"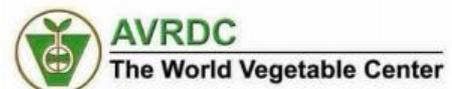Diversifying Food Systems: Horticultural Innovations and Learning for Improved Nutrition and Livelihood in East Africa" (HORTINLEA)

JOINT INTERIM REPORT (SP3)

01/01/2014 – 31/12/2014
FORMAL REPORT

Description of activities/milestones
SP3: Assessment of Crop-Specific Carbon and Mineral Element Fluxes for Sustainable Soil Fertility Management in Horticultural Productions Systems
NM1: Data base of soil fertility variability within and among farms and identification of plant nutritional constraints to vegetable productionTwo model farms near Nairobi were identified to test the methodological approaches for the assessment of plant nutritional constraints.
NM2: Data base on locally existing knowledge on soil fertility, and strategies for resource allocation The questionnaires for in-depth interviews with farmers and extension workers are currently elaborated by the three PhD-students working in SP3. Based on the information gained by the household survey ind SP7, farms and extension workers will be selected in two rural regions where AIVs are commonly grown
NM3: Identification of nutrient efficiency at field and farm level Two model farms near Nairobi were identified to test the methodological approaches for assessment of field and farm specific nutrient input and output. The main survey will be done in two rural regions where AIVs are commonly grown. For that survey, farms will be selected on the basis of information gained by household survey in SP7
NM4: Identification of critical nutrient levels in soil and plants leading to yield and quality losses Pot experiments under optimal and suboptimal nutrient supply were done to create a data set of critical nutrient levels in AIV.
NM5: Data base for crop- and site-specific requirements for organic fertilizer supply to maintain sufficient level of soil organic matter Plant residues of various AIVs were collected for assessment of humification coefficients in litter bag studies. The litter bags were constructed.
NM6: Identification of major sources and pathways of heavy metal contamination as basis for recommendations to reduce concentrations in edible organs The methodological approaches were developed for identification of major sources and pathways of heavy metal contamination of AIVs which are sold in Nairobi via different distribution channels (farm gate, local open-air markets, supermarkets)
NM7: Identification of crop-specific root and shoot traits regulating heavy metal contamination as basis for recommendation for culture on slightly polluted soils A field experiment, including various AIVs is currently running near Nairobi on a site which is supposed to be contaminated by heavy metals through irrigation water. A pot experiment was conducted with various AIVs to assess the effect of Cd concentration in nutrient solution on Cd concentrations in roots, leaves and stems; plants were harvested, and are currently analysed for Cd

Experiments have been started in Berlin and Nairobi. In Gatundu South sub-county (about 60 km from Nairobi), on two different farms, 2-factorial experiments with 3 repetitions were accomplished for African Indigenous Vegetables (AIV) (5 levels) and for fertilizer amendment (8 levels). The experiments will deliver data on field-specific measurement of nutrient input and output on farmers' fields (**NM3**), data on crop-specific nutrient requirement and responses to nutrient supply (**NM4**) and also on yield- and crop-specific input of organic plant residues into the soil (**NM5**). In Nairobi on two different sites that are supposed to differ in heavy metal contamination, 2-factorial experiments (3 repetitions) were accomplished with 6 different AIV species and 2 different types of irrigations treatments. The experiment will deliver data on measurements of heavy metal input and output on farmers´ fields, and concentrations in vegetables at various points from field to market (NM6), on crop-specific heavy metal transfer coefficients from soil to aboveground edible plant organs (NM7),

and on crop-specific nutrient requirement (**NM4**). Furthermore a survey of heavy metal contamination of vegetables sold on open markets and supermarkets in Nairobi was performed. The vegetable samples were subsequently subjected to three different washing procedures (no washing, washing with water, washing with 1% HNO3).

The mineral analysis of the samples will deliver data on heavy metal concentrations in vegetables at various points from field to market (**NM6**). In Nairobi, at JKUAT a field experiment was started in cooperation with SP1 on effects of different modes of irrigation on yield and rooting pattern. This experiment involved 7 AIV species: Amaranth, African kale, African night shade, cowpea, spider plant, exotic kale and maize (Zea mays). The experiment will deliver data on crop-specific input of organic matter via plants (NM5). At JOOUST a litterbag study was started, in which the mineralization of plant derived organic carbon sources in soil is quantified. The study will deliver data on crop-specific input of organic matter via plants and humification coefficients of carbon sources under field conditions (NM5).

In Berlin, a 2-factorial experiment was started under controlled environmental conditions, in which the effect of different Cd-concentrations in nutrient solution on Cd uptake and allocation to various plant organs (roots, stems, young leaves, old leaves) of various AIV is investigated. The experiment will deliver data on crop-specific Cd uptake and distribution in plants (NM7). Furthermore, several pot experiments with AIVs were started under controlled environmental conditions, in which the rate of nutrient supply was varied. The experiments will deliver data on crop-specific critical nutrient levels in plants (NM4), which are needed for interpretation of data from the field survey (NM3). Finally, a 2-factorial experiment was started under controlled environmental conditions, in which plant responses to three different rates of Fe supply (low, medium, high) are quantified. The experiment will deliver data on crop-specific critical nutrient levels in plants (NM4), which are needed for interpretation of data from the field survey (**NM3**).