

# Importance of Erosion Control for Cassava Fertilizer Use Efficiency

Control of soil erosion is essential for sustainable soil fertility management. Many of the soils used for cassava cultivation in Asia are prone to erosion (Howeler and Aye, 2014). Even though cassava is known to be efficient in absorbing nutrients in poor soils, growing cassava on sloping lands may cause serious soil and nutrient loss by erosion due to cassava's wide spacing and slow initial growth. According to Phien and Vinh (2002) one to two years of cassava cultivation without adequate inputs of fertilizer and erosion control will lead to soil nutrient depletion that may cause reduction in cassava productivity. Even when cassava is planted on a gentle slope of only 7%, significant losses of N, P, K and Mg may still occur (Howeler, 2001). Studies from Thailand and Colombia show high amounts of nutrient lost in eroded sediments (Table 1). Nutrient losses are directly related to the amount of soil eroded. Practices that reduced erosion automatically reduced nutrient losses (Howeler, 2001).

Nutrient loss by erosion is relatively higher after fertilizers are applied, as it carries away both the nutrients native in the soil and nutrients from fertilizers applied (Wargiono and Sudaryanto, 2002). Thus, it indicates the importance of having soil erosion control before applying fertilizers. Cassava grown on seriously eroded soils will have a low yield, reducing efficiency of fertilizer inputs (Bolarinwa et al., 2014), as it may require heavy inputs of fertilizer to obtain the same yield as in non-eroded soil without fertilizer application (Howeler, 2014). Research shows that, to reduce soil and nutrient losses, practices such as planting of hedgerows, intercropping with legumes, no or reduced tillage, mulching and returning of crop residues to the soil should be applied (Ardjasa et al., 2001; Iijima et al., 2004; Phien and Vinh, 2007; Vongkasem et al., 2002; Vries et al., 2012; Yuniwati et al., 2012; Trung et al., 2013). Fertilizer application on the early stages of cassava supports cassava development and reduces soil erosion and weed competition by encouraging rapid ground cover (Fermont et al., 2009; Vries et al., 2012). Fertilizers should not be left on top of the soil to minimize losses of nutrients by erosion (Howeler, 2014). These practices, not only improve the physical and chemical properties of the soil, but also improve cassava yield and the income of farmers.

**Table 1: Nutrients in sediments eroded from cassava plots with various treatments in Thailand and Colombia (Howeler, 2001).**

Location and treatments	(kg ha <sup>-1</sup> year <sup>-1</sup> )				
	Dry soil loss (t ha <sup>-1</sup> year <sup>-1</sup> )	N <sup>1</sup>	P <sup>2</sup>	K <sup>2</sup>	Mg <sup>2</sup>
Cassava on 7% slope in Sriracha, Thailand	71.4	37.1	2.18	5.15	5.35
Cassava on 7-13% slope in Quilichao, Colombia	5.1	11.5	0.16	0.45	0.45
Cassava + leguminous cover crops in in Quilichao, Colombia	10.6	24.0	0.24	0.97	0.81
Cassava + grass hedgerows in Quilichao, Colombia	2.7	5.8	0.06	0.22	0.24
Cassava on 12-20% slope in Mondomo, Colombia	5.2	13.3	1.09	0.45	0.36
Cassava + leguminous cover crops in Mondomo, Colombia	2.7	6.5	0.04	0.24	0.20
Cassava + grass hedgerows in Mondomo, Colombia	1.5	3.5	0.02	0.13	0.10

<sup>1</sup> Total N; <sup>2</sup> Available P, and exchangeable K and Mg

## References:

Ardjasa, W.S., H. Ando and M. Kimura. 2001. Yield and erosion among cassava-based cropping patterns in South Sumatra. *Soil Science and Plant Nutrition* 47: 101-112

Bolarinwa, O.K., A.S. Bamire, E.O. Akerle, R.O. Kareem and R.O. Akinwale. 2014. Effects of soil erosion on technical efficiency of cassava farmers in Enugu State, Nigeria. *Journal of Environment and Earth Science* 9:81-86

Fermont, A.M., P.A. Tittone, Y. Baguma, P. Ntawuruhunga and K.E. Giller. 2010. Towards understanding factors that govern fertilizer response in cassava: lessons from East Africa. *Nutrient Cycle Agroecosystem* 86:133-151

Howeler, R. 2001. Nutrient inputs and losses in cassava-based cropping systems- Examples from Vietnam and Thailand. *Proceedings of the International Workshop on Nutrient Balances for Sustainable Agricultural Production and Natural Resource Management in Southeast Asia. 20-22 February 2001. Bangkok, Thailand.*

Howeler, R. 2014. Sustainable soil and crop management of cassava. A reference manual. *Centro Internacional de Agricultura Tropical (CIAT). 280p*

> Please see the last printed page for more references.

## References:

### **Importance of Erosion Control for Cassava Fertilizer use Efficiency**

Howeler, R. and T. Aye. 2014. *Sustainable management of cassava in Asia- From research to practice*. Centro Internacional de Agricultura Tropical (CIAT). 148p

Iijima, M., Y. Izumi, E. Yuliadi, Sunyoto and W.S. Ardjasa. 2004. *Cassava-based intercropping systems on Sumatra Island in Indonesia: Productivity, soil erosion and rooting zone*. *Plant Production Science* 7:347-355

Phien, T. and N.C. Vinh. 2002. *Soil organic matter management for sustainable cassava production in Vietnam*, pp. 234–250. In R.H. Howeler (Ed.). *Proceedings of the 7th Regional Workshop*. 28 October–1 November 2002. Bangkok, Thailand.

Trung, N.T., S. Nakasathien and V. Vichukit. 2013. *Enhancing sustainable cassava production in hilly areas of Van Yen, Yen Bai province, Vietnam*. *Kasertsart Journal (National Science)* 47:492-505

Vries, S.C., G.J. Van de Ven, M.K. Van Ittersum and K.E. Giller. 2012. *The production-ecological sustainability of cassava, sugarcane and sweet sorghum cultivation for bioethanol in Mozambique*. *GCB Bioenergy* 4:20-35

Vongkasem, W., K. Klakhaeng, K. Srakaew, R. Sevasasai, W. Watananonta and R.H. Howeler. 2002. *Farmer participatory extension (FPE) methodologies used in the cassava project in Thailand*. In R.H. Howeler (Ed.). *Proceedings of the 7th Regional Workshop*. 28 October–1 November 2002. Bangkok, Thailand.

Wargiono, J. and B. Sudaryanto. 2002. *Cassava leaves and forage crops for ruminant feed in the establishment of sustainable cassava farming systems in Indonesia*, pp. 496-503. In R.H. Howeler (Ed.). *Proceedings of the 7th Regional Workshop*. 28 October–1 November 2002. Bangkok, Thailand.

Yuniwati, E.D., N. Basuki, E.W. Wisnubroto and W.H. Utomo. 2012. *Combating land degradation in cassava field by crop yield improvement*. *Journal of Basic and Applied Scientific Research* 2:4975-4982