Effectiveness of environmental policy instruments and management principles in wildlife resource management: The case of Mabalauta, Gonarezhou National Park, Zimbabwe

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Abstract

This study assessed the effectiveness of environmental policy instruments and management principles at Mabalauta, Gonarezhou national park in regulating the use and management of wildlife resources. The Story Telling Approach (STA) was used to determine the environmental policy history and implementation strategies. Focus group discussions, group lecture, observations, key informant interviews and a questionnaire survey were used to determine the policy instruments and management principles in use. Effectiveness was assessed through the evaluation of implementation methodologies and discernible outcomes of implemented policy instruments and management principles. The study established that non-economic, economic and property rights policy instruments have collaboratively contributed to the effective regulation of use and management of wildlife resources. The user-pays principle is the most widely used principle, which has managed to contribute to resource sustainability. However, effectiveness of instruments and management principles was discovered to be mostly dependent on resource availability. Lack of financial resources has weakened implementation, monitoring and evaluation of policy instruments and management principles.

Keywords: Environmental Policy, Economic instruments, non-economic instruments, use rights, wildlife resources.

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Estimating tree species diversity in small scale farming areas for effective environmental management: The case of Bindura and Shamva Districts, Zimbabwe

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Abstract

This study estimates and compares the spatial variations of trees species diversity and size in communal, old resettlement and new resettlement areas in Mashonaland West districts of Zimbabwe. A multi-scale assessment of diversity was done using the non-aligned block sampling design. Rooted frequency (Southerland, 2000) was used to measure tree species abundance. Data on species abundance was used to calculate tree species diversity using the Shannon Weaver Index (H). Analysis of variance (ANOVA) and Krustal Wallis tests were used to test for differences in trees species diversity between the three small scale farming areas. Results indicate that there is a significant ($p< 0.05$) difference in tree species diversity and size among the three farming areas. Newly resettled areas have higher tree species diversity than the communal and old resettlement areas. Tree species diversity and size vary with the period under which the area has been settled. Old settlement areas have smaller tree sizes and the new settlement areas have larger tree sizes. This suggests the need for environmental management options and policies that prevent tree diversity losses in newly resettled areas.

Keywords: Species Diversity, Species Evenness, Small Scale Farming

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People's state of health in Zimbabwe: A spatial perspective

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Abstract

Zimbabwe currently faces numerous health challenges. The challenges are being experienced in all parts of the country and in all health sectors from primary right to the quaternary sector. Added to this is the problem of regional inequalities which date back to the colonial era. The article examines patterns of people's spatial pattern of health in Zimbabwe. It discusses the major features of the study area, the description of the composite index method (the method of data analysis), the spatial pattern of people's health in the country and finally, the recommendations to help solve the health problems of the country. Data for the research was collected from the Ministry of Health and Child Welfare (2004) and the Central Statistics Office (2004). It emerged from the research that overall people's state of health in Zimbabwe is very poor and in addition, there is severe inequality in people's state of health.

Keywords: Health, Spatial, Inequality, Zimbabwe and Index.

(2013), International Journal of Research in Economics and Social Sciences, Vol. 3(8), pp. 1-18.

Causes and rate of reservoir sedimentation due to changes in catchment management. A case of Marah dam in Masvingo Province of Zimbabwe

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Abstract

The paper sought to analyse the rate of reservoir sedimentation due to changes in catchment management within the catchment area of Marah dam in Masvingo province of Zimbabwe. To do this, the study evaluated the current capacity of the dam based on current sedimentation rate as well as the lifespan of the dam under the current management practices. In order to obtain the rate of sedimentation, the formula (LTD/6) was used. The parameters T and D were measured using an Automatic level, Theodolite and staff. The depth of the reservoir was found to be 16m and the throwback was also found to be 840m. Calculations done pointed to an increase in the rate of sedimentation with a marked increase of 49.9% from 2000 to 2006, giving an average sedimentation rate of 8.3% per annum. The lifespan of the dam was also found to be about 12 years. This meant that the lifespan of the irrigation scheme dependent on the dam had a lifespan less than the 12 years. It was recommended that the Environmental Management Agency be involved and also that the community formulate catchment management strategy so that there is continuity and sustainability of Marah irrigation scheme.

Keywords: water availability, storage capacity, sedimentation, reservoir, catchment, land-use change.

2013, Greener Journal of Physical Sciences, Vol. 3(6), pp. 241-246.

Influence of grazing intensity on soil properties and shaping herbaceous plant communities in semi-arid Dambo wetlands of Zimbabwe

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Abstract

Key issues of concern regarding the environmental impacts of livestock on grazing land are their effects on soil, water quality, and biodiversity. This study was carried out to determine how grazing intensity influences soil physical and chemical properties and occurrence of herbaceous plant species in Dambo wetlands. Three categories of grazing intensity were selected from communal, small scale commercial and large scale commercial land. Dambos from the large scale commercial land functioned as the control. Data analysis included ANOVA and multivariate tests from CANOCO. There were significantly negative changes to soil nutrient status in communal Dambos though with a higher number of rare taxa. Sodium, phosphorous, pH and infiltration rate were significant determinants of plant species occurrence. Overgrazing is threatening the productivity, stability, and ecological functioning of Dambo soils in communal Zimbabwe. These Dambos also require special conservation and management priorities as they contain a large number of rare plant species.

Keywords: Dambo Wetlands; Grazing; Soil Nutrients

2013, Journal of Environmental Protection, Vol. 4(10), pp. 1181-1188.

Influence of communal area grazing management system on the foraging behaviour of steers in a semi-arid area of Zimbabwe

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Abstract

A study was conducted to determine the influence of grazing management system on the foraging behaviour of steers in semiarid area of Zimbabwe. Foraging behaviour was determined through direct observations of focal animals. Four draught steers were observed in either the grazing scheme or under the traditional grazing management over the early, mid and late rainy seasons. Grazing was found to be the most dominant foraging activity under the two grazing systems. The time spent grazing was significantly ($P<0.05$) affected by the interaction between grazing management system and season. As the season progressed, grazing time increased for animals in grazing schemes. In grazing schemes, browsing was strongly marked during the early and late rainy seasons. The time spent by animals walking was higher ($P<0.05$) for steers under the traditional system. Other idling activities, such as drinking water were curtailed in grazing schemes due to the absence of watering points in some paddocks. These findings suggest that grazing schemes tended to limit foraging activities, possibly due to limited range resources. The ability of cattle under traditional grazing system to switch effectively among different patches might have contributed to their foraging activities.

Keywords: foraging behaviour, steers, communal grazing management, grazing scheme, traditional grazing system.

2013, Greener Journal of Agricultural Sciences, Vol. 3(12), pp.787-793.

Influence of communal area grazing management system on the nutritive value of forages selected by cattle in a semi-arid area of Zimbabwe

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Abstract

A study was conducted to determine the effect of grazing management system on the nutritive value of forages selected by cattle. Animals were observed while grazing and the grazed samples were collected. The samples were analysed for chemical composition and digestibility. There were significant ($P<0.05$) interactions between grazing system and month of sampling on acid detergent fibre (ADF) and crude protein (CP) contents of the forages. Month of sampling had a significant ($P<0.05$) effect on all the parameters analysed. Samples collected under the traditional grazing system had significantly ($p<0.05$) higher levels of *in vitro* dry matter digestibility (IVDMD) and less ADF and NDF content compared to those forages from the grazing scheme. The CP content of the forages selected was not affected by grazing system ($P>0.05$). These findings suggest that grazing schemes tended to compromise the quality of forages selected under poor range conditions, possibly due to limited range resources. The ability of cattle under traditional grazing system to switch effectively among the different range resources might have enhanced the quality of forages selected.

Keywords: Forage nutritive value, communal grazing management, grazing scheme, traditional grazing system.

2013, Greener Journal of Agricultural Sciences, Vol. 3(9), pp. 663-668.

Use of linear programming model to determine the optimum cropping pattern for an irrigation scheme in Masvingo, Zimbabwe

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Abstract

Agricultural systems are often faced by challenges such as crop selection and irrigation planning which can be formulated as optimization problems. Decisions have to be made on the proper set of crops to be cultivated and a proper irrigation scheme. The objectives of such decisions are to maximize net profit or to minimize water waste. In this study, a linear programming model was developed that helped to determine the optimal cropping pattern for an irrigation scheme in Masvingo, Zimbabwe. Crops which we considered were wheat, sugar beans for winter and cotton and maize for summer for the 2012/13 agricultural season. The linear programming model was solved by using Microsoft Excel (2007). The model recommended no production of wheat and cotton. Sugar beans and maize gained acreage by 50 percent and 88 percent respectively. On the whole, the optimal cropped acreage did not change as compared to the existing cropping plan. As a result of the optimal solution, a farmer's income could be increased by $1,668.60. The optimal income increased from existing level of $1,919.40 to $3,588.00 showing an improvement of 87 percent. The results show that LP models solutions are worthy implementing.

Keywords: Linear Programming; Cropping Pattern; Irrigation; Income; Masvingo

2013, Journal of Management and Science, Vol. 3(4), pp. 33-35.

An investigation into the effectiveness of coal ash in acid mine drainage (AMD) abatement. A case study of Iron Duke Mine

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Abstract

IDM acid mine drainage (AMD) was found to have high concentrations of SO_4^{2-} (>3500mgl-1), electrical conductivity (E.C >20 000µScm-1) and acidic pH (<2.0) levels before neutralization by Trojan mine coal ash. Three treatments (CaO, Ca (OH) $_2$ and Coal ash) were used to neutralize affected soil from the Environ-Green site which was polluting the river system. The resultant effluent from the treated pots was pure representation of the groundwater and was chemically characterized to establish the suitable liming application level. The high application level of 560kg/tonne of soil was recommended since at this level, the SO_4^{2-} neutralization was optimal in 92% region and precipitation of Fe was high in the 99.4% region. Analysis of the heavy metals was done using Atomic Absorption Spectrometer (AAS), NO^{3-} and SO_4^{2-} was analyzed by a spectrophotometer and E.C and pH were determined by an electrode potential. Statistical analysis of results was done using Kruskal-Wallis statistic test. At 95% significance level, SO_4^{2-} reduction rate was the same in all liming materials. A field application rate of 2 184.1 tonnes of coal ash /Ha of affected site or 560kg/tonne of affected soil was recommended.

Keywords: acid mine drainage, environmental pollutant, coal ash

2013, International Researcher, Vol. 2(3), pp. 49-65.

Impacts of waste dumping on pomona medium sand clay loam soils and surface water quality in Harare, Zimbabwe

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Abstract

Municipal and industrial waste generated in Harare is dumped at Pomona dumpsite which is not lined to prevent seepage. The concentration of various heavy metals (Lead (Pb), Iron (Fe), Zinc (Zn), Cadmium (Cd) and Chromium (Cr)) in soils and surface water was measured with a view of determining potential ecological and public health risks. Soil samples were collected from above dump site (control), within the dumpsite and below dumpsite (down slope) at depths of 0-5, 10-20 and 30-40 cm using an auger. Water samples were obtained from shallow dams at Pomona dumpsite. At Pomona, the soil concentrations of Fe and Pb pollutants were apparent ($P<0.05$) and surpassed the prescribed threshold limit. There was no significant difference in soil microbial biomass among treatments ($P>0.05$) at Pomona dumpsite. These results imply phyto-toxicity risk of crops cultivated within the vicinity of dumpsites and downstream due to possible bio-magnification of heavy metals in crops and their proliferation up food chain and subsequent health hazard for all living species. It was recommended that the responsible authorities must construct an engineered landfill so as to prevent further environmental contamination.

Keywords: waste dumping, heavy metals, soil quality

2013, ARPN Journal of Science and Technology, Vol. 3(12), pp.1215-1221.

Effectiveness of water hyacinth (Eichhornia crassipes) in remediating polluted water: The case of Shagashe River in Masvingo, Zimbabwe

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The aim of this study was to investigate the effectiveness of water hyacinth (Eichhornia crassipes) in remediating a polluted river. Triplicate samples were collected on three different points designated SR1, SR2 and SR3 along the Shagashe River. The course of the river stretching from SR1 to SR3 was covered by over 95% water hyacinth during the period of study. SR1 was located on the upper stream, SR2 centrally and SR3 furthest downstream. Analysis for electrical conductivity, total dissolved solids (TDS), sulphates, phosphates, total hardness, pH, nitrates, nitrites and total nitrogen on all samples was done. Statistical analysis was done to check if there was a significant reduction of the parameters moving downstream. The results indicate that water hyacinth was remediating the river as noted by the significant reduction of electrical conductivity (25% decrease), total dissolved solids (TDS) (26%), sulphates (45%), phosphates (33%) and total hardness (37%) between the sample points SR1 and SR3. Statistical analysis showed no significant changes for the other parameters.

Keywords: Water hyacinth, bioremediation, physico-chemical parameters, pollution, phytoremediation

2013, Advances in Applied Science Research, Vol. 4(4), pp. 55-62.

A proposed integrated management approach to the control of water hyacinth: The case of Shagashe river in Masvingo, Zimbabwe

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Abstract

Water hyacinth (Eichhornia crassipes) invasion has become a global challenge which has had significant detrimental impacts on ecosystems and economies. A native of the Amazonian region, the free floating water weed has spread to most parts of the world. In Zimbabwe, its invasion of Lake Chivero and Manyame River systems has been well documented along with the resulting problems it has created. Water hyacinth has also infested other regions of the country including Shagashe River in the Masvingo Province. In this paper we outline a proposed site specific integrated management plan for the control of water hyacinth along Shagashe River. This has been formulated by way of reviewing published literature, consultations with various experts, stakeholders and pre-surveys done on various locations along the river. The programme entails timing of control measures to take advantage of the natural flooding of the river during the rainy season. The flooding removes the bulk of the water hyacinth and to avoid reinfestation, physical removal and biological control of the remnant water hyacinth is proposed. Various treatment methods are proposed to prevent nutrient enrichment in the river after having had identified the major sources of pollutants. Disposal of the removed hyacinth has also been discussed. Continuous monitoring by the responsible authorities and a multi-stakeholder water hyacinth monitoring committee is recommended concurrently with the enforcement of revised legal instruments.

Keywords: Water weeds, river pollution, integrated control, wetlands.

2013, Greener Journal of Oceanography and Marine Science, Vol. 1(1), pp. 011-022.

Environmental Impacts of Earth Dam Failures and Spillway Malfunctions

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Abstract

This study was carried out in selected districts of Mashonaland, East and Central provinces of Zimbabwe in 2011 to determine the environmental impacts of earth dam failures and spillway malfunctions with regards to soil erosion. A total of 14 earth dams were investigated. Eight dams contributed to soil erosion whilst six did not. Of the eight dams, half of them had breached. The remainder had not breached but had eroded the spillway channel. Only one dam breached without causing soil erosion. The properly constructed dams had contributions to degradation due to erosion ranging from 0.1% to 2.8%. Dam code 3 had the highest contribution to degradation due to soil erosion of 42%. The paper concluded that there is critical loss of soil when a dam fails or when a spillway malfunctions. Concerning spillways, it was shown that when the spillway channel is not properly designed, a lot of soil lose occurs within its channel.

Keywords: breached, spillway, overtopping erosion, subcritical flow, supercritical flow, classification.

2013, Greener Journal of Physical Sciences, Vol. 3(5), pp. 177-186.

Assessing the presence or absence of climate change signatures in the Odzi sub-catchment of Zimbabwe

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Abstract

Climate change and potential adverse impacts on water availability for the purposes of sustaining competing demand uses are causes of concern among water resources managers. This study focused on assessing rainfall and runoff data of a micro catchment in Save's Odzi sub-catchment to determine if any trends existed and how far the results indicated climate change. The study had four rainfall stations (Rusape, Nyanga, Mukandi and Odzi Police Rail) and five runoff stations (E32, E72, E73, E127 and E129). Mann Kendall's test was applied for determining trends in the two variables. The results obtained do not point to climate change. This study recommended that issues of current land use patterns and water abstractions be thoroughly understood for the area under study. It also recommended that techniques which promote terrestrial carbon sequestration should be introduced in the micro catchment.

Keywords: climate change, trend analysis, sustainable development, human activities, Mann Kendall, terrestrial carbon sequestration

2013, American Journal of Climate Change, Vol. 2(4), pp. 225-236.

Catchment management and its effects on arable lands of Zimbabwe: A look beyond the Fast Track Land Reform Program

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Abstract

This study was carried out in selected districts of Mashonaland East and Central provinces of Zimbabwe in 2011 to determine the effects of soil erosion on arable lands and how this related to catchment management. Results show that the highest contribution is 53% and is obtained from arable land codes 5 and 7. These fields show signs of excessive sheet and gully erosion. The least contribution is 0.8% and this is on arable land codes 3, 4 and 8. These fields have properly done conservation works existing. 33% of the assessed arable lands have conservation works in place whilst 67% are not protected and as such the fields are eroded. Soil erosion results in the washing away of the precious top soil, responsible for plant growth and infiltration of rain or irrigation water. This reduces the usefulness of such affected arable lands as crops grown on it can't thrive due to lack of soil fertility. The paper recommends that government policies focus more on promoting sustainable land use through integrated catchment area management. This will go a long way in achieving sustainable development in Zimbabwe.

Keywords: catchment area management, integrated catchment management, arable lands, sustainable land use, sustainability, terrestrial carbon sequestration

2013, Journal of Environmental Protection, Vol. 4(10), pp. 1123-1128.

Environmental Impacts of Earth Dam Failures and Spillway Malfunctions

Nyoni, K.

Great Zimbabwe University, Faculty of Agricultural and Natural Sciences, Department of Soil and Plant Sciences, Masvingo, Zimbabwe.

Abstract

This study was carried out in selected districts of Mashonaland, East and Central provinces of Zimbabwe in 2011 to determine the environmental impacts of earth dam failures and spillway malfunctions with regards to soil erosion. A total of 14 earth dams were investigated. Eight dams contributed to soil erosion whilst six did not. Of the eight dams, half of them had breached. The remainder had not breached but had eroded the spillway channel. Only one dam breached without causing soil erosion. The properly constructed dams had contributions to degradation due to erosion ranging from 0.1% to 2.8%. Dam code 3 had the highest contribution to degradation due to soil erosion of 42%. The paper concluded that there is critical loss of soil when a dam fails or when a spillway malfunctions. Concerning spillways, it was shown that when the spillway channel is not properly designed, a lot of soil lose occurs within its channel.

Keywords: breached, spillway, overtopping erosion, subcritical flow, supercritical flow, classification.

2013, Greener Journal of Physical Sciences, Vol. 3(5), pp. 177-186.

An Investigation into the Effectiveness of Coal Ash in Acid Mine Drainage (AMD) Abatement. A Case Study of Iron Duke Mine

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Abstract

IDM acid mine drainage (AMD) was found to have high concentrations of SO_4^{2-} (>3500mgl-1), electrical conductivity (E.C >20 000µScm-1) and acidic pH (<2.0) levels before neutralization by Trojan mine coal ash. Three treatments (CaO, Ca (OH) $_2$ and Coal ash) were used to neutralize affected soil from the Environ-Green site which was polluting the river system. The resultant effluent from the treated pots was pure representation of the groundwater and was chemically characterized to establish the suitable liming application level. The high application level of 560kg/tonne of soil was recommended since at this level, the SO_4^{2-} neutralization was optimal in 92% region and precipitation of Fe was high in the 99.4% region. Analysis of the heavy metals was done using Atomic Absorption Spectrometer (AAS), NO^{3-} and SO_4^{2-} was analyzed by a spectrophotometer and E.C and pH were determined by an electrode potential. Statistical analysis of results was done using Kruskal-Wallis statistic test. At 95% significance level, SO_4^{2-} reduction rate was the same in all liming materials. A field application rate of 2 184.1 tonnes of coal ash /Ha of affected site or 560kg/tonne of affected soil was recommended.

Keywords: acid mine drainage, environmental pollutant, coal ash

2013, International Researcher, Vol. 2(3), pp.49-65.

Human perceptions on degradation of wetland ecosystems: The case of Magwenzi wetland in Chivi district; Zimbabwe

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Abstract

Wetlands are critical natural resources that serve various purposes including environmental, hydrological and socioeconomic functions. However, this important resource is so fragile and has suffered deterioration due to human activities such as cultivation, grazing, water abstraction among others. Several current studies have studied wetland ecosystem changes using GIS and remote sensing and other scientific methods. These studies lack information on people's perceptions. In this study, degradation of Magwenzi wetland ecosystem was assessed based on local people's perceptions. The Story Telling Approach (STA), questionnaire surveys, interviews and field observations were used to collect data. Stratified random sampling technique was used in the selection of respondents. The study found that human activities such as wetland cultivation, water abstraction and cattle grazing have resulted in the alteration of ecosystem functions and interactions. There have been reported changes in land cover, species richness, species evenness and the hydrology of the wetland. We conclude that humans perceive themselves as the critical driving force behind ecosystem degradation as their activities negatively affect wetland ecosystems by changing the type, number and interactions of vegetative and animal species on the wetland.

Keywords: Perceptions, Human impacts, Wetland, Ecosystem, Biodiversity.

2013, Greener Journal of Geology and Earth Sciences, Vol. 1(1), pp. 013-022.

A Farm Resource Allocation Problem: A Case Study of Model A2 Resettled Farmers in Bindura, Zimbabwe

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Abstract

Small-scale resettled farmers are often faced with the problem of how to allocate resources. The objective of the farmers is to generate maximum income for their households subject to resource constraints. These farmers often solve this problem using traditional methods like trial and error methods, instinct and past experience. This does not guarantee optimal solutions. In this paper linear programming is applied to address this problem. A linear programming model is developed. Optimal crop patterns and optimal number of breeding sows are determined. The results obtained from using the linear programming model are compared with the results that are obtained from the traditional methods of trial and error used by the farmers. The strategies obtained by using linear programming yields more income than strategies obtained from trial and error methods. Results obtained so far reveal the optimal strategies that the farmer could have considered to realize more income.

2013, International Journal of Economics and Management Science, Vol. 2(7), pp. 1-4

A linear programming approach to crops and livestock enterprises planning for a model A2 farmer in Bindura, Zimbabwe

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Abstracts

Farmers need to make decisions on cropping patterns that would yield them maximum profits. This is a decision that most farmers make by intuition, experience and by comparison with other farmers. However, this does not result in optimal solutions. Linear programming can be used to determine optimum cropping patterns. In this study, a linear programming model was developed in order to determine the optimum combination of stocker cattle and crops for a Model A2 farmer in Bindura, Zimbabwe. Stocker cattle considered were beef cows and stocker steers. The crops considered were maize, soya beans and cotton. The linear programming model solution showed that the acreage of maize could be increased by 100 percent. It suggests no production of soya beans and cotton. The total acreage on overall crop production showed an increase by 14 percent compared with the farmer's existing plan. The results also suggest no production of beef cows. The production of steers did not increase compared to the farmer's existing plan. The model suggested an overall decrease of cattle production by 43 percent. The farmer's income could be increased from existing level of $8,189.00 to $11,461.02 showing an improvement of 40 percent. The results suggest that linear programming solutions are worthy putting into use.

Keywords: Linear Programming, Food Crops, Livestock, Farm Enterprises, Model A2.

2013, International Journal of Management, IT and Engineering, Vo. 4(1), pp. 101-109