be provided with an up to date overview of new erosion control strategies using recycled products that can apply to disturbed soils in catchments areas, urban land and agricultural land.

The field day will be of particular interest to:

- State Government Authorities responsible for catchment management and catchment policy;
- Local Government Catchment Protection Officers;
- Landholders;
- Landcare groups;
- Stormwater and catchment industry associations; and
- Manufacturers of composted products.

Expected outcomes from the field day

Participants in the field day will be provided with an overview of:

- What are composted products?
- What are these products made from?
- How compost can reduce soil loss, nutrient movement and improve run-off water quality in areas subject to erosion
- Scientific performance assessment of composted products in erosion control compared to conventional treatments
- How composts can be used in erosion control applications.

When?

Friday 24 June 2005, 10.00 am - 12.30 pm

Where?

The field day will be held at:

'Maxwell Park',
279 Inverary Rd, Bungonia.

Bungonia is approximately 2.5 hrs drive south of Sydney, on the Hume Highway to Canberra. Map are directions are shown over page.

How to register

There is no cost to attend the field day. To attend, RSVP to Mark Jackson, Department of Environment and Conservation (NSW) on (02) 8837 6010 or email mark.jackson@environment.nsw.gov.au by close of business Monday 20th June 2005.

Before compost application

Time	Program
10:00 - 10.10	Registration, tea and coffee, 'The Farm Shed'
10:10 - 10:20	Welcome and background to the project. Dr Mark Jackson, Department of Environment and Conservation (NSW)
10:20 - 10:35	Using compost for controlling erosion and improving water quality - results from the trial. Dr Percy Wong, NSW Department of Primary Industries
10:35 -10:45	Comments from the landholder. Mr Arthur Davey, Owner (Maxwell Park)
10:45 -11:00	Some comments from a catchment point of view. Mr Aaron Smith and Mr Steve Watts, Hawkesbury-Nepean Catchment Management Authority
11:00 -12:00	Guided tour of the trial site. Mr Phil Pengelly and Dr Percy Wong, NSW Department of Primary Industries
12:00 -12:30	BBQ lunch at 'The Farm Shed'

Directions to Field Day

'Maxwell Park', 279 Inverary Rd, Bungonia

Take M5 motorway from Sydney which leads into the Hume Highway.

Continue on the Hume Highway until you reach Marulan. Marulan is approximately 150 kms south west of Parramatta.

Approximately 4 kms past the Marulan turnoff take the exit (on the left) after the BP Roadhouse. This will be South Marulan Rd. It is also marked with a brown sign (white print) stating 'Bungonia State Recreation Area'.

Take an immediate right turn approximately 50m down South Marulan Rd into Bungonia Rd, (not clearly signposted!).

Continue along Bungonia Rd for approximately 14 kms, which terminates at a T-junction. Turn left and drive into the Bungonia village.

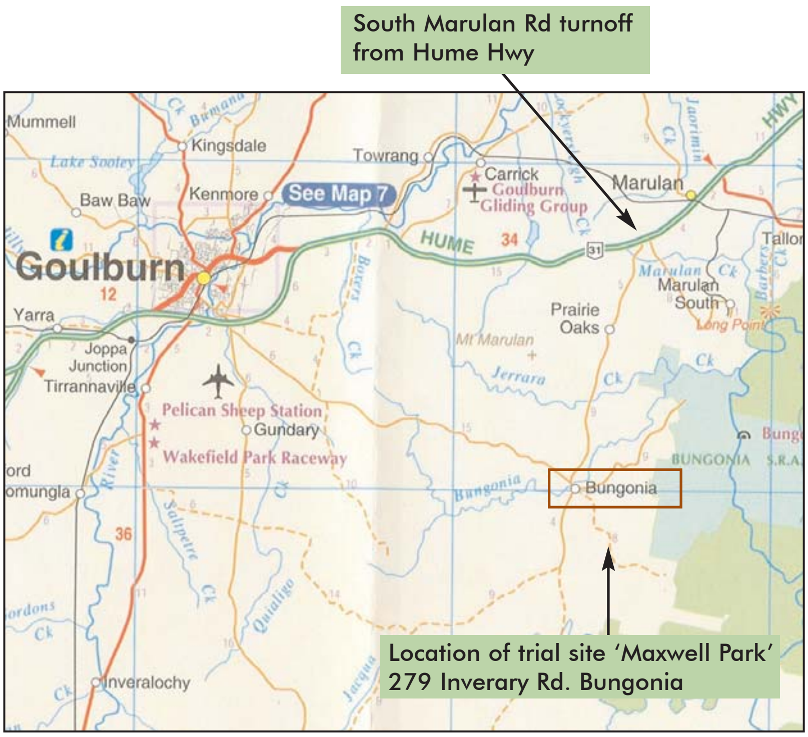
Take a left hand turn into Gooderich St which becomes Inverary Rd at the end of the village. It turns into an unsealeroad after the village (~200m from the village; you will also see a Telstra phone box near the end of the sealed road).

Continue on this unsealed road for approximately 4 kms.

'Maxwell Park' is a left hand turn off Inverary Rd (#279).

Park at the entrance to the property and follow directions to 'The Farm Shed', ~150 m walk.

Compost used in the project



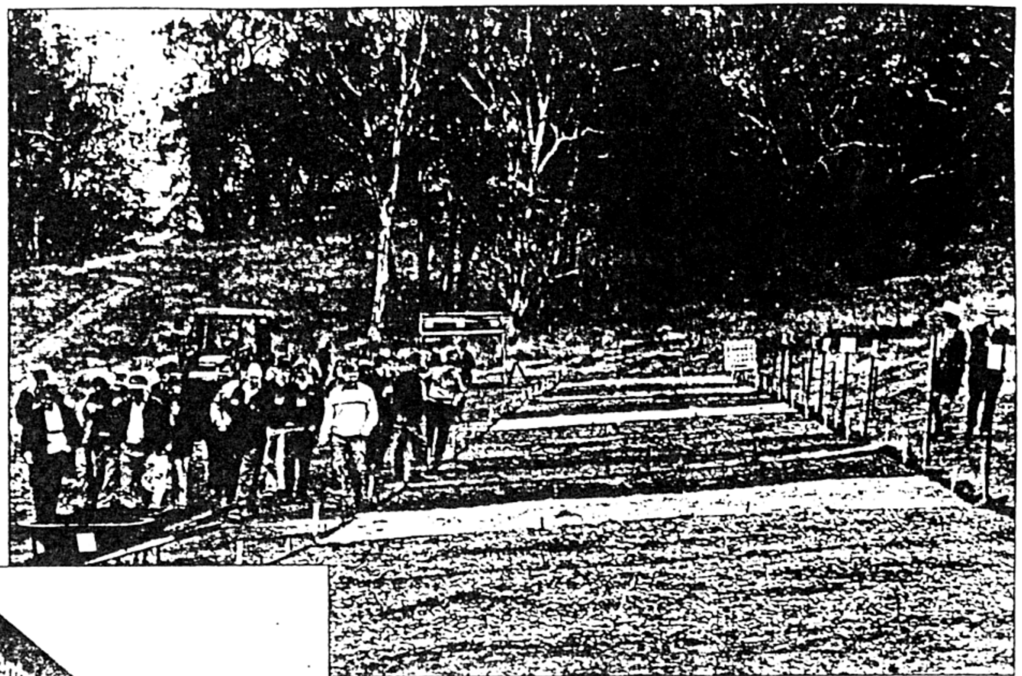
Regional map of Bungonia.

News

Primary Industries

Promising early signs for erosion control

RON AGGS
Camden



Field day participants at the Centre for Recycled Organics in Agriculture at Camden get an overview of new erosion control strategies using recycled products that could apply to disturbed soils in catchment areas and urban and agricultural land.

RESULTS of early work done on erosion control at the Centre for Recycled Organics in Agriculture (CROA) at Camden are promising.

Agriculture is a significant potential market for recycled organic products and outside Sydney there is a great need to replenish agricultural soils which are low in organic matter and nutrients and suffer from structural problems.

"Recycled organic products appear to be as effective as the conventional method of using wheat straw or hay for immediate erosion control before the establishment of any vegetative cover," said NSW Department of Primary Industries environmental scientist, Dr Percy Wong.

"Even low rates of one centimetre depth of a soil conditioner or 2.5cm of a coarse mulch were sufficient to reduce soil loss to a level comparable to straw," Dr Wong said.

"Moreover, these rates did not pose any risk of significant movement of nitrogen, phosphorus or dissolved organic carbon from the site. This would be highly desirable for maintaining water quality in catchment areas."

If farmers are to use these products they need to know they are safe for them to use, are safe for the environment and consumers and what benefits they will bring to their soil, crop health and productivity.

NSW DPI's CROA facility - the largest of its type in Australia - covers a 20 hectare site divided into 300 experimental plots classified by soil and landscape type.

NSW Department of Primary Industries, the Department of Environment and Conservation NSW, Sydney Catchment Authority and the Department of Infrastructure, Planning and Natural Resources are undertaking a two-year project.

The work will evaluate whether soil amendment products based on recycled organics reduce runoff and soil erosion in high-risk degraded sites within the Sydney catchment.

The use of fully certified recycled organic products, conforming to Australian Standard AS4454 for composts, soil conditioners and mulches, ensures that the materials used in the catchment are free of weeds, pathogens and heavy metal contamination.

A cost-benefit analysis will evaluate the cost effectiveness of using recycled organic products compared to traditional methods of erosion control.

Ongoing research will be of particular interest to State government authorities responsible for catchment management and catchment policy, local government Catchment Protection Officers, landholders, landcare groups, stormwater and catchment industry associations and manufacturers of recycled organic products.

■ Contact Dr Percy Wong, 4588 2127 or percy.wong@dpi.nsw.gov.au.