

Development of sustainable land management policies and practices in five selected countries from 1960 to 2010.

J. de Graaff¹, A. Aklilu², M. Ouessar³, S. Asins-Velis⁴ and A. Kessler¹

¹ Land Degradation and Development Group; Wageningen University, P.O. Box47, 6700 AA Wageningen, The Netherlands.

² Addis Ababa University, Department of Geography and Environmental Studies; P.O.Box 150223, Addis Ababa, Ethiopia.

³ Institut des Regions Arides (IRA); 4119 Médenine, Tunisia.

⁴ Department of Environmental Planning. Centro de Investigaciones sobre Desertificación-CIDE (CSIC, Universitat de València, Generalitat Valenciana). Carretera de Moncada a Náquera, Km 4,5. 46113 Moncada (Valencia), Spain.

ABSTRACT

Since the 1930s there has been worldwide concern about the effects of land degradation. After the problems experienced in the Dust Bowl in the USA, much attention was paid to soil and water conservation in both developed and developing countries. Initially Governments have stimulated the establishment of physical control measures, such as terraces and check dams, and reforestation. This was achieved through top-down regulations, and Forestry Departments were often in charge of the implementation. Subsequently the measures were implemented through more specialised agencies, and later with incentives, such as food aid. In some cases farmers were mobilised to work together on the establishment of the measures. Because of the low success rate of this top-down approach with line interventions, it was realised that a more participatory approach had to be followed. And the emphasis then shifted to area interventions such as cover crops, mulching and composting. In some countries voluntary ways of collaboration between farmers were developed. More recently Conservation Agriculture has been promoted, focusing on less soil disturbance, continuous land cover and crop rotations. This paper analyses whether and to what extent countries have followed such general trends in their soil and water conservation policies, since the 1990s often referred to as sustainable land management, or whether countries have also followed their own specific strategies. A historical (1960-2010) and comparative analysis of the development of these sustainable land management policies and practices is made in five selected countries (Indonesia, Ethiopia, Tunisia, Spain and Bolivia).

Keywords: soil and water conservation, sustainable land management, policies, approaches, practices

INTRODUCTION

Although Thomas Jefferson in 1789 already remarked that “The earth belongs in usufruct to the living”, it is in particular in the last 200 years that soils have in many areas been damaged beyond repair (FAO, 1988). The extreme wind erosion events in the USA in the 1930s in the so-called Dustbowl area formed in fact a sort of wake up call. Since that time many attempts were made to reduce land degradation, by planting trees, constructing terraces etc. While it were initially colonial powers and dictatorial regimes in the vulnerable (sub-) tropical areas, who “ordered” such measures to be taken, after independence and installation of more democratic regimes similar measures were promoted, but more on a voluntary basis. From 1960-1990 one generally referred to “soil and water conservation” projects and policies. But since the introduction of the term sustainable, which became popular after its use by the “Brundlandt report” (WCED, 1987) in their publication “Our common future”, a gradual shift towards the use of the term “Sustainable land management (SLM)” can be noticed. Although some authors (e.g. Pimentel et al., 1995) have suggested that the impact of land degradation is not that catastrophic as others (e.g. Stoorvogel and Smaling, 1990) have suggested, land degradation is a major concern in many countries, and this requires adequate sustainable land management policies and practices.

Over the past five decades national governments have devised various policies to protect their land and water resources and to control and avoid land degradation and rehabilitate degraded lands. In this paper we compare soil and water conservation (SWC) related policies and SWC measures implemented in five different countries to see whether these policies have followed similar trends and outcome, and what conclusions can be drawn from the experience with those policies and the resulting SWC measures.

METHODS

For this comparative study five countries have been selected in different continents and agro-ecological zones, from east to west: Indonesia, Ethiopia, Tunisia, Spain and Bolivia. While Indonesia, Ethiopia and Bolivia are within the tropics and all three have lowlands and highlands, Tunisia and Spain are in the Mediterranean zone and have largely a subtropical Mediterranean climate. After having collected some basic comparable data on the state of land use and land degradation in these countries, we have analysed policies, institutions and programmes for soil and water conservation (SWC) that have been developed in those countries in the past five decades (1960-2010), in order to make a comparative analysis. We realise that policies and SWC measures

Table 1 Land use (in 2009) and population (in 1961 and 2009) in the five countries

Country	Total land Area	Cropland in 2009	Irrigated in 2009	Forest land, as % of total area		Population (million)		Pop. Density (p/km ²)	
	Million ha	% of total	% of cropl.	1990	2009	1961	2009	1961	2009
Indonesia	181	24	16	65	53	94	237	52	131
Ethiopia	100	15	2	15	12	25	81	22	81
Tunisia	16	32	9	4	6	4	10	28	67
Spain	50	35	22	28	36	31	46	61	91
Bolivia	108	4	5	58	53	3	10	3	9

Source: FAOSTAT, 2012

Table 2 Land and water resources and use (in 2009)

Country	(Very) severe land degradation (%)		Actual erosion & desertification risk (%)		Soil fertility (NPK) maintenance on cropland		Average rainfall	Renewable water	Withdrawal as part of renewable
	Total	Agricult	Erosion	Desertif.	Kg nutrients/ha		mm/yr	m ³ /cap.yr	%
					2002	2009			
Indonesia	37	11	47	1	70	100	2702	8504	5.6
Ethiopia	31	6	31	63	16	7	848	1503	4.6
Tunisia	77	31	14	68	14	23	207	443	62.0
Spain	38	6	26	3	119	70	636	2443	32.9
Bolivia	28	3	23	25	4	6	1146	63696	0.3

Source: FAOSTAT, 2012; TERRASTAT, 2012

can vary considerably by area (e.g. agro-ecological zone) and that a multitude of projects may follow different approaches. We follow there the main stream of policies and SWC measures that were applied in the respective periods.

RESULTS

Land use and land degradation in the five selected countries

The five countries considered in this analysis differ not only in size, in agro-ecological zonation and GNP per capita, but also in such related aspects as land use and (rural) population density (Table 1). These countries have in common that they all five have experienced major problems with land degradation in the past decennia, and in particular with water erosion in their mountainous zones, as can be seen on the GLASOD map (Oldeman et al., 1991) and in the land degradation figures in FAOSTAT and Terrastat (Table 2).

Indonesia and Ethiopia are large countries with an on average high population density (Table 1), and in particular in rural areas. In Indonesia this has led to severe deforestation and soil erosion on the very densely populated island of Java and on parts of the other islands, where many oil palm plantations have been established. In some areas in Ethiopia there is no forest left, and people have become used to "dungcakes" as fuel, thereby reducing soil fertility (Amsalu, 2006). Both countries have overall enough rainfall and water resources (Table 2), but large parts of Ethiopia experience regular drought periods and are in fact subject to desertification risk. Bolivia on the contrary has in its low lands, which make up three fourth of the country, a very low population density and still ample forest and water resources, which contrast sharply with the bare and erosion prone highland areas (Zimmerer, 2004). Spain

and Tunisia have to considerable extent a Mediterranean climate and vegetation. The southern part of Tunisia consists already of desert, where wind erosion is a major problem and most other land shows a high desertification risk. Both countries have problems with water supply for agriculture and other uses, and have much land that is severely degraded (Hamza, 1991; Cerda, 2008). Spain has also some sub-humid zones and has still some large forest reserves.

Comparative analysis of development (1960-2010)

We made for each of the five countries a short review of how soil and water conservation policies and measures have developed over time. These reviews are not shown in this short paper. When comparing these five short country stories about the development of policies and practices on Soil and Water Conservation or Sustainable Land Management over the period 1960-2010, a few common aspects stand out (Table 3). First of all it becomes clear that soil and water conservation policies and approaches varied according to the political regime: Indonesia and Tunisia have initially and Ethiopia later on gone through a period of socialism, sometimes also referred to as communism, in which land reforms were undertaken, large properties were nationalised and various forms of collective farming and soil and water conservation methods were "imposed". Secondly, in the early period much attention was given to reforestation and terracing, and thirdly in most cases Forestry Departments or Ministries were primarily in charge. Both from an institutional and from a geomorphology point of view, it consisted of a top-down approach. While Forestry departments were relatively effective in reforestation on public land, they had usually no formal link with the farmers, and the implementation of terracing, etc. on private land was therefore not done in a participatory manner.

Table 3: Comparative overview of the influence of regimes and special (triggering) events on SWC policies and practices in three distinct periods from 1960-2010.

	Indonesia	Ethiopia	Tunisia	Spain	Bolivia
<i>Period 1</i>	<i>Upto 1965</i>	<i>Upto 1974</i>	<i>Upto 1969</i>	<i>Upto 1975</i>	<i>Upto 1982</i>
Regime	Socialist	Feudal	Socialist	Dictatorship	Mil. Dictatorship
Events	-	Droughts	Flooding (69*)	Flooding	Degraded highland
		Famine (73*)	(Kairouan)	(62,73*)	
Institutions	Min of Forestry	Landlords/tenants	Production Coops	Soil Con Serv.	No national SWC
			Min. of Forestry	/ICONA	policy
Approaches	Land reform	Focus on large farms	Land reform	Large scale	Resettlement; Integ. Rural Development
Main measures	Terraces, Gully control	Only few measures	Banquettes, reforestation	Reforestation, terracing	Traditional farming practices
<i>Period 2</i>	<i>1966-1998</i>	<i>1974-1991</i>	<i>1969-1987</i>	<i>1975-1986</i>	<i>1982-2005</i>
Regime	Authoritarian	Socialist	Mixed	Mixed	Mixed/short-lived
Events	Flooding (66*)	Drought, famine	Flooding	-	-
Institutions	Six ministries; prov/district units	Production Coops	CRDA, WFP	Auton. Comm.	Weak Ext Service / NGOs; municipality
		SCRIP (82-95)			Market liberalis.
Approaches	Demonstration plots (10 ha)	Land reform/ Food for Work	Food for Work Service coops.	SWC plans	Incentives by NGOs
Main measures	Terraces, Gully control	Stone terraces, Fanya juu,	Cactus rows, fruit trees+half-moon t.	Reforestation	Isolated SWC measures
<i>Period 3</i>	<i>1998-2010</i>	<i>1991-2010</i>	<i>1987-2010</i>	<i>1986-2010</i>	<i>2006-2010</i>
Regime	Democratic	Mixed	Autocratic	Part of EU	Socialist
Events	Flooding(03,07*)	War, drought, Flooding (06*)	Flooding (90*), Droughts	Land abandoned	-
Institutions	Prov/district units	Federal SC units	Soil Cons. Serv.	CAP; Ministerio Medio Ambiente	Municipalities still formal responsible
				Agri.Envir.Meas., Cross-compliance	National Soil Mgt Plan
Approaches	External projects for catchments	ADLI, also still mass mobiliz.	Focus on water conservation	Reforestation, CA, cover crops	Land use on basis soil capacity
Main measures	Various; start with CA	Soil&stone bunds, drainage ditches	Lacs collinaires, SWC, Water harv		

“*” Figures relate to years that floods, famine, etc. occurred.

Abbreviations used: ADLI: Agricultural Development Led Industrialization; CAP: Common Agricultural Policy (EU); CRDA: Commissariat Régionale de Développement Agricole; ICONA: Instituto Nacional para la Conservación de la Naturaleza; SCRIP= Eth./Swiss Soil Conservation Research Project; WFP: World Food Programme.

Shiferaw et al. (2009) do refer to three phases with different approaches: in the first phase, generally until the mid 1980s, the focus was on “top-down” implementation of terracing and tree planting. This was also referred to as “the command-and-control approach”. Then in a second phase, appearing in the late 1980s the emphasis was on a more “populist” approach, inspired by Farmer First (Chambers et al., 1989) and stressing bottom-up approaches and dealing with rapid rural appraisals, and village level mapping and planning as a learning process (van den Hoek, 1992). In the late 1990 this was followed by a neo-liberal approach, whereby innovation was assumed to be the result of a favourable economic, institutional and policy environment (Robbins and Williams, 2005).

These three phases can indeed be distinguished in the five countries, although their inception and phasing out were not always in the same period, which was partly related to the respective political regimes. In Indonesia the phases can in fact not be distinguished that easily, since the original leftist regime (before 1966) was until 1998 followed by a right wing authoritarian regime, which also followed a top-down approach in soil and water conservation. This included for example a national programme for 10 ha terracing demonstration areas (de Graaff, 1996). Various projects and programmes introduced more

participatory approaches, but not on a large scale. And while in the lowlands the rice sector was in the 70s and 80s stimulated with financial, market and institutional incentives, such a strategy was not followed for sustainable farming in the uplands. In Ethiopia the socialist regime came later and lasted until 1991, and created through its type of land reform, with land redistributions, better access to land for small farmers, but at the same time a continuous land tenure insecurity. And, although debated, that was often a disincentive for soil and water conservation. In Tunisia the land policies of the leftist regime in the 1960s were despised to such extent that terraces made in that period were not maintained and no specific SWC efforts were undertaken in the 1970s. The establishment of a SWC division in 1984 and national SWC strategies in the last twenty years led to the promotion of more vegetative measures, and gradually to more participatory approaches (FAO, 2008). Under the dictatorship of Franco, large scale reforestation and terracing were undertaken in Spain, first by the Soil Conservation Service and later by ICONA (Solé Benet, 2006). After his death in 1975, a decentralisation towards the Autonomous Communities took place. And after Spain’s entry in the European Union, farmers could apply for direct aids for their crops, subject to cross-compliance for good farming practices since 2006, and to additional Agri-Environmental Measures for

soil and water conservation and other purposes (EC, 2005; EC, 2009). During the period of various military dictatorships in Bolivia until 1982, a redistributive land reform was undertaken, although it eventually did not cover a large area. In the period thereafter the focus was on Integrated Rural Development Programmes, but these focussed not much on agriculture. And subsequently emphasis was given to market liberalisation, whereby little attention was given to agricultural extension, leaving rural areas in stagnation (Zoomers, 1998). Soil and water conservation activities were mostly promoted by international aid agencies and NGOs.

Since soil erosion is mostly a continuous and very slow, almost invisible, process nor farmers nor policymakers do attach a high priority to SWC measures in their daily decision-making. But certain events can trigger efforts for SWC to a large extent, and this concerns in particular the large floods, such as those that occurred in Indonesia in 1966 (Solo) and recently in 2003 and 2007, in Ethiopia in 2006 (Omo River Delta), in Tunisia in 1969 (around Kairouan) and in 1990 and in southern Spain in 1962, 1973, 1989 and 2010. Only after these highly damaging flood events, all with the loss of 100 to 1000 lives (Wikipedia, 2012), the need for proper soil protection in the upper parts of watersheds was acknowledged. And in Ethiopia land degradation got more serious attention after the periods of droughts and famine in the years around 1973, 1985 and 2010. Then it was realised what enormous effects deforestation and insufficient erosion control and soil fertility maintenance can have on the land productivity. In Spain, and also other EU countries, land abandonment has in the last 20 years been a factor that directly or indirectly, through fire, led to land degradation (Ministerio de Medio Ambiente y Medio Rural y Marino, 2010), and the urge to undertake measures.

The respective countries have over the years followed several strategies and approaches in SWC, which led to the implementation of a variety of SWC measures. After an initial focus on reforestation and terracing through (central) governmental organizations, subsequently more use was made of somewhat simpler measures, such as soil and stone bunds, promoted by NGOs and local government organizations (Table 3). And a gradual change towards more participatory measures can be observed, although for example in Ethiopia mass mobilization is still applied in areas with important downstream interests.

In the last ten years increasing attention has been paid to the detrimental role of tillage in erosion. After the first international conference on Conservation Agriculture (CA) in Spain in 2001 and the success of CA in South America, increasing attempts have been made to introduce CA in other areas. In Spain it seems to be successful, while in Tunisia it mainly focuses on direct seeding, since the importance of livestock limits the options of covercrops and mulching. In Ethiopia the main crop tef requires a fine seedbed and therefore tillage, which hinders the adoption of CA. In Indonesia and in other South East Asian countries CA has

recently received a boost, through the creation of a regional CA network in 2009 (CANSEA).

CONCLUSIONS

The comparative analysis learns that each country has its own history of political regimes, institutions, special climatic and other events, which have shaped their soil and water conservation approaches and measures. But there are also some common trends that can be distinguished. In the 1960s Spain and Bolivia had military dictators, Ethiopia a feudal regime, while Indonesia and Tunisia were newly independent states and followed a more leftish approach with much state control and production cooperatives. All these regimes acknowledged the need for soil and water conservation, which was in some cases triggered by major floods, droughts, etc., but thereby a top-down approach was followed with the Ministries of Forestry taking the lead in reforestation and terracing of agricultural land. Farmers were not involved and eventually abandoned or destroyed most of the SWC measures. After the respective regimes and centralistic policies had changed, there was in the 1970s and 1980s some more attention given to decentralisation and farmer participation, and government and non-government organisations (NGOs) were integrating aspects of soil and water conservation in rural development programmes. There was already more diversity in SWC approaches and measures, but participatory approaches were not yet well developed and/or not very successful. In the last two decades there was a further decentralisation, and also a focus on market liberalisation, which on the one hand led to more diverse SWC approaches and measures, while on the other hand to more attention to the productivity and (short-term) viability aspects, and less to the security and protection and thus long term viability aspects. And since the 1990 SWC is broadened towards sustainable land management, which in the last decade has been reflected among others in the further introduction of Conservation Agriculture.

REFERENCES

- Amsalu, A. (2006). *Caring for the land: Best practices in soil and water conservation in Beressa watershed, highlands of Ethiopia*. PhD thesis. Wageningen University, Wageningen.
- WCED (1987). 'Our common future'. World Commission on Environment and Development. Oxford University Press, Oxford.
- Cerdá, A. (Ed.) (2008). *Erosión y degradación del suelo agrícola en España*. Valencia: Cátedra Divulgación de la Ciencia. Universitat de València.
- Chambers, R., Pacey, A. and Thrupp, L.A. (Eds), (1989). *Farmer first; farmer innovation and agricultural research*. Intermediate Technology Publications, London.
- De Graaff, J. (1996). 'The price of soil erosion: an economic evaluation of soil conservation and watershed development'. PhD thesis, Wageningen University, Wageningen, 299 pp.
- EC (2005) European Commission : Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), Official Journal of the European Union, 21.10.2005, L 277/1.
- EC (2009). European Commission. Council Regulation (EC) No 73/2009 of 19 January 2009 establishing common rules for direct support schemes for farmers under the common agricultural policy and establishing certain support schemes for farmers, amending Regulations (EC) No 1290/2005, (EC) No 247/2006, (EC) No 378/2007 and repealing Regulation (EC) No 1782/2003. Official Journal of the European Union, 31.01.2009, L 30/16.
- FAO (1988). 'State of Food and Agriculture', Rome.
- FAO (2008). *Analyse de l'impact socio-économique et élaboration d'indicateurs d'impact et d'évaluation socio-économique des aménagements de CES (Rapport de synthèse)*. Bureau Régional de la FAO, Tunis.
- FAOSTAT (2012) www.faostat.fao.org, FAO, Rome.
- FAO/UNEP (1994). 'A suggested national soils policy for Indonesia'. FAO, Rome.
- Haile, M., Herweg, K. and Stillhardt, B. (2006). 'Sustainable Land Management – A new approach to Soil and Water Conservation in Ethiopia'. Mekelle, Ethiopia: Land Resources Management and Environmental Protection Department; Bern, Switzerland: Centre for Development and Environment (CDE), University of Bern, and Swiss National Centre of Competence in Research (NCCR) North-South. 269 pp.
- Hamza, A. (1991). 'La lutte anti-érosive ancienne dans le bassin versant de l'Oued Zeroud: les leçons de l'histoire'. *Revue des Régions Arides*, Numéro spécial, 1991, pp. 87-104.
- Hoek, A. van den, (1992). *Planning as a learning process: a strategy for planning land use programmes at local level with special reference to the uplands of Java*. PhD Thesis, Wageningen University.
- Jefferson, T. (1789). "The Earth belongs to the Living". In letter to James Madison - Paris, September 6, 1789
- Ministerio de Medio Ambiente y Medio Rural y Marino (2010). *Anuario de Estadística. Ministerio de Medio Ambiente y Medio Rural y Marino 2009*, Subdirección General de Estadística, Madrid.
- Oldeman, L.R., Hakkeling, R.T.A. and Sombroek, W.G. (1991). *World map of the status of human-induced soil degradation*. UNEP/ISRIC GLASOD Project, Nairobi/Wageningen
- Pimentel, D., Harvey, C., Resosudarmo, P., Sinclair, K., Kurz, D., McNair, M., Crist, S., Shpritz, L., Fitton, L., Saffouri, R. and Blair, R., 1995. Environmental and economic costs of soil erosion and conservation benefits. *Science*, vol. 267, february 1995, pp. 1117-1123.
- Robbins, M. and Williams, T.O. (2005). *Land management and its benefits: the challenge, and the rationale, for sustainable development of drylands*. A paper presented at a STAP Workshop on Sustainable Land Management, Washington, D.C.
- Shiferaw, B.A. and Okello, J. and Reddy, R. V. (2009). *Adoption and adaptation of natural resource management innovations in smallholder agriculture: reflections on key lessons and best practices*. *Environment, Development and Sustainability*, 11 (3). pp. 601-619.
- Smyth, A.J. and Dumanski, J. (1993). FESLM, An international framework for evaluating sustainable land management. *World Soil Report 73*, FAO, Rome, pp74.
- Solé Benet, A. (2006). Spain. In: J. Boardman and J. Poesen (Eds.), *Soil Erosion in Europe*. John Wiley & Sons, Ltd., pp. 311-346.
- Stoorvogel J.J. and Smaling, E.M.A. (1990). *Assessment of nutrient depletion in Sub-saharan Africa: 1983-2000*. The Winand Staring Centre, Wageningen.
- TERRASTAT (2012) www.fao.org/ag/agl/agll/terrastat/ FAO, Rome.
- Wikipedia (2012). http://en.wikipedia.org/wiki/List_of_deadliest_floods.
- Zimmerer (2004). *Soil erosion and social (dis)courses in Cochabamba, Bolivia: perceiving the nature of environmental degradation*. *Economic Geography*, Vol. 69, No. 3, Environment and Development, Part 1, 312-327
- Zoomers (1998). *Rural poverty alleviation in the Southern Andes*. In: *The Bolivian Experiment: Structural Adjustment and Poverty Alleviation*. Pitou van Dijk (ed); Latin America Studies, CEDLA, Amsterdam.