Accounting on Ecological Environment Value of Soil and Water Conservation

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Abstract: To unify the direct benefit in production practice and that from ecological environment of soil and water conservation, and to make analysis of economics, is thought as the principle content of the study for ecological environment value of soil and water conservation. The limitation of the common analysis for soil and water conservation was reviewed briefly. The paper raised the study system and the ways to account value of ecological environment value from soil and water conservation.
Keywords: ecological environment value, soil and water conservation, accounting

1 Introduction

It is reported that the soil and water loss area is 25 million km^2 in the world, which is amounted to 16.8% of the global area with annual soil loss amount for 260×10^8 t, of it the soil and water loss area in China is 3.67 million km^2 with annual soil loss for over 50×10^8 t[1].Due to the soil and water loss, the ecological environment and development of social economy was damaged seriously in the countries or regions related. In China land area lost in a year is computed as large as 13.3×10^4 hm^2, and is estimated as the loss of 20×10^8 Yuan(RMB) in the cost of 15,000 Yuan/ hm^2[2]。Of the 16×10^8 t sediment in a year from soil and water loss in China, about 4×10^7 t nitrogen, phosphorous and potassium were contained, those lost in America from erosion of surface soil with annual rate of 6.28mm/hm^2 could be converted to 280×10^8 US dollars. In India the serious soil erosion has lasted for centuries because of irrational production practice in agriculture, it was said that the soil and water loss could be amounted to 53.33×10^8 t, 29% of which was transported to sea, 61% was deposited in channel, lake and river, and 10% was retarded in reservoirs. Large area of desert and soil loss were made due to deforestation in Africa and Australia. In a word, the global situation of soil and water loss could be generalized as that the area of soil and water loss is being expanded, the vegetation of forest and grassland are being deflated gradually due to grievous damage, but the speed of dersertification is accelerated; the natural disasters such as drought, storm of sand and dust occur frequently; farmland is reduced and soil degenerated; water resource is decreased greatly and environment pollution is aggravated. All these impact the sustainable development of the mankind strictly.

The practice has demonstrated that the soil and water conservation has significant meaning to improve ecological environment and to realize sustainable development of social economy. It is known that soil and water conservation could protect and improve land resource, raise land productivity; decrease sediment of river and improve hydrological condition and water quality of river, reduce disasters of flood and waterlog, which could protect safety of lives and property, raise or prolong benefits from engineerings of water conservancy; protect industry and mine, communication, promote shipping; facilitate production in farm, forestry and animal husbandry through improvement of ecological environment conditions. It is thought that well-done soil and water conservation have profitable effects on both ecological environment and development of social economy.

However, the understanding to soil and water conservation value is illegible since there has not been identical index system and method to calculate the benefits of soil and water conservation due to the variation of objectives and way to consider although the effect of soil and water conservation was confirmed, which touches evaluation of soil and water conservation effect, this further effects the related departments of government and policy decision in thinking and attitude. To unify direct benefit of

production and indirect benefit from ecological environment of soil and water conservation into one study system, the results from which with the opinion of economic might be more objective, comprehensive and systematic, and its conclusion and suggestion to the manager is more useful and have better effect. is thought to be the principal content in accounting of ecological environment value of soil and water conservation.

2 Ecological environment value of soil and water conservation

2.1 Ecological environment function of soil and water conservation

Of the special measures in practice, soil and water conservation includes biological (forest and grass or vegetation), engineering and farming measures. In function, it mainly affects resources of soil and water, environment conditions and living quality of human being, as is shown in Figure 1.

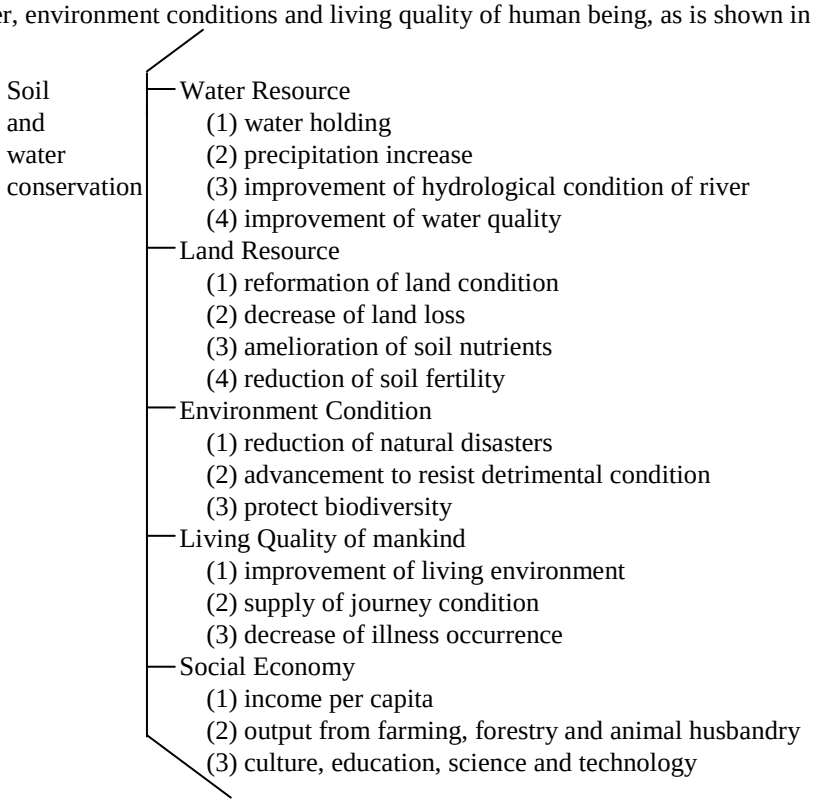

Fig. 1 sketch map of soil and water conservation function and benefit

It is thought that soil and water conservation is an economy activity with strong intention. In most case, especially in poor mountainous areas or hills, the production aim is to raise yields of grain and fruits, or to increase products from animal husbandry to obtain direct economic earnings. The reasonable and effective activity of production does not only achieve higher output or economy benefits, but also enhance the amelioration of ecological environment in hill regions, such as terrace construction and planting shrubs on ridge of field. However, some of the production activity, such as tillage on steep slope, reclamation of barren land and deforesting for farming, might obtain higher income of economy in part place or short time, but damage conditions of ecological environment for sustainable development of production, which certainly impacts the production and income in future. The soil and water conservation per se produces little direct value of economy, but exerts important effects on ecology, economy and society through improvements of ecological environment condition, production conditions for farming, forestry and animal husbandry, and living quality of mankind. Considering on economics of environment, the value of ecological environment of soil and water conservation should not be ignored.

2.2 Value of ecological environment of soil and water conservation

When the method of value accounting is used various kinds of function or its benefit from ecological environment could be unified in one system, and it is possible to compare benefit of soil and water conservation in different case from each other. The results of value accounting sets base for establishment of policy, principle and methods of benefits compensation.

The value accounting could be made according to the measures, functions or benefits of soil and water conservation as well as cost and price related.

2.2.1 Value to protect water resource. All of the engineering, biological and farming technical measures of soil and water conservation have the value

(1) water holding. In comparison with the land with no measure, the engineering measures including dry well, stove and vault, pond, check dam, and silt-deposition dam etc. could hold and store more water from precipitation, fountain and river; forest, grassland and terrace could conserve precipitation efficiently.

(2) precipitation increasing. Result from investigation demonstrates that rainfall in forest area is more than it without forest.

(3) improvement of hydrological condition of river. It is thought that the measures of channal control, vegetation increase in watershed, etc. could decrease or avoid the occurrence of disaster from flood and waterlogging.

(4) improvement of water quality. In the upper reaches of channel, lake or other water body the comprehensive management of soil and water conservation could not only reduce sediment transportation, but also decrease pollution of water quality.

2.2.2 Value to protect land resource. It is incarnated in three aspects

(1) melioration of land condition. The measures such as slope transformed into terrace, contour furrow, making fish-scale pit, building shelterbelt, etc., ameliorates the condition for production, which makes the barren slope to be estate with higher value of production.

(2) reduction of land loss. The soil and water conservation measures can control soil erosion, reduce soil loss and land degeneration, thus prevent the loss of land resource.

(3) melioration of soil nutrients. For example, vegetation could improve the physical and chemical properties of soil, soil nutrients could be increased thanks to the withered matter and effect of plant root.

(4) reduction of soil fertility loss. The farming measure such as terrace and biological measure such as vegetation construction could not only control soil loss, but also reduce the loss of N, P, K and organic matter.

2.2.3 Value to meliorate environment condition. Soil and water conservation has significant effect on ecological environment

(1) reduction of natural disasters. A lot kinds of disasters, such as soil collaps, slope slide, debris flow, drought, flooding and water logging, etc., could be reduced or prevented.

(2) enhancement of resist ability of the system to the bad conditions. The comprehensive management of soil and water condition could raise ability of an area or watershed to counteract disbeneficial conditions of climate, topography, etc..

(3) safeguarding biodiversity. The amelioration of natural condition is propitious to both protection and improvement of ecological environment function and existence and development of various species.

2.2.4 Value to raise living quality of mankind

(1) amelioration of living environment. Construction of water conservancy and soil conservation engineering, planting in optimal configuration could have effect of soil and water conservation, and reform relief landscape at great extent, increase its esthetics value. Also the green vegetation could improve environment condition of atmosphere effectively.

(2) supply of journey condition. Construction of various kinds of shelter-belts, economy forests and green vegetation in rational arrangement of tree, shrub and grass would create certain economy value,

important values of ecology, esthetics and entertainment. It is seen that the journey and tour points was constructed through soil and water conservation measures.

(3) decrease of illness. As the conditions for production and living as well as ecological environment are improved, the health level of people is raised.

2.2.5 Value to improve economy and social condition

(1) Raise of net income per capita. It is profited from improvement of ecological environment condition and regulation of production structure.

(2) Increase output of farming, forest and animal husbandry. The output of practicality and currency could be increased through optimization of land use plan, readjustment of production structure, improvement of flora and fauna species, and application of science and technology.

(3) Science, technology, education and social culture would be developed. Soil and water conservation work needs the natural and social science as base, the implementation of the measures should be designed and guided by science. From soil and water conservation work, the professional workers could be cultivated, scientific study would be promoted, and the local society and culture would be impulsed.

2.3 Accounting of ecological environment value of soil and water conservation

It is thought that the soil and water conservation is a kind of human activity to improve ecology, economy and society system, and it has not economy value per se. But the soil and water conservation could produce ecological function of benefit, i.e., ecological environment value. The evaluation of the value consists of 2 parts of calculation, the accountings of cost and ecological environment value of soil and water conservation.

The cost for soil and water conservation includes various kinds of substance input such as seed and chemical fertilizer, energy input such as human labor, non-substance input such as fund and science and technology[3]. All these input could be converted into monetary input through transformation and regulation. As is indicated above the ecological environment value of soil and water conservation could be incarnated in 5 aspects, the valuation of these needs quantification of the functions and the benefits, and determination of their prices. It is thought that the benefit from soil and water conservation is an exterior and public commodity with no market price and value. Due to publicity of the benefit it could be looked as a social capital. In reference with the international methods to study the commodity, it is raised to calculate ecological environment value of soil and water conservation using the ways below.

(1) Market value method[4]：The value is calculated with quantified function or benefit and corresponding price of market.

(2) Condition value method: It is used to evaluate the value of the commodity being lack of practical market and substituting market exchange. It is mainly expressed by WTP(willness to pay), which is composed of practical output and surplus from consumer.

(3) Journey cost: The tour expenditure, generally including travel expenditure and payment of visit tickets, is used to show consumer surplus for the “tour commodity” and as tour value of forest.

(4) Enjoyment price method: It is mainly used to estimate value of land resource. The study from western countries shows that trees could increase the price of realty for 5%—10%; but one point percent increase of environment pollution material could reduce the price for 0.05%—0.10%.

In addition, there are other methods, including shadow engineering, increase of underground runoff and cut loss, etc.[5].

3 Suggestion

Of the various kinds of ecological engineerings, the soil and water conservation is the kernel content. Under market economy condition and environment problem globalized situation, to quantify the function or benefit of soil and water conservation is of great importance. It is suggested that:

(1) to study and develop comprehensive and practical index system for ecological environment value of soil and water conservation as well as the accounting methods;

(2) to account the value of the soil and water conservation engineering actively;
(3) to enhance the cooperative research with the related specialties and disciplines.

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