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Designing land taxes to promote conservation through use of rangelands : bio-economic modeling of farm decision-making in southern Namibia

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Key words : bio-economic modeling , institutional incentive , land tax , Namibia , rangeland conservation

Introduction In reaction to the skewed land distribution inherited at independence , the Namibian government is engaged in a land reform . One of the tools of the reform is the new agricultural land taxation scheme , implemented in 2006 . The objectives of the land tax are , among others , to encourage productive use of the land as well as to ensure funds for land redistribution . However , it has been suggested that the tax , calculated at a fixed rate per ha of farmland , could represent an additional financial burden for the farm and encourage farmers to increase stocking rates , increasing the risk of overgrazing and degradation (LAC 2005) . The objective of this paper is to test the impact of the new taxation scheme on stocking practices and their ecological consequences for rangeland quality . In addition , we propose alternative taxation schemes which explore the potential of taxes to foster rangeland on-farm conservation .

Materials and methods We used a bio-economic and recursive optimization farm model , able to simulate farmer decision making and strategies on the long term . It enables us to predict responses of farmers to changes in the economic environment and thus the ecological impact of a new tax . The model was parameterized for our case study region in the arid dwarf shrub savanna where farms are 10 ,000 ha on average , annual incomes vary with prices and rainfall from 200 to 450 KNAD with minimum costs of about 250 KNAD . Rangeland ecology was depicted thanks to use of a State-and-transition model with 6 states of rangeland health , defined with jointly with ecologists , farmers and local experts and characterized by their grass and bush vegetation cover . Through the optimization (20 years) , each state has a marginal value which represents its actual production value in NAD/ha . We tested four different taxation scenarios based on the actual taxation procedure (table 1) . The tax level at the moment is very low : 0.75% of the USV (Unimproved Site Value) , which reflects the productive potential of the land . In the proposed incentive and punitive scenarios , we make use of the marginal value to modulate the USV and link the taxation level to the state (or conservation level) of the range .

Table 1 Four taxation scenarios : definition , ecological impact , stocking rate and total tax income per farm .

scenarii	principle	definition	ha in high quality	ha in poor quality	# SSU	tax per farm KNAD/y	
base	no tax	none	3529	3248	1577	0	
current	Potential productivity	0.75% * USV	3499	3285	1601	1.35	
actual tax rate	punitive	stick	0.75 * (USV + [USV-marginal value])	3679	2849	1606	2.839
	incentive	carrot	0.75% * marginal value-USV)	3880	2348	1590	1.11
tax rate 10.75%	current	Potential productivity	same as above	3569	3144	1618	19.35

Results Selected results are given in table 1 . At its actual level , taxation seems to have an impact neither on herd management strategies nor on the average rangeland condition . Even if the tax rate increased of 10% of the USV , we do not observe a significant change as compared to the no-tax scenario . This might relate to the low amount of yearly taxes as compared to the fixed costs of the farm . Further , we observe that the punitive and incentive schemes have an impact both on herd management and stocking rates applied as well as on the rangeland condition . However , the effect is much greater in the case of the incentive scheme . A slightly greater part of the farm rangeland is in good condition and more importantly the area in poor condition is reduced of 30% . Interestingly , the effect is the same at low (0.75) or higher (10.75) tax rates .

Conclusions In the studied system , agricultural land taxes in their present form are not likely to have an impact on farming strategies or to lead to rangeland degradation . However , if designed properly with differentiated tax rates according to the state of the rangeland , taxation has the potential to be an effective tool to foster on-farm conservation , as revealed by this paper .

Reference

Legal Assistance Center (LAC) , 2005 , Our land we farm-An analysis of the Namibian commercial agricultural land reform process . Abassade van het Koninkrijk der Nederlanden , Windhoek , Namibia . 63pp .