The Realigning Agriculture to Improve Nutrition (RAIN) project integrates agriculture, health & nutrition and women’s empowerment activities to reduce the prevalence of child stunting.

The Realigning Agriculture to Improve Nutrition (RAIN) project aimed to design, implement and evaluate a model of multi sectoral integration of interventions to reduce the prevalence of chronic malnutrition in Mumbwa district in Zambia. The project was implemented by Concern Worldwide together with Mumbwa Child Development Agency (MCDA), with impact evaluation by the International Food Policy Research Institute (IFPRI).

The project targeted children during the first 1,000 days of life, through integrated agriculture, nutrition and health community based interventions. The overall approach focused on addressing the multi-sectoral causes of malnutrition, based on a ‘farm to fork’ concept to increase household production and consumption of micronutrient-rich animal- and plant-source foods. The project comprised of agricultural interventions to increase year round availability of, and access to, nutrient rich food at the household level. Additionally in one study arm, the promotion of optimal health, nutrition and care seeking behaviour through the delivery of social behavioural change communication was added. All study areas received community gender trainings.

The RAIN impact evaluation was designed to help address a critical gap in the evidence base regarding the degree to which agricultural interventions can improve child nutrition. It aimed to establish ‘proof of concept’ for an intervention model that can be replicated and scaled up within Zambia and beyond. Different combinations of agriculture and
nutrition interventions randomized to different areas provided agriculture-only and agriculture+nutrition study arms, and a third study arm which continued to receive standard government services as a control area. The evaluation assessed change over time and between study arms in nutrition outcomes and determinants. The research included baseline and endline cross-sectional surveys, and two rounds of mixed-method process evaluation.

**Beneficiary participation and exposure**

The RAIN project was centred on women’s groups consisting of 20-25 female members who were either pregnant or had a child under the age of 18 months at time of being recruited into the project. The women’s groups were targeted for recurring agriculture trainings delivered by Smallholder Model Farmers (SMFs), who were women chosen by their fellow group members, and in the ag-nutrition arm for nutrition trainings by Community Health Volunteers (CHVs) who were attached to local health centres. The SMFs were new positions selected from within the group, whilst the CHVs were existing positions selected by the health facilities. SMFs and CHVs were linked to women’s group and aimed to meet on a bi-weekly basis. The SMFs and CHVs were also tasked with conducting home visits to provide additional one-to-one assistance and information on agriculture and health, respectively. Community

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Queen Pova, from Sichanzu ward, was encouraged to grow a vegetable garden near her house and provided with tools, training and various seeds to help her do so. Additionally, she received nutrition training which taught her the importance of a varied diet and how improving the children’s nutrition with different vegetables will help them become healthier. Now she has a productive garden with more than 10 different crops near her home. With training from Concern, she has learnt to make a natural pesticide spray from the onions and chili, which protects her other vegetables from pest. *The best thing I’ve learnt is how to keep small livestock. I was given one goat from Concern and now I have 10. I’ve enjoyed learning how to keep them and how to milk them so I can give the milk to my children. I’ve also learnt to use the manure to fertilise my vegetable garden.*
Development Facilitators (CDF, a category of MCDA partner staff) provided training and mentorship to the SMFs, with assistance from government workers (Camp Extension Officers, Rural Health Centre Staff) and other MCDA and Concern staff. Each of the 12 CDFs was responsible for 30 women’s groups.

In the final impact evaluation, the project was found to have reached 31 percent of all eligible households in the Ag-only project area, and 34 percent in the Ag-Nutrition project area. The intensity of program delivery varied, with approximately, 50% of all households reached receiving medium or high levels or programme delivery (defined as RAIN implementation being received as planned). In terms of intensity of delivery, SMF attendance at RAIN groups was high (approximately 90%), but CHV attendance was low (38-45%); group members therefore had more opportunity to interact with trainers from the agriculture side than from the health side. The additional home visits, aimed at providing one-to-one support for gardening and IYCF counselling and support, were conducted more frequently by SMFs as compared to CHVs, again providing more opportunity to build agriculture knowledge and skills than understanding of health and nutrition.

Agriculture and food production
The SMFs were trained by agriculture experts, and in turn provided training to their group members on agricultural practices including homestead gardens, organic manure, use of botanical pesticides and rearing small livestock. Bi-monthly refresher trainings were organised at community level by the CDFs with assistance from government on various topics. The women’s groups aimed to meet for 2 hours, either at one of the members’ home gardens for a hands-on demonstration, or at any central gathering point in the community for teaching sessions. The SMFs were in charge of the group solar drier and treadle pump, which were introduced to reduce the seasonal gap in vegetable consumption, and received incentives such as a bicycle and vegetable seeds. Agricultural inputs were provided to all group members during the dry and wet season for two years. The crops were chosen based on their nutritional value and included legumes (cowpeas, groundnuts, Fe/Zn biofortified beans); vegetables (e.g., rape (dark green leaves), tomatoes, carrots, okra, cleome, spinach, pumpkin (leaves), paprika, green beans), fruits (banana suckers, granadillas/passion fruit, watermelons) and biofortified orange fleshed sweet potato vines. To facilitate livestock production and access to milk and meat, a pass-on scheme was designed whereby SMFs were provided with a male and female goat, whilst some group members received a female goat, and passed on their first offspring to the other group members. Chickens were provided to increase access to eggs and meat.

Overall, the RAIN interventions had a consistent significant impact on several dimensions of agricultural production and consequent availability during the year of nutritious foods. Both the Ag-Nutrition and the Ag-Only arms had greater increases over time, compared to the control group on the total number of foods produced, the total number of agricultural activities engaged in by the household and the number of months producing vitamin A rich foods and dairy. There were no significant program impact differences on these outcomes between the two RAIN intervention groups.
The Household Dietary Diversity Score shows household food security in terms of access to varied food groups decreased in all study arms, but decreased less in the Ag-Nutrition arm. Household consumption of roots, legumes, vegetables, fruits, meat, eggs and milk were all better over time in the Ag-Nutrition group.

**Diet and health**

The nutrition and health activities focussed on behaviour change communication for improved child and maternal nutrition, especially infant and young child feeding, and linkages to the existing health system, including the prevention of mother to child HIV transmission services. A Behavioural Change Communication (BCC) strategy was developed based on a barrier analysis conducted for several behaviours related to infant and young child feeding. The BCC materials used are based on the standard government IYCF training package (counselling cards, participant’s manual and brochures), but translated in the local language. Health Facility Staff were trained as Trainer of Trainers (ToT) in Infant and Young Child Feeding (IYCF) and they provided a six days residential training on IYCF to the CHVs. Monthly refresher trainings for the CHVs were delivered at health facility level and covered various subjects including maternal health, how to conduct cooking demonstrations, WASH and micronutrient deficiencies. The CHVs received incentives including a bicycle, seed packs and a bag. In order to promote the integration of nutrition and agriculture at field level, the SMFs in the Ag – Nutrition area also received some basic nutrition training in addition to their agricultural training.

In general, all breastfeeding-related IYCF indicators among children 0-23 months were high at endline, across all three study arms. There were significant increases in several complementary feeding indicators, but there was no differential change in favour of any study arm. The introduction of complementary foods at 6-8 months of age was high (95% across all three study arms), whilst other complementary feeding practices were suboptimal; such as minimum acceptable diet (25-30%) and minimum meal frequency (60%)). There were significant increases within the Ag-Nutrition arm over time in minimum dietary diversity, minimum meal frequency, and minimum acceptable diet, but these were not significantly different to the control group at endline. In terms of specific food groups, there were increases across arms and over time in consumption of legumes/nuts in both intervention arms compared to the control, however, the consumption of iron rich food decreased in both study arms over time. There were significant improvements in Maternal Dietary Diversity (measured out of a total of 7 foods) within study arms over time, but there was no differential change over time, in favour of any study group in impact analysis.

*Queen Pova watering her garden with a treadle pump, Sichanzu ward.*
Gender and empowerment
At the initial stage of the project, a gender needs assessment was conducted to better understand the gender constraints related to food and nutrition security. Using a manual developed for the project, CDFs and government extension workers received a training in gender, and in turn facilitated trainings with group members. Community sensitizations were conducted for all community members including men and village elders. Special gender trainings were conducted for community leaders. Women’s group members and their husbands were trained in the importance of gender in improving nutrition (e.g. husbands providing land for homestead gardens, assisting with chores like fetching water and supporting health facility visits). Continuous gender awareness activities were conducted by integrating gender messages into nutrition and agricultural messages provided to beneficiaries; drama group performances; and a series of materials with gender messages distributed within the project area.

There were clear impacts of the RAIN interventions on different domains of women’s empowerment. Over time, there were significant increases in several domains of women’s empowerment, including scores for “buying power”, “social capital”, and “decision making”. Although there was no consistent pattern of change over time, across groups, there were significant impacts of the Ag-only group on “asset access”, “financial empowerment”, “social capital” and the composite score of women’s empowerment, whilst the Ag-Nutrition arm significantly impacted on “financial management” and “social capital” compared to the control group. There was a clear shift over time in women’s involvement in decision making in agriculture, away from having men only involved towards having women involved (either solely, or jointly with her spouse). The shift was greater for different aspects of decision making (e.g. crop production, use of money from sale of crops, as well as in a composite score of women’s empowerment in agriculture) in the RAIN intervention areas compared to the control area.

Changes in child nutrition and its determinants
The agriculture, nutrition, and gender components of the program were designed to address the food, health and care determinants of child nutrition. Over time, between baseline and endline, the prevalence of stunting decreased significantly from 44.8% to 28.5% in all three study arms for children aged 24-59 months old. However, there was a significantly greater decrease in the control group as compared to the two RAIN intervention areas. Levels of wasting increased significantly over time from 2.5% to 7.1% for all three study groups. However, there was a consistent positive impact on the prevalence of wasting in the Ag-only arm, compared to the control arm. Decomposition analysis was carried out to explain the factors that determined the changes in stunting and wasting attributable to the RAIN project. However, the RAIN model only explained 8.4% of the actual change in HAZ scores and 6.3% of the actual change in stunting in the key age group (24-59 months). The largest proportion of the predicted change in HAZ scores was attributed to receipt of nutrition counselling and reductions in child morbidity.
Project limitations and learning
The overall reduction in stunting across all three study arms is encouraging, and continues a trend seen in national surveys in Zambia over the past 15 years. However, reductions in stunting the RAIN intervention areas were smaller than in the control area, suggesting no impact of the project on stunting. Several explanations can be provided for the lack of impact on stunting. A key factor is the relatively short period in which the project was implemented. Although the project duration was four years, the long start-up time of an agricultural based project needs to be taken into account. The focus of the project was on first 1000 days of life, as this is considered to be the window of opportunity for children to reduce stunting. However, as eligibility for participation in the RAIN project was based on being pregnant or having a child under the age of 18 months, not all children eligible for the endline survey have benefitted from the full package of interventions during the critical window of opportunity. This may have resulted in an underestimation of potential impact.

The impact evaluation study was not designed to account for elements beyond the RAIN project, nor for general improvements in government services across the district. Further investigation is warranted to understand the steep decline in stunting seen across the area. The inclusion of a control group however did allow for the attribution of impacts to the RAIN project model, despite changes in the underlying context in the overall project area.

In 2012, Catherine was selected to be a Smallholder Model Farmer. Her husband, Chibala, explains that it was Concern’s RAIN project that changed his beliefs about traditional roles. “I never knew about working together but it’s helped us have a higher yield of food. Through the project I have learnt to help. I saw that if I helped we could do more. I’m happy to put a child on my back and to cook. People used to make fun of men who did this and thought a man who did this had been put under a spell but now people know differently. Working together has made our love deeper.”
Rural Zambia is a difficult place to implement development projects. In particular, the difficulties in accessing water for many project participants made it difficult for many to maintain vegetable gardens during the long dry season (April – November). The results of the project also raise the question on the scale of agricultural activities necessary to grow and consume adequate amounts of diverse foods in order to prevent stunting. Although the project did provide agricultural input packages, it was not determined how long it would take or required land size for adequate returns of seeds to provide sufficient volumes for year round food access of the various crops and fruits or food groups. Other challenges occurred with the animal related interventions, including slow pass on rate, high goat and chicken mortality, and time taken to increase the number of animals available. As three out of the seven food groups on which the dietary diversity score for children is based are coming from animal sources, it is a challenge to increase the Dietary Diversity Score for children by focusing on plant based products. In addition, there was a tension between the main interest of the project participants, to increase the number of small livestock (as a form of savings and future income) and the aim of the project, to increase consumption of milk, eggs and meat.

Home visits by SMFs and CHVs, a component of the intervention delivery by the program, did not materialize as envisaged, losing a key one-to-one element that would bolster the project effect. Across both the women’s group session and individual home visits, it was clear that the agriculture frontline workers (SMFs) were more active than the health-side workers (CHVs), which plays out in the improved agriculture outcomes compared to nutrition and health outcomes in the evaluation. A suggested explanation for the low CHV engagement is that they were not selected among the group members (as the SMFs were), but they were selected by the health facility. This resulted in CHVs being either men, or much older than the group members. This may have influenced the participation of the CHVs in the project. Also, the RAIN work was an addition to the CHVs usual community work, whilst the SMFs were a newly created position.

Finally, there were limitations with program enrolment and monitoring. Partially due to challenges in the census data, the number of eligible women in the project area was underestimated, leading to low targets for enrolment which drove the low program exposure in the evaluation. It is possible that higher coverage would have led to improved impact, as sub-analyses of confirmed beneficiaries found additional improvements in some determinants in this sub-group, though not nutrition outcomes themselves.

Overall, the results from the RAIN evaluation and the learning from the program contribute to increasing the available lack of evidence from rigorous impact evaluations of integrated agriculture and nutrition programs. There are clear and important maternal and household level benefits of the program, which may be achieved in other similar programs, and lessons to scale-up the existing project.
The clear and consistent impact of the RAIN intervention on agricultural production and on women’s empowerment, two core objectives of the program, are noteworthy and consistent with the limited evidence to date from similar interventions. These interventions alone however were not enough to detect impact on stunting, and further interventions will need to address all of the food, health and care determinants of malnutrition if nutrition outcomes are to be affected. Further work building on the practical learning from the RAIN project will be required if the positive effects are to be replicated and improved elsewhere, to contribute to improved impact on nutrition outcomes from integrated agriculture and nutrition programmes.

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Picture left: Joyce Chaambwa
Picture middle: Delhi Muhila
Picture right: food solar drier

RAIN PLUS project

Concern started the scaling up of RAIN activities with the implementation of the RAIN+ project in other wards in Mumbwa. This project is based on the RAIN model but incorporated the lessons learned from RAIN.

- Digital beneficiary registration and data collection. Participation of beneficiaries will be tracked on an individual basis to ensure full exposure to the interventions
- Inclusion of a focus on markets for nutritious foods, creating incentives to produce nutritious foods and incomes to purchase foods year round.
- Stronger promotion of male involvement in nutrition, supporting women in making nutritious food choices and ensuring there is sufficient time for care.
- Inclusion of additional WASH activities as more evidence is emerging linking reduction of stunting to improve water and sanitation.