In the highlands of Western Kenya, we investigated the reversibility of soil productivity decline with increasing length of continuous maize cultivation over 100 years (corresponding to decreasing soil organic carbon (SOC) and nutrient contents) using organic matter additions of differing quality and stability as a function of soil texture and inorganic nitrogen (N) additions. The ability of additions of labile organic matter (green and animal manure) to improve productivity primarily by enhanced nutrient availability was contrasted with the ability of stable organic matter (biochar and sawdust) to improve productivity by enhancing SOC. Maize productivity declined by 66% during the first 35 years of continuous cropping after forest clearing. Productivity remained at a low level of 3.0 t grain $ha^{-1}$ across the chronosequence stretching up to 105 years of continuous cultivation despite full N–phosphorus (P)–potassium (K) fertilization (120–100–100 kg $ha^{-1}$). Application of organic resources reversed the productivity decline by increasing yields by 57–167%, whereby responses to nutrient-rich green manure were 110% greater than those from nutrient-poor sawdust. Productivity at the most degraded sites (80–105 years since forest clearing) increased in response to green manure to a greater extent than the yields at the least degraded sites (5 years since forest clearing), both with full N–P–K fertilization. Biochar additions at the most degraded sites doubled maize yield (equaling responses to green manure additions in some instances) that were not fully explained by nutrient availability, suggesting improvement of factors other than plant nutrition. There was no detectable influence of texture (soils with either 11–14 or 45–49% clay) when low quality organic matter was applied (sawdust, biochar), whereas productivity was 8, 15, and 39% greater ($P < 0.05$) on sandier than heavier textured soils with high quality organic matter (green and animal manure) or only inorganic nutrient additions, respectively. Across the entire degradation range, organic matter additions decreased the need for additional inorganic fertilizer N irrespective of the quality of the organic matter. For low quality organic resources (biochar and sawdust), crop yields were increasingly responsive to inorganic N fertilization with increasing soil degradation. On the other hand, fertilizer N additions did not improve soil productivity when high quality organic inputs were applied. Even with the tested full N–P–K fertilization, adding organic matter to soil was required for restoring soil productivity and most effective in the most degraded sites through both nutrient delivery (with green manure) and improvement of SOC (with biochar).