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Utilization benefit of cultivated land and land institution reforms: Economy, society and ecology

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ABSTRACT

Food security is a condition related to the supply of food, and individuals' access to it. Africa is a region with the highest hunger prevalence in the world and the number of hungry people is increasing. One of the most important reasons is that the utilization benefit of cultivated land (UBCL) in Africa always lags behind other regions of the world. Based on the definition of UBCL and associated with land decentralization, land property rights and land marketization reforms, we develop a theoretical framework for this study, in which the total UBCL is divided into economic, social and ecological UBCL. An index system is then built to evaluate the different kinds of UBCL and examine the relationship between these and land institution reforms. We find that (1) failed land property rights reforms can lead to low ecological UBCL; (2) unsuccessful land marketization reforms can lead to low economic UBCL; (3) paternalistic land institutionalization has advantages but it is not sustainable for raising the UBCL in the long run; (4) an unstable political environment can hinder land institution reforms and lead to low social UBCL; and (5) successful land institution reforms have a great potential for raising the total UBCL. According to the analysis, we conclude that the farmers' enthusiasm can be motivated by land institution reforms, while further improving food production and enhancing the UBCL.

1. Introduction

Cultivated land is defined as a “nature-economy-society” complex ecosystem where contains material cycle and energy transportation (Li, Wu, Huang, Sloan, & Skitmore, 2017). All the ecosystem service functions of cultivated land are based on this ecosystem process (Raum, 2017). Cultivated land use is a process by which people make use of the ecosystem service functions of cultivated land to meet their own needs. The ecosystem service functions of cultivated land can be divided into two parts: a product-producing function and a life system supporting function (Liquete, Cid, Lanzanova, Grizzetti, & Reynaud, 2016). The products of cultivated land are the material products that can generate direct benefits for people during the process of cultivated land use, while the life system supporting function is neither constituted by physical form nor does it construct the specific parts of commercial value (Ghaley & Porter, 2014). However, the effects generated by the life system supporting function have natural and social attributes. So the utilization benefit of cultivated land (UBCL) can be defined as the direct or indirect benefits that are produced during the process of the

service functions being used by human society, including economic, social and ecological benefits (Karp et al., 2015).

Based on this definition, and associated with the land-institution reform effect, we developed the theoretical framework shown in Fig. 1 for this study. According to the types and mechanisms of the ecosystem service functions of cultivated land, we can define the economic, social and ecological benefits respectively. The *economic UBCL* comprises material achievements and monetary profits under certain conditions of investment and market requirements. These are the object of such cultivated land ecosystem products as food crops, economic crops and fiber material (Li, Saphores, & Gillespie, 2015b). The amount of economic UBCL should take investment and market price into account. The *ecological UBCL* is the total benefits of the cultivated land ecological system that are intervened and controlled by humans, and are the benefits that have no business with the human sensations produced by physical and chemical factors (Liang, Xin, Dongsheng, Xiuying, & Guodong, 2016). *Social UBCL*, on the other hand, is the macroscopic effects of the ecosystem service functions of cultivated land on the human individual's spiritual world and the development of human

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Fig. 1. Theoretical framework.

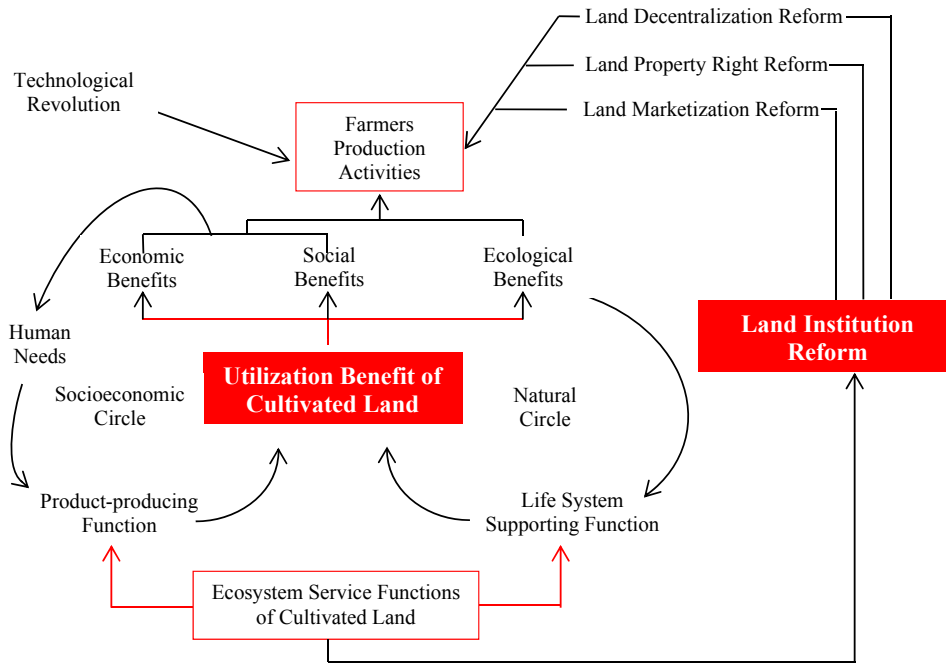


Table 1
Utilization benefit of cultivated land Index System.

First grade indices	Weight	Second grade indices	Weight	Calculation formula
Economic benefits	0.38	Grain yield per hectare	0.23	Total output of crops/cultivated land area
		Increased rate of agricultural output	0.20	Added value of agriculture/total value of agricultural output
		Degree of agricultural mechanization	0.15	Total agricultural machinery/cultivated land area
Social benefits	0.33	Urbanization rate	0.15	Urban population/total population
		Technical efficiency	0.08	Total value of agricultural output/total agricultural machinery
		Efficiency of financial investment	0.19	Total value of agricultural output/fiscal investment in agriculture
		Per capita grain yield	0.21	Total output of crops/total population
		Social demand satisfaction	0.28	Per capita food consumption/255 kg (per capita basic food demand stipulated by the United Nations)
Ecological benefits	0.29	Per capita agricultural GDP	0.12	Total value of agricultural output/total population
		Farmland areas per capita	0.11	Cultivated land area/total population
		Level of human capital	0.13	The number of agricultural workers with a high school degree or above/total number of agricultural workers
		Labor metastasis index	0.15	Urban population/population of agricultural workers
		Drought and flood index	0.20	The land area to ensure stable yields despite drought or excessive rain/cultivated land area
		Percentage of forest cover	0.09	Forest area/land area
		Irrigated area rate	0.13	The effective irrigation area/cultivated land area
		Fertilizer use rate	0.18	Amount of fertilizer application/cultivated land area
		Multiple cropping index	0.13	Sown area of crops/cultivated land area
		Land load	0.08	Total population/cultivated land area
Efficiency of energy use	0.19	Energy consumption of agriculture/total value of agricultural output		

society (Schmidt, Sachse, & Walz, 2016). Social UBCL has a non-physical form and is the sublimation of economic and ecological benefits.

Many factors can affect the UBCL, of which land institution is one of the most important. Land institution reform belongs to endogenous factors, compared with exterior factors such as natural condition, labor force and capital (Jürgenson, 2016). The farmers' enthusiasm can be motivated by land institution reforms, further improve food production and enhance the UBCL. When a new land institution is developed, it can conflict with the traditional land institution and result in a dual land institution, which leads to vagueness in land rights and impaired crop production. These all hinder the improvement of the UBCL. We classify land institution reforms in Africa into land decentralization, land property rights and land marketization reform. *Land decentralization reforms* refer to the devolution of land allocation rights, land management rights and land decision-making rights from the central to local government (Deininger & May 2016); *land property rights reforms* include land private ownership, state ownership of land and recognition

of traditional land property rights (Sanchez, Swaminathan, Dobbie, & Yuksel, 2005); while *land marketization reforms* mainly focus on land leasing and land trading, with the subject of the transaction complying with the laws of the market (Li, Huang, Kwan, Bao, & Jefferson, 2015a).

2. Methodology and data

2.1. Index screening and data selection

Cultivated land is a complex subsystem of the agricultural ecosystem. When people make use of cultivated land to create economic values, they also influence such society development as increasing the employment rate, income distribution justice, improving working conditions, improving the level of health and improving national defense capacity. We use other study results (Zhang & Song, 2009; Zhang, Qin, & YAN, 2013) combined with the definition of cultivated land use, economic, social and ecological benefits as first grade indices before

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