

Nature of Soil and Water Conservation Is an Economic Action

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With our long history of agricultural development, soil and water conservation appeared, which was a great cause in China. During the long time, Chinese people had accumulated a lot of practical experiences about soil and water conservation and created lots of practical technology. Now it develops better. But our developments of soil and water conservation theories are not satisfied. Some theories lagging behind practices can't have a positive effect on practices, while, hinder the development of practices. From most important aspects, some basic theories of soil and water conservation, for example, the category of soil erosion, the definition of calamity nature, the accurate assessment of calamity on soil erosion, the basic approaches of soil and water conservation and other big questions, can't be solved well and they need to discuss more deeply.

1 The accurate definition of soil erosion contents and soil and water conservation category

Now, the most popular and impressive views of soil erosion is: soil erosion is the geologic removal (including abrasion, transportation and sedimentation) of surface material (soil, mother rock and parent material) by wind, water, gravity and other external forces. Some people expanded the category of the whole external force. They put the geologic removal of glacier, ground water and brine into that category. Moreover, some even regarded the geologic endogenic force, for instance, tectonic movement, magmatic explosion explosion and seismic shock as the force of soil erosion. In the book "Chinese encyclopedia of water resource volume", the definition of soil erosion is: soil and its mother rock are damaged, denuded, transported and sedimented by water, wind, freeze-thaw, gravity and other external forces. Several other books have the similar definition. The definition given by *the American Soil and Water conservation Association* is: soil erosion is the land surface abrasion or the dispersion and removal of soil and rock debris by water, wind, ice or gravity and forces. The book of soil conservation written by an English expert says: essentially, soil erosion is a deplanation. It can make soil and rock fragment be transported, rolled or lost by external force. But recently the latest textbook about soil erosion in China, for example, *Soil Erosion Principle*, which was brought out in 2001 and was written by Zhang Hongjiang, regarded tectonic movement and magmatic action as the force of soil erosion. It isn't difficult to find that all definitions about soil erosion looked erosion action as pure natural action and a part or the whole of external force geologic action. Of course, in some other articles with similar basic views, some writers indicated: destruction which people had made to vegetative cover which preserved soil will prompt the external force action, then become accelerated erosion. But they never put accelerated erosion due to human action into a dominant place of concept. If the definition about soil erosion is so above all, we think that we should conceal the concept of soil erosion and directly replace the concept with parts or whole external force of transportation on the view of semantics. Then we may abolish the concept of soil and water conservation. It is said that actually some experts support the opinion. Geologic action by external force is a indispensable pace of matter circulation and ripe soil development on the earth crust surface. And it can't be prevented. However, in our minds all the time soil erosion was regarded as preventative action in order to practice soil and water conservation program. Obviously, those deductions can't be accepted by some experts who supported previous views, but, logically it can't be debatable. So, those definitions about soil erosion have faults. Maybe due to faults, the emphasis of internal and external development on soil erosion is natural aspect of erosion action. And there are abundant achievements on natural on natural aspect. However, human action about erosion development had been confined to the concept of " free reclaiming, free herding, illegal felling, illegal woodcutting "for a long time (in brief, " four illegalities"). There is little development about the reasons that " four freedom" developed and how

confirmed accurately the appearance of “four illegalities”. In relative to those, there is a trend of paying attention to treatment instead of prevention. As a matter of fact, if soil erosion actually is a pure natural course, that way of paying attention to treatment instead of prevention is understandable and even natural. Human being can't find a positive precaution to prevent basically from appearance of various natural disasters, for instance, volcano, earthquake, hurricane and hard rain. At the time, the prevention that we usually called only is some precautions of eluding or decreasing the damage loss, for example, consolidating house to prevent from earthquake, reinforcing embankment to reduce the threat of flood. The matters that people can take positive measures to prevent from damaging, only are disasters that result from people's unreasonable actions. Due to the trend of paying attention to treatment instead of prevention. Our country proposed the soil and water conservation guideline in “Laws of Soil and Water Conservation” that was promulgated in 1991. And some phenomena that had existed in China for a long time of “simultaneous treatment and destruction” and “destruction more than treatment” can't be resolved absolutely. A trend of paying attention to technology instead of economy also was embodied in many aspects of soil and water conservation, so that some popular sayings appear in soil and water conservation. Due to human being action, some damages can't get effective control. This is relative to that trend. Because the destructiveness due to human being action is destruct of protecting soil that resulted from “four illegalities”, it is a kind of economic action itself and can't be solved though technology.

From those statements, we think that those realizations on soil erosion and those definitions about soil and water conservation need to be revised and developed. Maybe in the early time of human being social development, unreasonable cultivating and herding only occurred partly and scatteredly, instead of on scale, so that kind realization on soil erosion is understandable and acceptable. Because that time, people hadn't the concept of rationally utilizing resources. People only could know natural aspects of calamity. At present, however, particularly during the latest 100 to 200 years, with the sharp expansion of population, the rapid development of productivity and the sharp increase of requirement, destruction with human being unreasonable action hadn't been what existed in early time. High-intensive damages with regional scale had changed the nature of calamity from the land capability decrease of small area to the decline of regional ecologic productivity and regional economic sustainable development basement also was destroyed. So, under the present background if we still continue to use those views, they will hinder the practical development of soil and water conservation.

We think the modern concept on soil and water conservation should indicate clearly that it is a disastrous external force process, and it most result from man-made inducement. If we don't know the disastrous character of the process, soil and water conservation program can't stand. Similarly the time and space orientations about soil and water conservation programs also depend on the calamity of nature to confirm. We can't take measures to prevent soil and water loss where water erosion and wind erosion exist. We think the modern concept must include the nature of man-made inducement, because the serious external force transportation with damage character as usually appears after good vegetation is destroyed on scale. However, after fine vegetation is damaged seriously, it has natural reasons, for example, forestry fire, but most reasons result from man-made unreasonable action. In fact, we only can take positive preventative measures to prevent from man-made inducement soil erosion. Emphasizing the man-made inducement nature on soil erosion id help to consolidate our preventative minds on it. In conclusion, we think that the modern definition about soil erosion should be the process of various external force (water, wind, slope gravity), geologic transportation (abrasion, transportation and process of sedimentation) with disastrous results that are induced by man-made unreasonable action.

In accordance with the modern concept on soil erosion, the definition of soil and water conservation can't be only confined to make land resources permanent utilization through technology and legislation. We think that the more comprehensive definition on soil and water conservation should be: working in coordination with the construction and development of regional sustainable development of economic system, to determine the economic basement of regional land resources permanent utilization and developing measures of small watershed to provide technical guarantee for the permanent utilization of resources. Summarily speaking, utilizing means of economy in combination with technology to do the prevention and treatment of regional soil erosion calamity and make sure land resources for permanent utilization.

2 Evaluation of calamity on soil erosion

Before we begin our discussion, we want to analyze and discuss briefly several basic concepts. First, we think, the bad environmental conditions through long man-made or natural historical process, for instance, a succession of mountains and lofty ranges, thousands of gullies and ravines, barren soil, fridity and drought etc., can't be called calamity, only can be regarded as environmental or land states, which are the radical background or aims of land and environmental treatments. So, we think, some definitions which usually appear in articles on soil erosion, for example, gully density, present live, soil thickness which can indicate the bad level of slope erosion, all can't be regarded as soil erosion calamities, and objects of resistance and remedy. Second, according to the theory of calamity the content of calamity evaluation is classified into two kinds. The first is the risky evaluation of calamity, which counts on that we make perceivable some forecasts and evaluations on damage level before calamities occur. Also there are some calamities, which occurs through a long unperceived accumulation, for example, climate warming, the development of ozone-hole. In fact, to some extent soil erosion also belongs to this kind of calamity. Another kind is called as disaster conditions evaluation, which we make realistic evaluation on damage and loss after calamities appear. At present, we often make timely disaster conditions evaluation after earthquakes and storm rains appeared so as to remedy and decrease loss.

It isn't difficult to find that the gap between the present conditions of calamity evaluation on soil erosion and the basic requirement on calamity evaluation is very big. First, disaster conditions evaluations on soil erosion hardly are blank. Except some macro-estimations and forecasts on sedimentation loss of river or lake bed on base of many runoff sedimentation observed datum (in fact these datum can't be the basement of providing disaster relief), there is hardly the standardizing and valuating disaster conditions evaluation on regional erosion that can be regarded as tactics of relieving disaster loss. For example, every year, our country have a disaster conditions evaluation on flood and drought disaster and plant diseases and insect pests, but, we never find a yearly of sometime disaster conditions evaluation on soil erosion. It was reported that the direct economic loss of "Flood in China in 1998" is about 166.6 billion RMB. Maybe it contains some loss due to soil erosion, for example, destroyed farmland by water. Also there are some loss of slope water erosion, which should be included in the total loss. But now we still can't evaluation those loss. Our government hold a national science seminar on relieving natural disaster in Beijing, 1998. During the meeting, academician Ma Zhongjing reported his scientific paper of *General Situation, Tactics and Overall Research on Chinese Serious Natural Disaster*, and provided the assessment of direct economic loss that resulted from natural disaster from 1949 to 1998. He listed several bad calamity types, which are the calamity that can happen most loss, the calamity that has a impressive influence, the calamity that can make people dead most, the calamity that make direct economic loss increase most sharply and the calamity that can make the harm for agriculture serious increasingly. However, he never spoke of the calamity on soil erosion, maybe because we had very few disaster conditions assessments on soil erosion.

3 Risky forecast of the calamity on soil erosion

In this part, first, we think that a lot of experts on soil and water conservation have done massive effective works. Second, we think that the work of this part is not all-round and its accuracy isn't enough to meet practical requirement. We think that it isn't comprehensive because existing much work and plentiful achievement nearly all concentrate on runoff sediment aspects. Those achievements contain not only many sedimentation models of watersheds and overland runoff with different conditions and scales, but also a lot of type charts on soil erosion which express erosion intensity modulus with different accuracies and type regions. We think is not very accurate, because some mathematical models what we have got only experiential and the erosion intensity numbers in all kinds of type charts are evaluated with experience only based on very few runoff sedimentation observed datum, which connected with erosion factors character. Another, the qualitative difference of soil erosion with different regions that one judged only through the erosion intensity indexes depending on the concept tolerant erosion level, is not reliable. Because indexes only point out the relation between quantify and quality on regional erosion that

happened most through slop water and wind (its aim is top soil), and they can't indicate that the relation of quantity and quality on the damage of gulch erosion, gravity erosion and sedimentation.

Above condition on calamity assessment of soil erosion, obviously, have an influence on the proper recognitions and the practices of soil and water conservation. Of course, the first reason that this present situation happens is that works of this part is extremely hard to do. We can't finish those works perfectly according to the present development level of science. Second, it is connected with our recognitory inclining. It isn't difficult to find that our assessments of calamity emphasize excessively on sediment deposition, and the decline of land productivity, due to soil erosion, which is more serious and impressive consequence, isn't enough to evaluate. We think that the decline of land productivity appears in many aspects in serious soil erosion region. The eroded land not only is subjected to nutritious elements loss and effective soil layer becoming thin, but also soil aeration, regional character and activity of soil microorganism, soil structure, soil quality and soil profile became worse. Moreover, when soil erosion happens continually in a region, the regional whole eco-productivity will decline and the resources basement of regional sustainable development also will weaken. With the development of erosion degree, much harm will appear more serious. So it is more difficult to build a new ecological system with more high-level eco-productivity and even, it is difficult to recover the previous eco-productivity. Now, some articles point out that in erosion region the loss of ecological economic system have surpassed the actual loss of sediment deposition. Obviously, improvement and development of calamity assessment on soil erosion are very important for us to do soil and water conservation well.

4 Basic approach on soil and water conservation

The basic approach on soil and water conservation count on what approach we use to solve the prevention and cure of soil erosion calamity. About those work, it is necessary for us to discuss some problems. We can find that soil and water conservation mainly carry out approach of technology treatment through practices for many years. Our country had a long history about soil and water conservation, and our government attached important to soil and water conservation after the liberation. So our country attained great achievement on soil and water conservation (the treatment area is 0.83 million km² in 50 years) and technical level get to a higher degree, even a international place. Though we can't say there aren't difficult, and can't be developed any more, we think lots of regional soil erosion with different complicated conditions can be prevented. as long as we can make full use of existing technical fruits. However, many means of soil and water conservation can't solve the basic problems, that is, appearance and development of man-made damage. Maybe some people think the way of comprehensive control over soil erosion with small watersheds as the controlling units in soil and water conservation, particularly small watersheds economy that was given after that, is a very effective way to solve small watersheds soil erosion. Actually, small watershed economy are our important achievement and they have played a positive role in controlling over soil erosion But we think the comprehensive control of soil erosion with small watersheds as the controlling units only is a basic principle on spatial arrangement of soil and water conservation measures. And also is a technical fruit. It can properly make arrangements for measure system of soil and water conservation. So as to get a ideal good controlling efficiency. The principle have changed basically the situation of scattered, dispersive arrangement on soil and water conservation, which is low efficiency. Small watersheds economy aimed at stimulating enthusiasm of peasants. But it can't resolve the basic problems of regional economic sustainable development and resources permanent utilization. Only great system with some scale and complicated structure can resolve these basic problems. In the present economic world, maybe only all people in the world strive together to solve completely. Small watershed is only a independent hydrometric unit with a small scope and a basic runoff erosion unit with a small scope and a basic runoff erosion unit. However it can't be regarded as a economic unit with distinctive function.

Scales are limited and industrial structures are monotonous in small watersheds, and the restoring capability of eco-system is very bad. Maybe some people think we can control completely soil erosion caused by man through powerful laws, which is " laws of soil and water conservation".

But we think ruling by law only can intercept instead of eliminate soil erosion and can't abolish the prime power which cause soil erosion. What is the prime power? We think it is unsustainable economic

operational mechanism which existed in some places in our society. Man-made damage is a kind of economic action itself and excessive management for land resources. It originates from recognitions and social economy. According to the theory of environmental economy, the excessive management for resources is actually short of recognition about the exterior of economic action. The exterior of economic action indicates the influence that production and consumption of a unit give those of another unit. If the influence is positive, we call it positive economy. Otherwise, we call it negative economy. Development of erosion intensity due to man-made "Four illegalities" is typical negative economy. Main objects of environmental economy are to try its best to weaken and eliminate negative economy. According to the basic principles of environmental economy, the most simple and basic way of abolishing externalism is to change externalism into internalism. We can realize this transformation only through improving the cost of economic action and the utilizing cost of resources. If the building of roads and factories worsen the environment of soil erosion and promote the development of soil erosion, we may increase a sum of money to restore the prime environment. The transformation isn't difficult to realize when the economic action is caused by government or big group. But when the unreasonable utilization of resources is caused by peasants who lived in mountains, the transformation is difficult to come true. About it we have a rough proposition. We can call a special economic region which is classified according to the similar calamity of soil erosion the economic experimental region of soil and water conservation. The goal of building the experimental region is to attempt to depend on own strength instead of outside supporting to resolve regional economic problems in the course of the building and development of regional sustainable economic system. In experimental regions, every departments should become a untied entity. All or main problems should be resolved by themselves, that is, when we control the regional soil erosion, the fee of treatment can't be given completely by our government and departments of agriculture, forestry and water resources. We think the fee should be allotted reasonably. The work of soil and water conservation will engender good positive economy and make the whole region better. If productions and consumptions of some units may emerge negative economy, all departments which are damaged will manage together. So it takes on a good look of all people focusing on soil and water conservation. Of course, the experimental region should have a big area and even can cross other provinces. We should also take into account of watershed limitations. In a big region all superiorities of resources may get orderly distribution by sound market. Meanwhile, they can get the right of legislation so as to have a education of special policy and environmental protection. Though the proposition seems to be too simple and rough, it can bring us one way of thinking.