DISTRIBUTION OF BEAN ROOT ROTS IN SUB-SAHARAN AFRICA

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Bean root rots have emerged as a major constraint to bean production in parts of sub-Saharan Africa where bean is a major crop (Map 1). The disease complex has been estimated to cause 221,000 t yr^{-1} loss in production and to be the eight most important constraint to bean production in sub-Saharan Africa (Wortmann *et al.*, forthcoming). Incidence and severity of root rots are associated with high intensity of bean production and with less productive soils. The following model explains 58% of the variation in root rot severity (RR) when severity is rated low (3), moderate (4) and high (5).

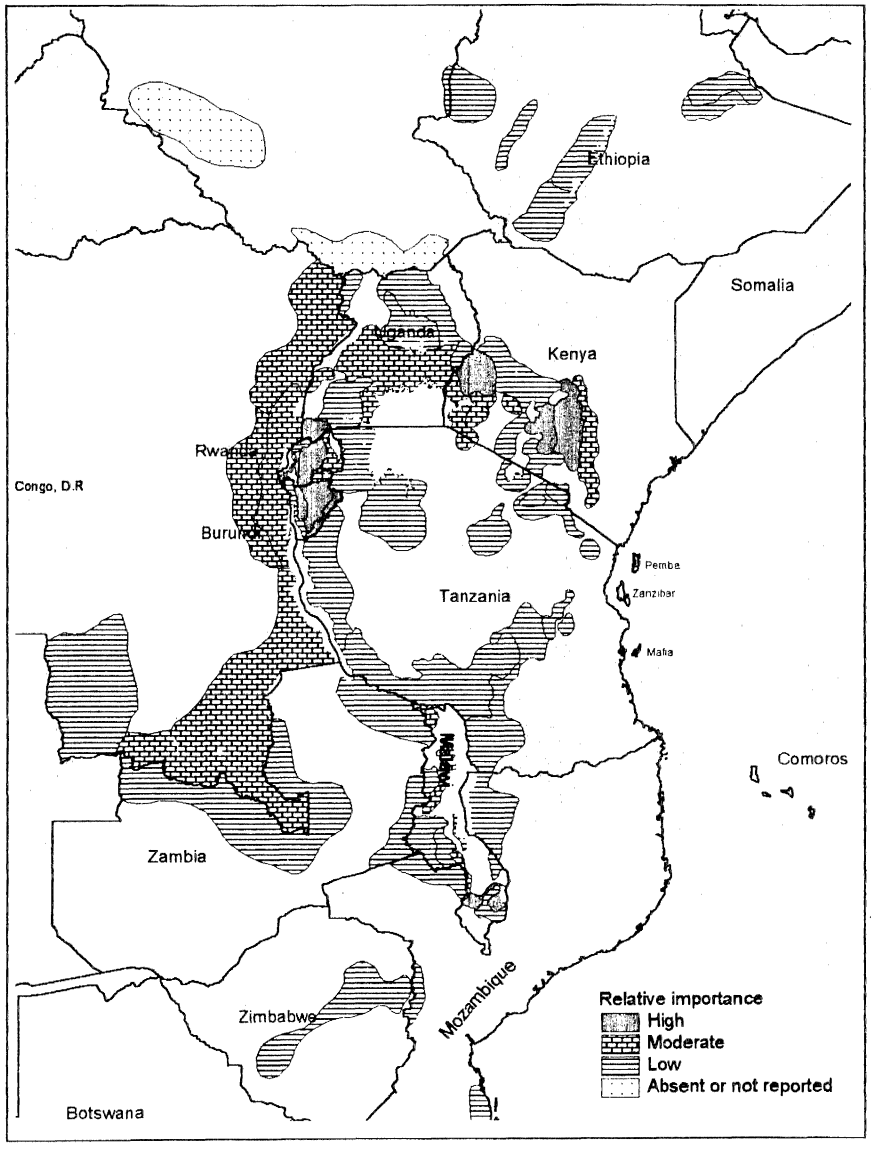
$$RR = 3.382 + 0.000654 * PD + 0.0605 * INT + 0.191\ PASOIL$$

where: PD = human population density (km^{-2}); INT = percent of area sown to beans in a year; and PASOIL is a principle component which explained 31% of the variation in seven soil properties, including (with vector values) CEC (0.15), exchangeable bases (0.51), organic carbon (0.43), pH (-0.42), and available N (0.22), P (0.48) and K (0.27). The principle component for soils reflects greater nutrient availability, although lower pH, to be positively correlated with root rot severity while in the field, root rots are more severe where nutrient supply is inadequate. This apparent contradiction might be due to: the intensity of bean production and population density are greatest where soils have high nutrient levels; and the quality of data is not good enough to account for the variation in soil nor in severity of root rots, i.e. damage due to root rots tends to be more severe in pockets of low soil fertility.

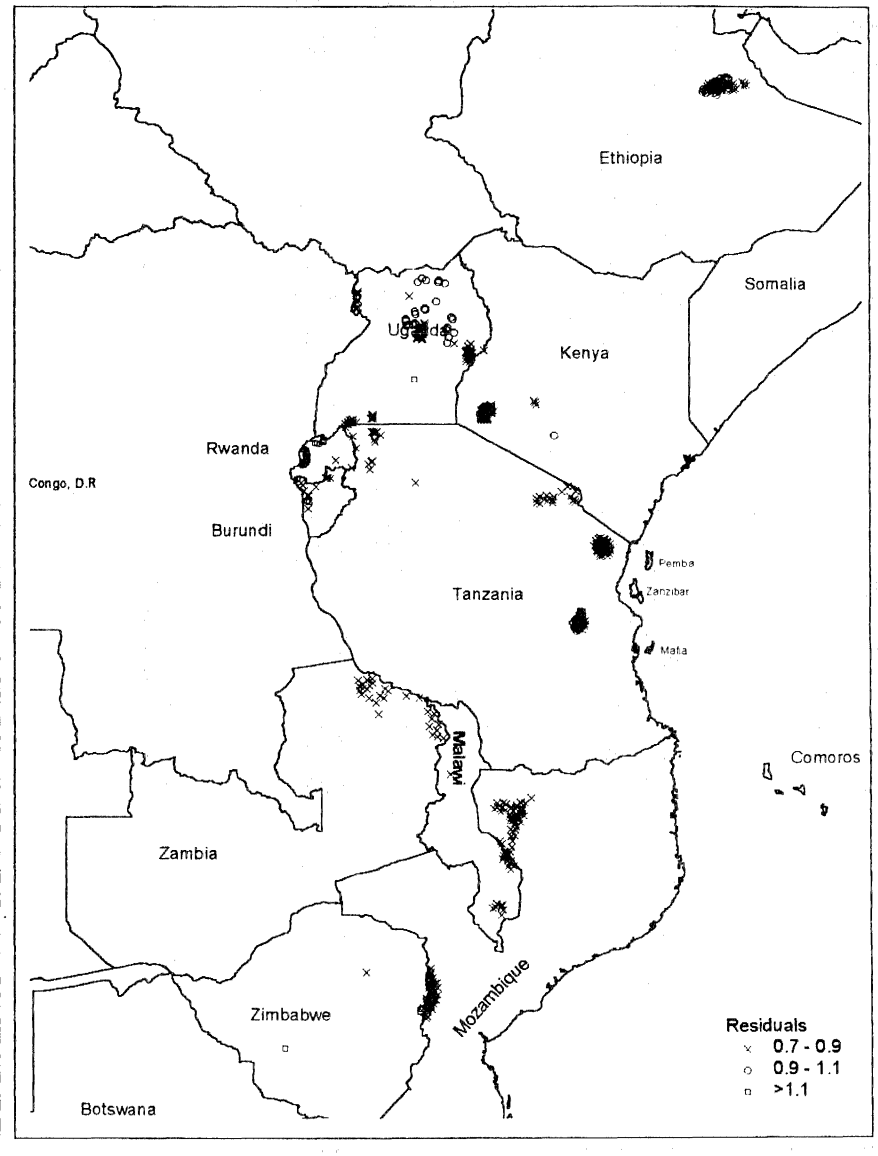
The model was used with the Africa bean database to predict where root rots are likely to emerge as a serious problem, or where their importance has until now been under-estimated (Map 2). Points, indicating 500 ha, are shown where the difference between the predicted and the observed is large. The weaknesses of the model, and the data from which it is derived and from which prediction are made, must be recognized but the points indicate where we need to be aware of the potential for the root rot problem becoming serious.

The results **indicate** that root rots **are likely** to become more serious or have been underestimated, at least in pockets, in the vicinities of : Kisii and Nyahururu in Kenya; Morogoro, the Usambara Mountains, and parts of Kilimanjaro, Arusha and Kagera in Tanzania; Nebbi, Apac and parts of Ntungamo in Uganda; the Lake Kivu Basin in Rwanda; parts of the Imbo Plain of Burundi; parts of Mbala in Zambia; the Chitipa Highlands and Shire Highlands in Malawi; Manica and Lichinga in Mozambique; and in the northwestern part of the Hararghe Highlands in Ethiopia. Observations were generally in agreement with predictions for areas west of 28° E longitude and south of 20° S latitude (not shown in the map) indicating no need for alarm in these areas.

Wortmann, C.S., R.A. Kirkby, C.A. Eledu and D.J. Allen, *forthcoming.* An Atlas on Common Bean (*Phaseolus vulgaris*) in Africa. CIAT.



Map 1. Relative importance of root rots in bean production areas



Map 2. Areas where root rot severity may be underestimated or worsen in the future