

# Sustainable Land Management: an efficient tool to combat desertification in China

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## Abstract

China is the third largest country in the world with large population and scared arable land, where arid semi-arid and dry sub-humid regions enclosed 2,976,000km<sup>2</sup>. In Northern China extreme arid areas covers 697,000km<sup>2</sup>. The total land figure of 2,080,000km<sup>2</sup> has decertified land, which uncompressed over 30 percent of the total land territory through adversely effected 400 million peoples. China has 22% of the world population have only 6.4 percent of global land area, hence sustainable land management is perilous for the country long term agriculture economy, however while some states enjoyed continued high level of productivity, others remain feelings sensible to split deprivation. Over 40% of the country is adversely effected. Yet many dry land developing countries, the maximum land is cruelly caused through land degradation. The desertification is mostly because of the observation unsustainable land management. The condition of additional serious about the shortage of water, regular deficiency, ostentatious flood, and the impact on climate change. The resulting to influence of development in deserts, Decrease land productivity and accordingly increase hip desertification and intensification in rural poverty. There are strategies recognized, economic and socioeconomic issues which consequence harmfully to sustainable management of land in China..

**Key words;** Desertification, Land Management, Sustainable drought, water management

## 1. Introduction

The meaning of the desertification conversion of a grassland or exist arid land into a desert through undifferentiated human actions magnified by droughts. Such actions including overgrazing, repeated burning, intensive farming. The decreases of land productivity directly effected of the desertification; the desertification is the cause by which combinations of factors such as population pressure, socio-economic and policy factors, international trade as well as direct factors such as land use pattern, policies and climate related processes is the main cause of desertification's. also reason of major reduction in carbon storage in soil, loss of bio diversity and increasing of global warming and also the major cause of desertification stripping of the natural vegetation's, extra pumping of ground water and overgrazing its help to increase soil erosion, salinity, saline water, and siltation in the reservoirs. The rapidly growth of population and inefficient of agricultural practices are the manmade cause of increasing desertification.

China with 22% of the world population has only 6.4 % of the global land area and 7.2% of the world's farmland, hence sustainable prolific land management is perilous for the country long term agriculture economy, however while some states enjoyed continued high level of productivity, others remain feelings sensible to split deprivation. Over 40% of the country is adversely effected.

China is the third largest country in the world, with a large population and scarce arable land, which feeds 22 percent of the world's population on seven percent of the world's tillable land. . China is one of the country's most severely impacted by desertification which encompasses over 30 percent of the total land territory (approximately 3 327 million km<sup>2</sup>) and adversely affected 400 million peoples (FAO). In China arid semi-arid and dry sub-humid zones enclosed 2 976 000 km<sup>2</sup> in northern China; extreme arid areas cover 697 000 km<sup>2</sup>. This totals 3 673 000 km<sup>2</sup> or 38.3 percent of China's total land figure including 2 080 000 km<sup>2</sup> of decertified land (cf. bibl. entry 26)

In China successively working the national federal, provincial and NGOs national or international the international NGO's working in China huge level on Land resources which name are mentioned here, (UNCCD) United Nations Conservation to Combat Desertification (FAO) food and Agriculture Organizations of the unites Nation (UNEP) United Nations environmental program, UNDP, United National Development Program, (WEP) united Nations world food Program and (GEF) Global environmental facility these 6 international NGO's running projects on Combat the desertification in different areas of China, and have fruitful attainments programs for future.

## 2. Issues related desertification in China,

### 2.1. Soil Erosion

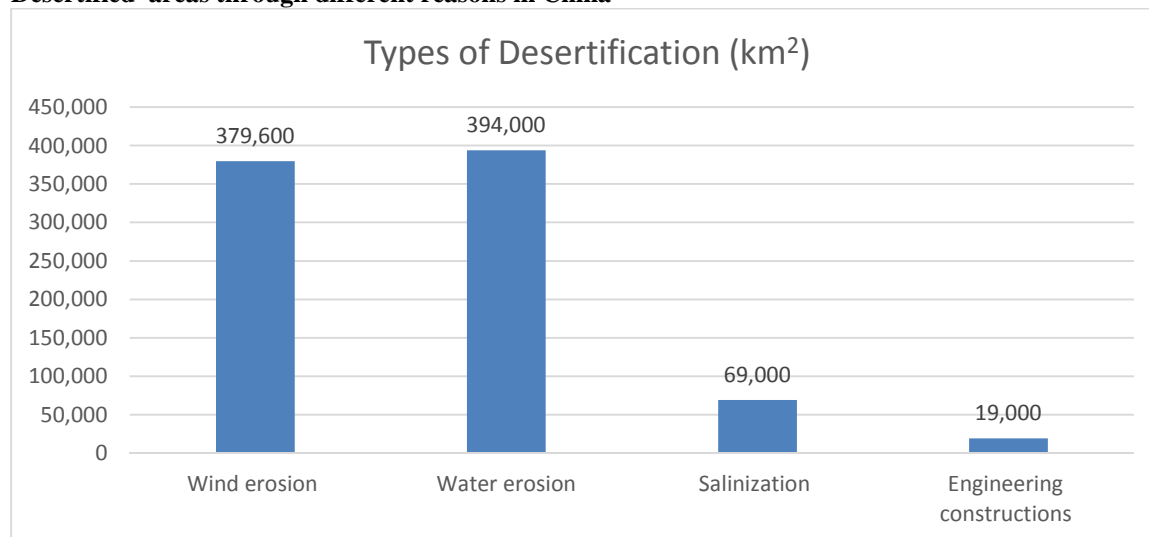
The total land area of china is 9.6 million km<sup>2</sup> from them more than 40% arable land suffering in degradation due to long term anthropologic activities, it is adversely effected on economic and social development. China loosing 861,600km<sup>2</sup> every year due to wind erosion, water erosion, freezing, glacier, overgrazing, deforestations.

Since 2000 the cause of soil erosion at least 200 billion Yuan (US\$29.4 billion) economic loss to China.

Rate and types of desertification in china,

- ❖ Sandy desertification caused by wind erosion
- ❖ Land squalor by water erosion
- ❖ Land squalor caused by engineering i.e. building, communication, coalmine and oil fields.
- ❖ Soil salinization,

### Desertified areas through different reasons in China



#### 2.2. Wind erosion

Wind erosion is a natural ecological process and comprises the detachment, where participation is rare, vegetation is sparse, wind is strongly every day, and the loose ground surface material is susceptible to blowing away by wind. In the North China the core of land ruin is sandy desertification due to wind erosion, which covers 379,600km<sup>2</sup> and mostly dispersed in arid and semi-arid zones from some areas where the climate condition change the rainfall is below 50mm.

In north china the sandy desertification main caused by human economic activities and desertified land growth rate has increased from 1,560km<sup>2</sup> in 1950 and the1970-1980 was 2,100km<sup>2</sup>-2,460km<sup>2</sup> since the late 1980s.

According to the (Peijun Shi,2004) In China wind erosion is the record significant factor of land degradation and desertification in the arid, semi-arid portion of the sub humid regions of the total land area suffering wind erosion is around 160.74 x 10<sup>4</sup> km<sup>2</sup>, which is 16.7% of the global territory documentation of wind erosion and its adverse effect on China period over 2000 years, since 1950s Chinese researchers had carried out an combined analysis of the principle land susceptible to wind erosion, and had assumed several laboratory test and field observation with respect to stabilization and utilization of soil in desert areas. Since the late 1970s there has stood an upsurge concern global regarding land desertification caused by climate change and human activities.

#### 2.3. Water Erosion

The central Asia stands a typical arid and natural fragile region, because of the environment change rainfall and melting of glaciers in the areas are expected to increase, which is the main principal to increase surface runoff and flood. Hence, in the central Asia soil water erosion should not be overlooked, exclusively seeing the serious desertification, land degradation and related drought problems, however in central Asia of soil and water conservation are key major technical problems for sustainable developments of the Silk Road economic belt.

In china Soil loss due to the water erosion is the most serious problem, the annual soil reached 5 million tones caused by water erosion, which about two-fifth from the ocean.

Xinjiang province of China have many of the Tian Mountains. The key of geomorphologic units in Xinjiang province from north to south of China contain Artia Mountain. The feature elevation of orography difference up to 7000m, strong gradient in mean annual precipitation exists in desert from grater then 50mm to less then 900mm in the windward slopes of Tian Mountains (Böhner, 2006). In Xinjiang most serious problem of water erosion occurs as flow erosion in middle, small mountains and hilly areas, because of the snowmelt and heavy rain flooding in spring and summer

#### 2.4. Salinization

In china spread extensively effect of salt on soil, those wide areas covers with tropical and temperature, currently the total area of soil effected by salt about 36million hectares, which occupies cultivable land 4.88% in China. Its

arable land by effected salt about 9 million hectares, accounting from 6.62% total land in the country soil effected by salt the mainly distributed in the Northwest China and North China. The area of six province accounts for 69.03% in China 69,000km<sup>2</sup> farmland has been salinized mainly arid and semi-arid regions of Northwest of China. Current situation of salinization evolution virtually all the distribution areas of effected by salt, involve Northeast, Northwest and Inner Mongolia coastal areas of China. The great band area of the yellow river, salinization move towards more severe at two aspects: the Growth of area is extant, the soil effected by salt nearby 3.5 million hectares in the plan of songnen.

The annual increasing rate of salinization is high its 1-1.4% and 45% of soil effected by salt, degraded area has been abandoned sever saline land. The increased area of salinization 1-3% annually in last three decades in the great band area of Inner Mongolia. Secondary salinization arisen in the west corridor of the same problem in Gansu province of China, irrigation and brackish water is the main part to evolution of salinization in China. According to the evaluation data of Guyuan areas and Nixia province, salt contained in soil increased 2.3g per kilogram after 5 years of brackish water up to 8.3g per kilogram in 14 years. Salt also increased due to the drip irrigation practices in some areas of Xinjiang province which causes sat accumulation consequently, usually, 35% irrigated land in Gensu, Xinjiang and Ninxia province, and the 50% of irrigated land in Inner Mongolia is facing the threat of salinization.

Another hotspot, in the coastal areas salt water movement is unbalanced like as yellow river delta and the salinization also developed in such areas. In china driving factor of salinization mainly consists of irrationalities of water resource management, land resource management and climate change. Irrational use of water in the dominant cause of salinization evolution in the irrigated areas, some of them effected due to the seepage of irrigation water through canals and low efficiency of the water, as needless high irrigated norm, poor drainage management and blockage of drainage channels, rising of ground water table by construction of plan reservoir. Micro irrigation practices i.e. Drip irrigation, Sprinkler irrigation, Bubbler irrigation, Rain gun irrigation system etc., in dry areas is serious effected to increase salinity, in some areas already found local salinization due to irrigation practices such phenomena trend to an expansion, irrational land management in arid and semi-arid areas is also a big factor of salinization acceleration due to cutting down areas by the overexploitation of salt disposal through west land in irrigated area, deteriorating of chemical and physical properties of soil due to poor fertility management, increasing of surface evaporation and failing of drainage because of the destroy of plantation through the overgrazing, deforestation and misuse of irrational land. Areas by the salt effected commonly located in region of influenced by climate change of china. Another significant factor of the evaluation of salinization considered to change of climate. The currently situation of south and Northwest china has been moving to trend of warm and dry process. The SLM and climate to evaluate of salinization in china, consequently desalinization areas is staved and local salinization expansion is observed.

### **2.5. Deforestation**

China covers only 20% forest the nation has some of the largest incidentals of forest land in the world making it is the top target for forest preservation efforts, in 2001 the united nations environmental program (UNEP) listed the china among the top 15 countries with the most closed forest or naturally grown woods, in china 12% of land area or more than 111 million hectares is closed forest i.e. virgin ancient growth forest. However the UNEP also assessed that 36% of china fastened forest are facing pressure from high population concentrations making safeguarding efforts especially important. in 2011 preservation global listed the forests of south –west Sichuan as one of the world`s ten most endangered forest provinces.

Transcription of Chinese government website the center government invested more than 40 billion Yuan among 1998 and 2001 on protection of vegetation`s, farm subsidies and discussion of farmland for forest between 1999 and 2002, china rehabilitated 7.7 million hectares of farm land into forest.

### **2.6. Overgrazing**

Nowadays overgrazing a serious problem in china to increase desertification due to the reducing forest and vegetation, overgrazing increased day by day due to also increasing of livestock population with human being population overgrazing reduce productivity of land because of the compacting of soil and vegetation.

Overgrazing was not serious problem long time ago in China due to animals travels in the response of rainfall and the human being would move behind of animals so it prevented overgrazing in China, now humans have stable food supply so don`t they moves them, therefore, livestock growers used barriers to stand their animals in one place it is the main reason of overgrazing.

### **2.7. Biodiversity**

China is the one of from whole word which have richest biodiversity, according to the statistics, in china have more than 35,000 species of higher plants, it shows 3<sup>rd</sup> ranking in world after Brazil and Colombia. Among them, 2,200 species of bryophytes, its account 9.1% of the total word, 2,600 species of ferns, certain 22% of the whole word, greater than 250 species of gymnosperms, its top of the whole word and more than 30,000 species of angiosperms, account 10% of the total world. In china also have plentiful species of animals. It is estimated 10% invertebrate species of the total world. In china has 6,347 vertebrate species, constituting 14% of the total

world, among them, there are 1,244 birds species, its ranking top in the world, its accounts 3,862 species of fishes in china, its 20.3% of the total world. China is not rich with species it also has high level of endemism. There are 17,300 endemic higher plant`s species, which account 57% of china total higher plant species and 667 species of endemic vertebrates is equal to 10% of China`s.

In china 8 types of ecosystem in sandy desert areas, 13 in chomoeremion gravel desert (Gobi), 10 in stone detritus desert and 7 in argillaceous desert. Its compare with other terrestrial ecosystems, the desert species composition is relatively poor, its accounts more than 600 seed plant species growing in the desert of China, however despite low fertility of plant species, desert contain a large number of ancient relic species. In china`s deserts are ungulates most numerous, rodent and reptiles come next and amphibians are the rarest.

### 3. Techniques for decreases desertification

- i. The policies control of wind erosion in china has progressed and the wind erosion measures have been kept indoors of restrictions in few areas. Due to the worldwide climate change, the climate change of north China become hot and dry, since the 50 years average annual increasing temperature has 0.5-2.08c, and the rainfall become less, the data of decreasing soil moisture during winter and spring. The changing of climate increased intensity of human activities due to frequent development of land desertification, for the reasons wind erosion control to be continue it`s a large problem for china in to the next century, after the national strategy wind erosion control its essential to put in place of the dominant areas. The desert and grassland of North China, the grassland and farming areas at the Tibet plateau, the load of grassland necessary washed-out and grazing must be forbidden to protect of grassland. Those areas where soil and water condition are good, there sustainable production maintained, its essential to notorious and achieved production through necessary to protect against wind erosion. Therefore, must be recognize economic value to unbroken ecological management in China. Control of erosion through replantation of vegetation must be observed for long term public and social benefits and must be make new compensation management to take ecological benefit of wind erosion prevention and control balance cost to the local users of land.
- ii. Since 1980s watershed management and ecological renovation program has been realized in main areas behalf of China that time had serious water erosion problem. Before focused on eight main areas and seven big river basins, it`s including Yangtze River and yellow River basins required immediately soil erosion control actions and ecological renovation. China has been developed comprehensive soil erosion control management the idea of controlling also suited of socioeconomic condition.  
Soil erosion conduct on four controlling ideas.
  - a. The planning of land management should consider the relationship between water, mountains, Road and cultivated land.
  - b. Erosion control should be measures through implemented a small watershed scale under the framework of large basin.
  - c. Erosion control measures through the technologies should be assimilate with engineering, biological, soil and based on water conservation.
  - d. Erosion control should be measures the balance of ecological, social and economic benefits.
- iii. The soil salinity control is main aim to avoid soil degradation through salinization and reclaim exist saline soil, the irrigation is the primary main cause of salinization, the salt contain in river water and ground water irrigation, which stand after the evaporation in the soil. The primary control technique of soil salinity authorize 10-20% of irrigation water to percolate the soil, after the drained to discharge through drainage system the concentration of salt through the drainage water is generally 5 to 10 times of irrigation. Therefore, salt distribute in matches and it will not accumulate. When reclaiming already exist in saline soil, the concentration of salt through drainage water plentiful up to 50 time of irrigation, the salt disseminate will significantly then top salt ingress. Therefore, the drainage portion grow desalinization occurs. The soil salinity is decreases so much within one or two years. The drainage water come down to salinity water with a normal value and touched to satisfaction level. Those areas where dry and wet season dominant, that areas must be operate drainage system in only wet season. Because this experiment to control drainage saving water.  
It pose may be environmental problem to downstream areas through discharge of salty drainage water. So that the environmental hazards should be carefully therefore must be taken mitigation measures. If it is possible to drain water should be limited in only wet season, when the salty sewage reaches at least maltreatment situations.
- iv. China is involve huge tree planting and revive its forest and ligneous industries, to preserve soil and stopped deforestation. In 1970s the government of China has planted millions of tress to rotated large swaths for unfertile land into forest. The benefit was assumed to control floods and soil erosion and also effect on to combat worldwide warming approximately a half of billion ton carbon dioxide a year.

Through the reduction of carbon radiations, in china efforts of huge trees plantation have balancing of deforestation in Indonesia and Brazil. In Asia, China trees planting program greater than balancing of deforestation is the additional part of Asia to produce net rises amount of the forest land in Asia regions during 2000 and 2005. In Northern china has created 4500 kilometers long green belt in this belt have 35 billion trees,70% of the forest has planted in North of China be done in one mile wide strips and the rate of survival millions of acres. An additional belt of trees in Southwest china for the protection of measures typhoons. In China plantation of tree is a civic duty which should be performed every pupil. The forest covers land amount in China 9% increase in 1949 and around 13% today.

Few of the reforestation effort is completed through sampling of whole diggers, in rare cases dumps of dug and built of terraces but no sampling for planting. Once asked why, then one villager expressed the Los Angeles times, due to our employment are free, nevertheless have pay for the trees of them. Some techniques to reduce deforestation.

- o To create forest derived goods to buy or make 100% consumer satisfied product.
- o Acquisition after companies promise to reducing deforestation with friendly environment purchasing policy.
- o Uncertainty you procurement goods made from virgin forest strength, to create tolerant to cover trustworthy on forestry certified management, similar forest Stewardship Council.
- o To examine the product you buy impression on forest.
- o To instruct community friends and family, how our everyday activities could impact on forest thousands of miles away.
- v. Re-vegetation to avoid soil erosion through wind and water, tress could reduce the local properties of deficiency and assist to preserve normal rainfall pattern.
- vi. Different crop rotation in the similar arena for several dissimilar growing time. Its help to sustain efficiency of the soil through replenishing serious nutrients detached at the time of harvesting.
- vii. The grazing must be rotational, several region where grazing previously leave that will reason enduring impairment by the plants and soil from them area. Through in these few techniques we can reduce the desertification.

#### 4. Case studies to combat desertification.

A case study was conduct in china on sustainable Land management the feelings of the study log time development and adjustment in the history of china`s land use has a well-founded structure, which is usually responsible much experience has been won on sustainable land management much experience has been won on sustainable land. China has managed to feed 22% of the world population on less than 7% of the arable Land use in the whole world. However the soil erosion wind erosion, salinization, deforestation, overgrazing and biodiversity problem are significance to China`s Sustainable Land use in future: clarifying the character of China`s land, finding out problems to sustainable land use and subsequently finding out the needed action and counter measures to be taken.

A case study was conduct of Past present and in Future wind erosion in China.in this research findings shows that wind erosion is one of the most important associated with land degradation and desertification in the arid, semi-arid and portions of sub-tropical areas of China. The total land area experiencing wind 160.74104km<sup>2</sup>, which is 16.7% of the national territory. Wind erosion is recognized as a great threat to land utilization and sustainable social and economic development. Documentation of wind erosion and its negative impact in china dates back over 2000 years. Since the 1950s Chinese scientist have carried out an integrated investigation of the principal land susceptible to wind erosion and have undertaken many laboratories tests and field observations with respects to the stabilization and utilization of soil in desert areas. Since the Late 1970s there has been an increasing concern worldwide regarding land desertification caused by climate changes and human activities. Hence, wind erosion one of the main purpose of desertification the attention of Chinese scientists to an even greater extent. Studies have been conducted to investigate the mechanics, causes and control techniques related to wind erosion using wind tunnel simulation tests and field observations in typical areas. Some encouraging achievements have been made. In this paper we summarize the main research results on wind erosion that have come to light in China in recent decades, and put forward some perspectives and suggestions to deal with problems in both research into and control practices of wind erosion in China.

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