

A SYNTHESIS OF THE
**RWANDA NUTRITION,
MARKETS & GENDER
ANALYSIS 2015**





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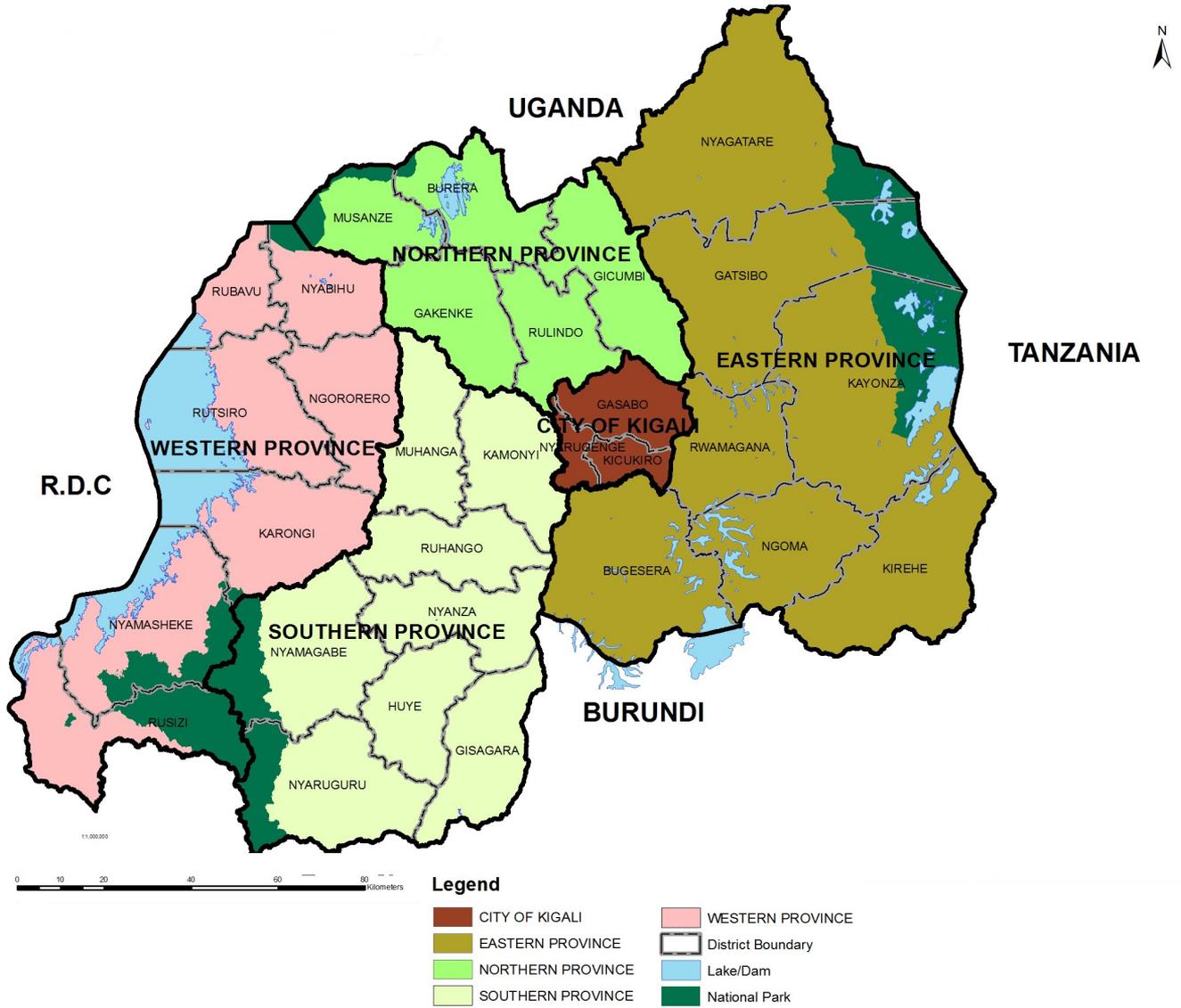
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ADMINISTRATIVE MAP OF RWANDA



KEY MESSAGE

This synthesis highlights multiple determinants of stunting in children under 24 months in Rwandan households.

The analysis indicates that children in households with acceptable food consumption are 23 percent less likely to be stunted than children in households with inadequate food consumption. The nutritional outcomes of children are strongly correlated with dietary diversity; children with medium diversity are 19 percent less likely to be stunted, while those with good diet diversity are 58 percent less likely to be stunted.

In addition, water and sanitation impact significantly upon the nutritional status of children. Children in households that sourced their drinking water from public or communal sources were three times more likely to be stunted compared to those in households whose main source of drinking water is treated.

When exploring sources of livelihoods, it is evident that more households with a stunted child were employed in unskilled jobs as their most important source of livelihood. In general, the majority of households with a stunted child earned less cash income from their livelihood activities including

crop production, and they were generally poorer, as would be expected.

Crop production was the main source of livelihood of rural households. The lower income earned from crop production among households with stunted children reflect lower production and less quantities sold on the market. Households with higher levels of production (more than 500kg of crops) were less likely (50 percent) to have stunting in children, compared to those who could only marginally produce.

When assessing gender empowerment, the results indicate an association between this indicator and childhood stunting. Women's empowerment incorporates multiple aspects such as decision-making power related to income, time, labour, assets and leadership. An analysis of the gender empowerment index for these empowerment indicators indicates that overall empowerment scores were significantly higher for men and women in households



that did not have a stunted child. Additionally, empowerment scores were also higher for men than women across households with and without a stunted child. The findings suggest that empowering men and women to own assets, have access and to make decisions regarding credit, as well as enabling them to participate in community leadership roles can play an important role in addressing stunting.

Overall, it is clear that no single sector can address malnutrition alone; several well-coordinated sectors have a role to play in addressing stunting in Rwanda.

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1.0

INTRODUCTION



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Ending hunger, malnutrition and poverty have been central to Rwanda's policy framework since 1994 in the reconstruction period after the genocide, and this is reflected in Rwanda's Vision 2020 document. Between 2006 and 2011, the country recorded remarkable progress towards the Millennium Development Goals driven by higher productivity in the agricultural and industrial sectors (UN 2012).

Current welfare and nutrition data in Rwanda indicate substantial progress in poverty reduction and improvements in other socio-economic, demographic and health indicators in the last few years. For example, the Integrated Household Living Conditions Survey 4 (NISR 2015a) shows that overall poverty in Rwanda has reduced by 5.8 percent during the last three years. During the same period, extreme poverty dropped from 24.1 percent to 16.3 percent. In addition, the 'Key Findings of the Rwanda Demographic and Health Survey' (NISR 2015b) indicate that the prevalence of stunting among children under 60 months has reduced by 6.3 percent in the last five years. Despite an increase in agricultural productivity resulting in an impressive reduction in poverty and hunger, prevalence of stunting among children is still high particularly among children living in rural areas (40.6%) and in regions where agricultural production is relatively high (WFP 2012), that is, the western province at 44.9 percent and the northern province at 58 percent.

(NMG) Survey was conducted to investigate the causes of malnutrition in children under 24 months and examine the apparent disconnection between agricultural productivity and nutrition outcomes in some regions to enhance the understanding of risk factors that contribute to child malnutrition at the household level. The study also investigated the interlinkages between nutrition outcomes, market participation and gender dynamics in the households.

The primary goals of the NMG Survey were: (i) to determine the causes of stunting in children under 24 months; (ii) to establish the pathways between agriculture and nutrition outcomes among households; and (iii) to establish a baseline for the nutrition status among target groups prior to the implementation of nutrition programmes in the selected sectors. This analysis also provides evidence that will enable the nutrition sector to: (a) develop appropriate interventions for addressing malnutrition; and (b) inform policy dialogue and malnutrition strategy development.

2.0

METHODOLOGY



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The NMG Survey was a case-control study that compared cases (households with a stunted child) with controls (households without a stunted child). The survey looked back retrospectively to compare what risk factors for malnutrition are present in each group so as to determine the relationship between the risk factors and stunting in children under 24 months.

The decision regarding which geographic locations to include in the NMG Survey was based on the primary survey goals with the intent to survey each of the five provinces in Rwanda. Information from the Rwanda demographic and health survey (NISR 2010) and comprehensive food security and vulnerability analysis and nutrition survey (NISR 2012) documents were used to guide site selection. One district in Kigali and two districts from the other four provinces were randomly selected. In each of the districts that were selected, namely, Rubavu, Ngororero, Gakenke, Musanze, Kirehe, Nyagatare, Nyaruguru, Nyamagabe and Gasabo Districts, one sector was randomly selected. At least 16 villages were randomly selected for screening in each of the selected sectors.

The sample was 2,788 with 1,388 households with a stunted child (49.8%) and 1,400 households without a stunted child (50.2%). This means that the two groups were matched well in the ratio of 50:50 in all the provinces and districts and the households without a stunted child group resembled the households with a stunted child group in every way possible (sex, age and location) with the only difference between the groups being malnutrition status.

The data collection phase was designed to generate information on the three main survey components – nutrition, markets, and gender – from questionnaires; haemoglobin from blood analysis; and more details on food consumption using the 24-hour dietary recall. Trained enumerators used tablets to collect data for the three main questionnaires on nutrition, agricultural production and markets, and gender. Professional phlebotomists from local hospitals collected blood samples using standard operating procedures.

Data on nutrition, markets, and gender was analysed by first assessing responses to the survey questionnaire, comparing households with a stunted child and households without a stunted child to determine how they may differ. Then values (odds ratios) for risk factors of stunting based on areas of statistically significant differences between the two groups were computed. Variables that generated significant risks were then used in a statistical model to determine factors driving stunting in the survey population.

3.0

RESULTS



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3.1 Overall Prevalence of Stunting in Children

High prevalence of malnutrition was evident across the target regions (Tables 1 and 2, and Figure 1). All the prevalence data shown are representative at the sector level only. The listing exercise that generated this information was from a much larger sample of more than 10,000 households, out of which 2788 were matched (case/control) for the rest of the study. Overall prevalence of stunting in the screened population was 32 percent. This was observed across all age categories and as low as between 0-5 months, increased among the children of 6-47 months and slowed down as children enter the age of 48-60 months. In addition, boys were more prone to stunting than girls with a prevalence of about 36 percent for boys vis a vis about 29 percent for girls.

Table 1: Prevalence of Stunting in Children under 60 Months in the Survey Sites

	Height-for-age below -2SD (Stunting)	
	Total No.	% Stunted
Age groups		
0-5	1820	9.9
6-11	1995	19
12-23	3558	36.1
24-35	3485	36.7
36-47	3307	39.9
48-60	2546	35.4
Sex of the child		
Male	2888	35.6
Female	2457	28.6

A regional perspective of stunting by district showed that some districts and sectors had relatively higher levels of stunting, ranging from 45 percent in Ngororero (Matyazo sector), 43 percent in Musanze (Cyuve sector) and Gakenke (41%). This contrasts significantly with Gisenyi in Rubavu district (16%). Those sectors considered as urban or peri-urban

such as Gisenyi, Nyagatare or Rusororo had relatively lower levels of stunting compared with much rural sectors such as Gakenke and Matyazo.

Table 2: Prevalence of Stunting in Children under 60 Months in each Survey Site (sector level data)

District	Sector	Total	% Stunted
Musanze	Cyuve	1378	42.7
Gakenke	Gakenke	1232	40.9
Nyagatare	Nyagatare	1728	29.7
Kirehe	Kigarama	1573	36.6
Rubavu	Gisenyi	3073	16.4
Ngororero	Matyazo	1953	45.2
Nyamagabe	Cyanika	2109	32
Nyaruguru	Kibeho	1867	31.6
Gasabo	Rusororo	1798	28.6
Total		16711	32

3.2 Prevalence of Malnutrition in Children under 60 Months of Age and Adult Women

Like stunting, underweight was also observed among children of 0-5 months and increases with age of the child. Overall, the prevalence of underweight and wasting in the screened population was 8.2 percent and 1.1 percent respectively.

Figure 1: Nutrition Status of Children by Age

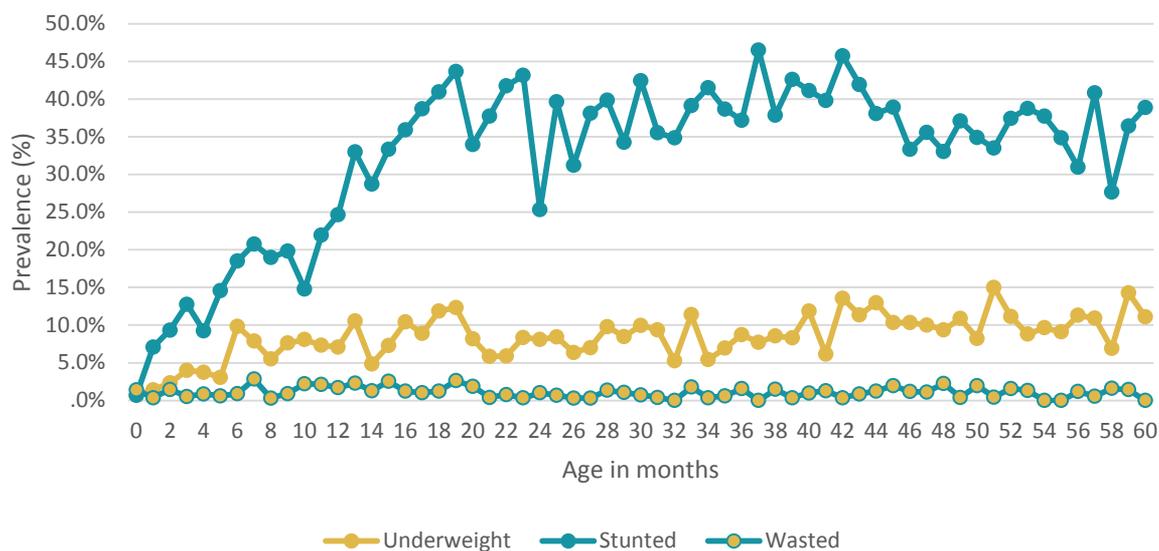


Table 3 provides a summary of nutrition status of women enrolled into the survey by sector. The body mass index was classified to generate five groups that were used to assess the nutrition status of adult women: thinness, underweight, normal, overweight and obesity. In the sampled population, the prevalence of thinness in women was overall below 1 percent, while obesity was below 5 percent but alarmingly high in Gisenyi sector (16.9%).

Table 3: Prevalence of Underweight and Overweight among Mothers in the Survey Sites

	Total No.	Underweight %	Overweight %
Sector			
Cyanika	1495	5.4	13.2
Cyuve	1053	2	29.2
Gakenke	1001	2.5	17.9
Gisenyi	1529	3.1	48.3
Kibeho	1259	6	17.1
Kigarama	1105	4	19.4
Matyazo	1304	2.5	12
Nyagatare	1140	3	28.1
Rusororo	1212	6.4	23.6
Total	11098	3.9	23.6

The prevalence of anaemia among children (boys and girls) and adult women was also checked and found to be high (above 40%) among children of 0-11 months but varied between regions. It was surprisingly low (<4.9%) in Matyazo sector, where stunting is an important public health concern. Instead, the prevalence of anaemia was alarmingly high (65.2%) in Gisenyi sector where the rate of stunting was the lowest. Locations such as Gisenyi sector in which childhood anaemia was severe also had high prevalence of maternal anaemia (Table 4). These results point to a multi-faceted nature of malnutrition for both child and mother. Any interventions thus have to consider the different facets of the problem, where no single approach or intervention would be sufficient.

Table 4: Prevalence of Anaemia in Children under 24 Months Enrolled in the Study (child adjusted haemoglobin, grouped)

	Total No	Any anaemia %	Mild anaemia %	Moderate anaemia %	Severe anaemia %
Study groups					
HH with Stunted child	1,345	38.8	17.2	19.9	1.8
HH with no stunted child	1,339	33.1	17.8	14.2	1
Sector					
Cyanika	302	28.1	15.9	12.3	0
Cyuve	294	21.8	14.3	6.5	1
Gakenke	308	31.8	19.5	12	0.3
Gisenyi	273	65.2	24.5	38.5	2.2
Kibeho	300	34.3	17.3	15	2
Kigarama	301	52.8	24.9	25.2	2.7
Matyazo	292	4.8	2.1	2.7	0
Nyagatare	296	45.6	20.6	22.6	2.4
Rusororo	312	41	18.9	19.9	2.2
Total	2,684	36	17.5	17	1.4

Household food security: The World Health Organisation defines food security as existing when household members have access to sufficient, safe and nutritious food to maintain a healthy and active life. This concept of food security implies both physical and economic access to food that meets individuals' dietary needs as well as their food preferences. The food security indicator was divided into three groups – group 1: food secure; group 2: marginally food secure; and group 3: food insecure. Compared to food secure households, children in both marginally food secure and food insecure households were more likely to have stunted growth.

Food consumption score: The Food Consumption Score is a composite score based on dietary diversity, food frequency, and the relative nutritional importance of different food groups. Three groups were compared: households with poor food consumption (score = 0-21), borderline food consumption (score = 21.5-35), or acceptable food consumption (score ≥ 35). An acceptable food consumption score has a protective effect against stunting. Compared to households with a poor

food consumption score, children in households that have acceptable food consumption scores were 23 percent less likely to be stunted.

Child diet diversity: In addition to diet diversity at the household level, the diet quality of individual children enrolled in the study was assessed. Diet diversity among children 6-24 months is protective against stunting. Compared to children with low diet diversity, children with medium diet diversity are 19 percent less likely to be stunted, while those with good diet diversity are 58 percent less likely to be stunted.

The results show that malnutrition thrives without sufficient and diverse foods; and although having sufficient and diverse foods may be protective, they are not sufficient to eradicate stunting in Rwandan households as food secure households and those with good diet diversity still have relatively high rates of stunting in children under 24 months as shown in Table 5.

Table 5: Association between Food Security Indicators and Risk of Stunting in Children under 24 Months

Indicators of food security	Total	Household with a stunted child	
	No	No	%
Household food security			
Food secure	458	193	42.1
Marginally food secure	1,020	501	49.1
Food insecure	1,277	679	53.2
Total	2,755	1373	49.8
Household food consumption score (FCS)			
Poor (FCS = 0-21)	480	250	52.1
Borderline (FCS = 21.5-35)	956	511	53.5
Acceptable (FCS = 35)	1,190	543	45.6
Total	2,626	1304	49.7
Child dietary diversity			
Low diet diversity	1,896	995	52.5
Medium diet diversity	680	321	47.2
Good diet diversity	179	57	31.8
Total	2,755	1373	49.8

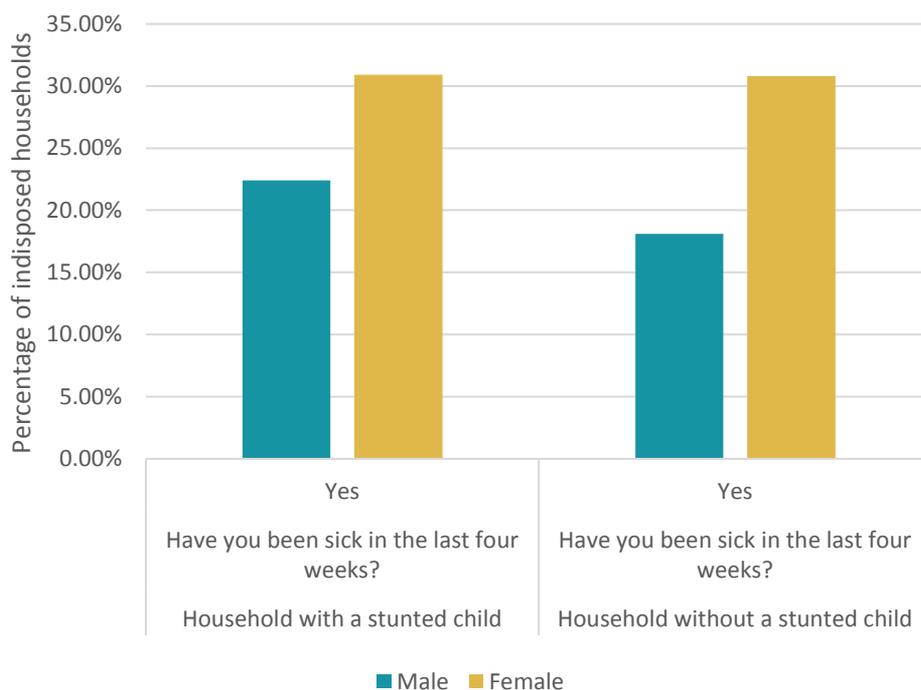
FCS= food consumption score, a measure of food security

3.3 Health and Sanitation (WASH)

The study results confirm significant association between the indicators of health and sanitation among households and malnutrition in the selected regions. In particular, the quality of water (in addition to other practices such as water treatment, hand-washing knowledge, and practices of the mother which were also significant contributors) and overall sanitation of households demonstrated positive association with nutrition outcomes. Specifically, children in households that sourced their drinking water from public or communal sources were 3.09 times more likely to be stunted, compared to those in households whose main source of drinking water is treated piped water. This implies that communal water sources may be of poor quality (for example non-treated) thus negatively affecting the users.

With respect to sickness, results show that the levels of indisposition among females (31%) was the same for both households with a stunted child and without. However, more males (22%) in the households with a stunted child than males in the households without a stunted child (18%) were indisposed (Figure 2).

Figure 2: Incidence of Sickness in the Last Four Weeks among Males and Females



The difference between the two groups was significant, arising especially from the level of indisposition of the males in the households with a stunted child. The likelihood of a child being stunted significantly increased when at least a family member was reported having been sick over the reference period. Results thus show that when a member of the household falls sick, this affects the rest of the household including their food consumption situation.

3.4 Sources of Livelihoods, Agriculture and Markets

Households in Rwanda depend on agriculture for their consumption and as a source of cash income to meet other household needs. Such dual objectives could easily compete and deprive households of sufficient food quantities or diversity needed for good nutrition outcomes especially when households are resource-constrained. This hypothesis was tested by first examining the most important sources of livelihood for households with stunted children and those without. In rural areas, about 62 percent of the sampled households reported crop production as their most important livelihood activity. This means that about 38 percent of the households living in rural localities listed crop production as a secondary activity and derive their livelihood primarily from non-farm activities such as labour supply on other farms and petty trade among others (Table 6). A whole 21 percent of the households with a stunted child derive their livelihood from working on other people's farms compared to 16 percent of the households without a stunted child.

Table 6: Sources of Livelihoods among the Rural and Urban Households in the Study Area of Rwanda

The most important livelihood activity	HH* with stunted child	HH without stunted child	All	Chi ²
	%	%	%	
Rural localities (other sectors)				
Farming	62.58	62.27	62.43	
On-farm labourers	21.24	15.99	18.62	
Livestock/fish	1.35	1.13	1.24	
Non-farm unskilled labour	2.7	4.05	3.37	
Petty trade	5.39	5.86	5.62	
Skilled labour and own business	1.46	3.27	2.36	
Other (unspecified)	5.28	7.43	6.36	0.005
Urban localities (Gisenyi, Nyagatare and Rusororo)				
Farming	33.25	30.5	31.83	
On-farm labourers	16.25	8.75	12.39	
Livestock/fish	0	0.95	0.49	
Non-farm unskilled labour	13.5	12.53	13	
Petty trade	19	23.88	21.51	
Skilled labour and own business	9.25	14.89	12.15	
Other (unspecified)	8.75	8.51	8.63	0.002

*HH=Household; Chi² is a measure of significance of association with stunting

In the urban localities of Gisenyi, Nyagatare and Rusororo, crop production was less important as a source of livelihood; reported by only 32 percent of the households. Majority of these households derive their livelihoods primarily from non-farm activities such as unskilled labour jobs (13%), petty trade (22%) and skilled or own business (12%). Further analysis of the data on the significance of livelihood sources for stunting reveal that more households with a stunted child were those employed in unskilled jobs as their most important source of livelihoods—thus earn less income. In general, the majority of households with stunted children earned less cash income from their livelihood activities including crop production, were generally poorer and perhaps with limited capacity to access sufficient food for their nutritional needs (Table 7).

Table 7: Monthly Income (in Rwandese Francs) from Major Sources of Livelihoods and Crop Production in Rural and Urban Localities

Monthly income	HH with stunted child	HH without stunted child	All	
All livelihoods activities	Mean (RwFr)	Mean (RwFr)	Mean (RwFr)	
Urban	47,695	73,633	60,872	***
Rural	20,765	28,707	24,732	***
Crop production				
Urban	31,639	42,173	36,801	Not significant
Rural	20,492	25,089	22,798	**

***, ** denote significant at 1% and 5% respectively

Since crop production was the main source of livelihood among the rural households, lower income earned from this activity among the households with stunted children reflected lower production and subsequently less quantities sold on the market. Overall, results indicate that households with higher levels of production (more than 500kg of crops) were less likely (50 percent) to have stunting in children, compared to those that could only marginally produce e.g. 100kg of crop (Table 8). In addition the data revealed that for production diversity crop-livestock integration was protective for stunting in children.





Table 8: Quantities of Major Crops Harvested Dry by Households Stratified by Stunted vs Non-stunted Children

	Percentage of households			sig
	All	HH with stunted child	HH without stunted child	
Maize				
Less than a bag (100kg)	51.12	54.9	45.1	
One - five bags (>100kg)	48.88	44.3	55.7	**
Sweet potato				
Less than a bag (100kg)	44.22	53.8	46.2	
One - five bags (>100kg)	55.78	47.6	52.4	NS
Beans (bush + climbers)				
Less than a bag (100kg)	82.38	48.9	51.1	
One - five bags (>100kg)	17.62	43.5	56.5	NS
Any major crops				
Less than a bag (100kg)	69.1	50.2	49.8	
One - five bags (>100kg)	30.9	45.2	54.9	*

****, *** denote significant at 5% and 10% respectively (cut-off value for significance is 10%). *NS* denotes not significant.

Low production is associated with extremely low use of yield-increasing inputs such as chemical fertilisers, as well as low fertility of soils among other factors. Households that have not adopted soil chemical fertilisers were more likely to have stunted children. However, it should be noted that this relationship does not in itself imply causality. It is plausible that the use of chemical fertilisers and yield-increasing inputs is in fact a proxy for other more direct risk factors such as income or access to credit. Non-use of chemical fertilisers diminishes food productivity. Modest expenditures on chemical fertiliser have a profound effect on stunting in children due to increased agricultural productivity. With respect to seed, the chances of stunting in children significantly increased when households relied on seeds from gifts and other free handouts. Thus quality seed and fertiliser application are necessary for enhancing production, which is then channeled into food and incomes.

In the context of severe land shortage, land degradation and smaller population of livestock in the area, under-utilisation of improved technologies such as chemical fertilisers and quality seed of improved varieties reduces the household's productive capacity and access to

food for the family. Only 18 percent of the households used chemical fertilisers in agriculture production and only 51.5 percent had soil ditches in their farms. Although the majority may opt for organic manure because of its low cost and sustainable benefits, the quality of the manure and its usage is not certain. It is noted that possession of livestock in the population was also very low – kept by less than five percent of the households. From the perspective of manure, these low levels of livestock may easily compromise the quality of manure. Thus, results support the need to enhance farm level productivity of marginal farmers by addressing critical productivity factors such as fertiliser use, soil control measures and seed quality and by enhancing inclusion of livestock in the systems.

The role of complementary sources of income is prominent in the

surveyed households. The majority of households reported access to some income from off-farm employment which they use to supplement their farm income. Of those who obtain off-farm income, about 47 percent use it primarily to purchase food while 26 percent spend part of that income on food after meeting other critical needs (Table 9). As already alluded to, cash constraints appear to be more binding for households with stunted children as compared to those without. On average, households with stunted children spend less on purchasing food from the market than households without stunting despite the fact that the former produce less from their own farms (Table 10). The results further reveal that when either spouse does not earn any regular income, especially in urban localities, the chances of stunting in children significantly increases.

Table 9: Important Use of Income from Non-farm Activities

Important use of income	Most important	Second important	Third important
	Percent	Percent	Percent
Food purchases	46.84	15.42	11.5
School fees	1.55	5.84	4.95
Health	4.7	13.6	9.91
Agriculture/farming	2.96	11.46	10.98
Alcohol/Entertainment	0.18	1.55	2.18
Other	43.77	52.13	60.48
Total	100	100	100

There was no significant difference between cases and controls.

Table 10: Household Average Cash Expenditure on Food and Non-food Items in the Last 30 Days

Item	All HHs	HH with stunted child	HH without stunted child
Cash expenditure on food (RwFr)	21,626	19,123***	24,108
Non-food expenditure (RwFr)	8,738	6,806***	10,652

*** denote significant at 1% compared to cut off value of 10%

The study also examined the association between market participation in terms of proportion of produce sold and the risk of having stunted children. Results reported in Table 11 reveal no significant marketing of staple crops to suggest any direct competition between food security and cash income objectives. On the contrary, results in Table 7 are suggestive of low purchasing power associated with poor remunerative employment as significantly linked to stunting. Households that earned more income from off-farm employment seemed to be at an advantage to supplement their farm production.

Table 11. Percent of Crops Harvested Consumed and Marketed by Households in Study Areas

	All	HH with stunted child	HH without stunted child	Significant
Utilisation of harvest of major crops	Mean	Mean	Mean	
Percent of the harvest that is consumed				
Most important crop	75.3	75.8	74.8	NS
Second important crop	76.4	76.8	76.1	NS
Percentage of the harvest that is marketed				
Most important crop	15.1	14.9	15.4	NS
Second important crop	14.4	13.9	14.8	NS
Percentage consumed of major crops				
Maize (N=367)	68.2	68.1	68.4	NS
Sweet potato (N=166)	77.5	77.8	77.1	NS
Beans (N=831)	83.2	84.2	82.3	NS
Percentage of the major crops marketed				
Maize (N=367)	21.3	20	22.7	NS
Sweet potato (N=166)	9.8	9	10.5	NS
Beans (N=831)	10.3	11.2	9.6	NS

NS denotes not significant at a cut-off value of 10%

N = number of hh to bottom of table (NS denotes not significant at a cut-off value of 10%; N = number of hh)



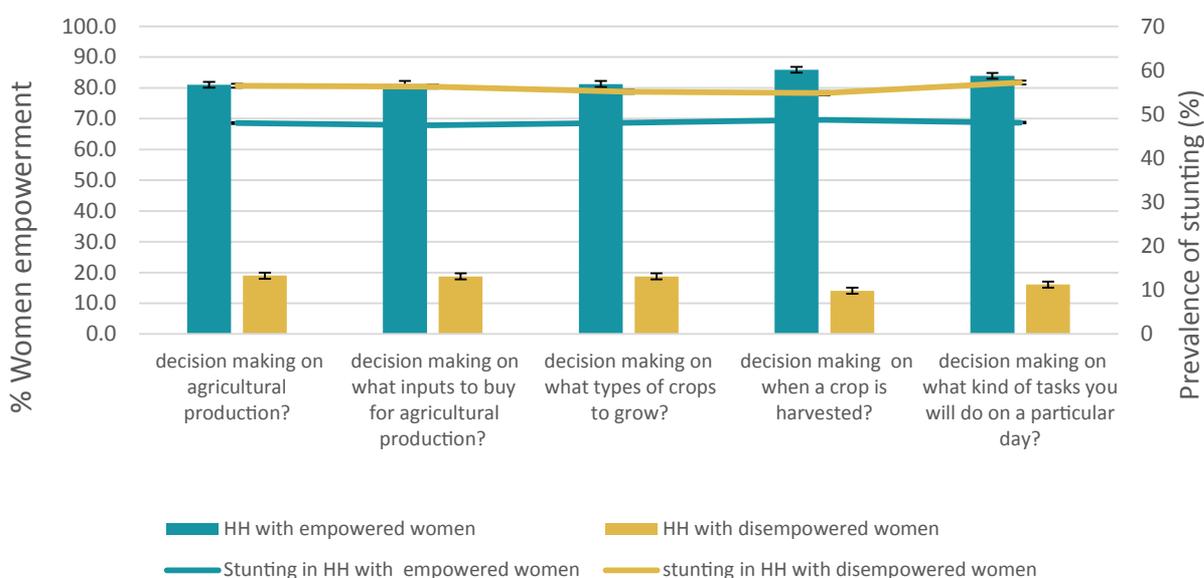


3.5 Gender

Empowerment of women in the agricultural sector is generally considered vital for good nutrition outcomes. In the analysis, empowerment scores were derived from the Women Empowerment in Agriculture Index (WEAI) and used with the appropriate indicators (odds ratios) to investigate the association between gender disempowerment and stunting in children under 24 months of age. Although large differences between men and women exist with regard to decision-making, women appeared to have a good degree of involvement in decision-making in most of the domains except in the case of livestock and this was negatively correlated with nutrition outcomes. Children in households where decisions on which livestock to rear were made with limited

participation of women had significantly higher risk for stunting compared to those in which both men and women were involved. Similarly, the extent of influence on decisions regarding use of income from harvested crops differed between males and females with males more likely to dominate. In both strata of households (stunted vs non-stunted children), women were less involved in decision-making on how to use income from livestock commercialisation, but no significant association with stunting on children was established. Overall, about 15-20 percent of households reported extremely limited or no input from women in decisions regarding agricultural production. These households were significantly more likely to have stunted children than those in households where mothers were empowered (Figure 3).

Figure 3: Women Empowerment with Regard to Control over Agricultural Production and Prevalence of Stunting in Children under 24 Months



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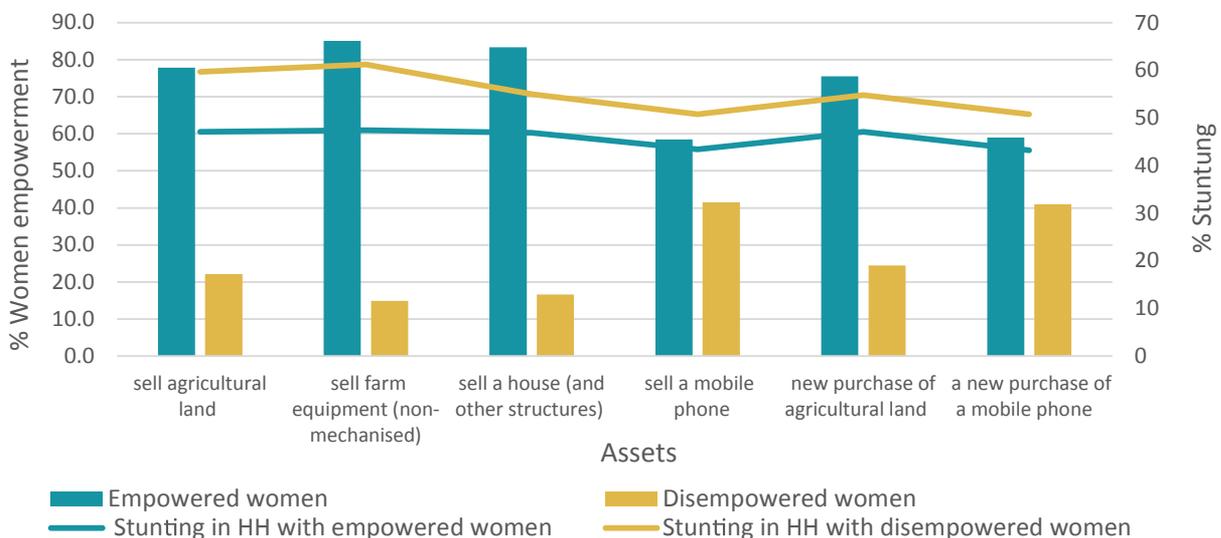
Overall, a household endowment in large assets (i.e. non-farm equipment, large durable assets, small consumer durable assets, mobile phones and means of transport), which is a proxy for wealth, was significantly associated with the level of stunting.

Ownership of each asset type was found to be significantly associated with 27-32 percent lower risks of having a stunted child irrespective of whether it was owned by the heads of household or jointly by all household members. With respect to who owned most of the key assets, significant observations were made on ownership of agricultural land, non-mechanised farm equipment, and non-farm business equipment.

Aggregately, women in about 20 percent of the households lacked participation in ownership, access to, and decision-making power over productive land, while about 40 percent were considered disempowered in terms of control over mobile phones owned by the households (although a woman

may use the mobile phone, it is owned and controlled by the man). Lack of female control over productive assets was found to be significantly associated with the prevalence of child stunting, and ranged between 50 and 60 percent among households with no empowered women (Figure 4). Similarly, children in households where mothers lacked control over household land were at a higher risk of stunting. Similar results are noted farm equipment and mobile phones. Lack of control over productive resources implies that women are unable to increase their productivity in the activities they do either to enable them access income or increase food production. Some of the resources such as land are necessary to access credit as collateral, while some can reduce drudgery. Others such as mobile phones act as sources of useful information, and are popularly used for mobile-based banking in rural areas, both of which are key areas of empowerment.

Figure 4: Prevalence of Stunting and Women Empowerment with Regard to Assets Control in Rwanda

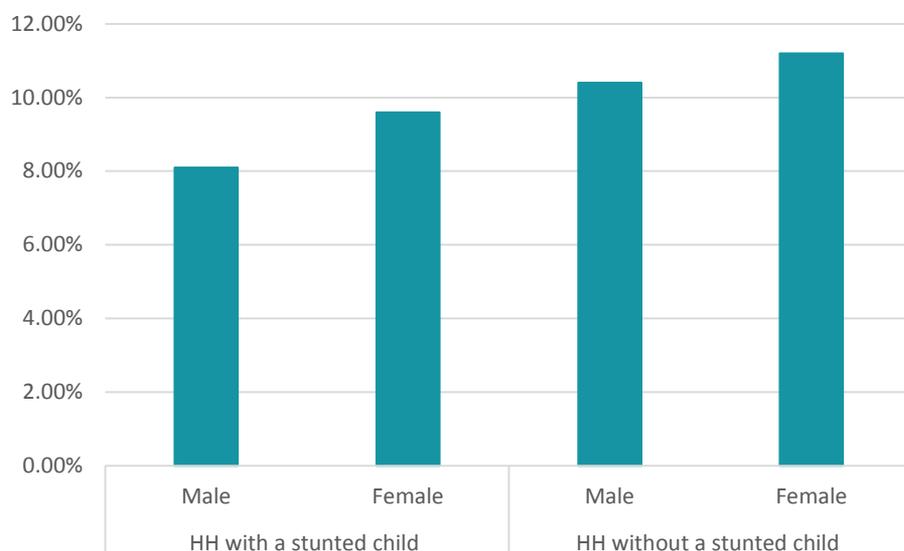


Control over one's time is another dimension that was used to measure empowerment. The analysis looked at whether individuals worked more than 10.5 hours in the previous 24 hours. Individuals were considered inadequate in time allocation if they worked more than 10.5 hours in the previous 24 hours. Results showed that time spent in the field farming by the households increased the risk of having a stunted child by 1.8 times, which reflects the competition between productive and reproductive roles at household level. Females generally reported having less than enough sleep as compared with males. This difference was statistically significant. Similarly, there appeared to be slight differences between households with stunted and those without a stunted child in the amount of sleep. More households with a stunted child appeared to have less than average amount of sleep than households without a stunted child, and this is statistically significant.

Consistent with a study conducted

in Nepal by Cunningham et al. (2015), the NMG Survey results show that individual satisfaction with leisure time, access to, and decisions on credit are significantly associated with nutritional status of children less than 2 years of age. The percentage of males and females who took credit was 12 percent, implying that access to credit is still a challenge among households. But among those households that took credit, this was positively associated with low stunting; a fact that can be attributed to potential use of credit for productive purposes (and emergency consumption purposes) by the households. Furthermore, females were more likely than males to take credit in either group but those from the households without a stunted child were more than the females in the group with a stunted child (Figure 5). Current credit efforts revolve around information and communication technologies (mobile banking) with a mobile phone having potential to increase financial inclusion when women are able to own and utilise the phones.

Figure 5: Percentage of Respondents Who Took a Loan or Credit

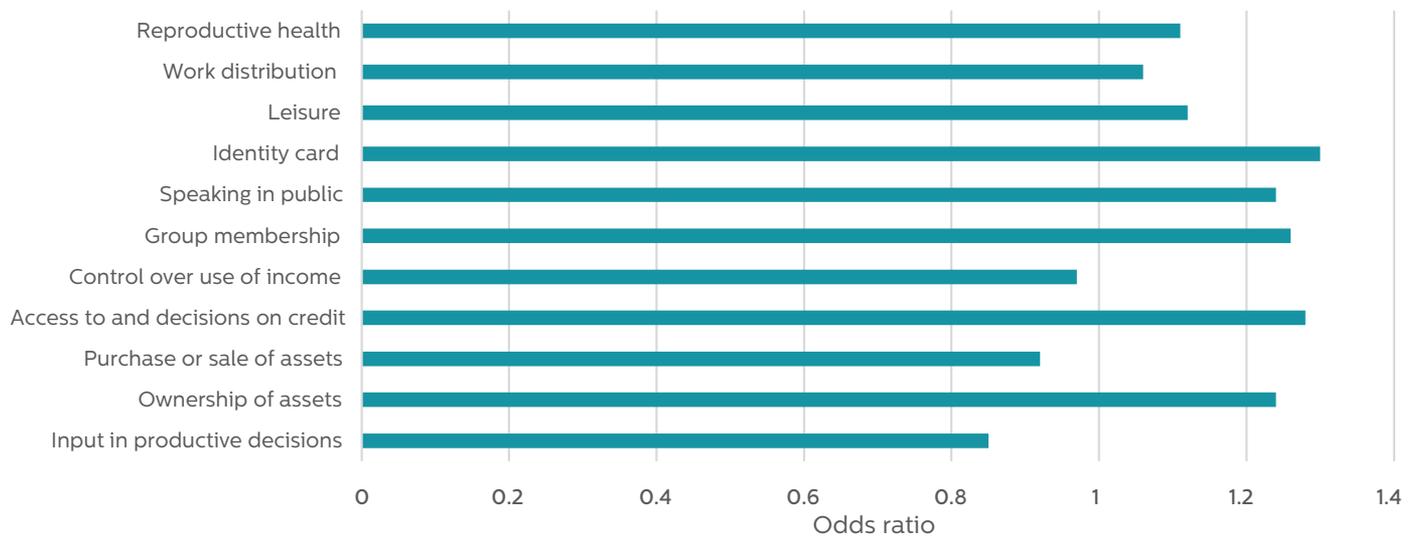


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In order to understand the association between gender empowerment and child nutritional outcomes, the risk for stunting was computed between households with a stunted child and households with a healthy child for each of the indicators of gender empowerment. Disempowerment in asset ownership, lack of access to and decisions on credit, no membership in a credit group, and poor reproductive health were found to significantly increase

the risk of stunting in children (Figure 6). Overall, results show that households that neither had a member nor a leader in a social group had a higher risk of having a stunted child. In many of the households with a stunted child, female participation in groups appeared lower, especially in the economically-oriented groups. The risk of stunting in children was higher in mothers who lacked access to credit facilities offered by such groups.

Figure 6: Association Between Household (men and women) Empowerment and the Risk of Stunting (NB: Risk of stunting highest if odds ratio value >1).



4.0

INTERLINKAGES BETWEEN NUTRITION, MARKETS AND GENDER



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The association between child nutrition and factors discussed is important but does not imply causality. In this section, we present results from a statistical analysis for multiple variables where causality is assessed. Variables were selected to represent aspects of market and gender dimensions while controlling for related variables. The variables included in the final statistical analysis are shown in Table 12.

Table 12: Statistical (Probit) Model Results for Determinants of Stunting in Children under 24 Months in Rwanda

Variable	Significance* (p value)
Response Variable: Stunted child (0) or No stunted child (1)	
Child factors	
Birth weight of child	0
Maternal education (Reference: no education)	
Some primary	0.65
Completed primary	0.824
Some secondary	0.591
Completed secondary	0.101
University or college	0.496
Decision-making on daily tasks	
Disempowered	0.027
Active membership in credit group	
Not active member	0.016
Empowerment and confidence in public affairs	
Disempowered	0.065
Number of occasions washed hands	0.176
Knowledge of food nutrition value e.g. biofortified foods (reference: no knowledge)	
Yes, had knowledge	0.043
Type of floor (Ref. mud floor)	

Variable	Significance* (p value)
Cement	0.02
Other types of floor	0.612
Use of mineral fertilisers	
Did not use	0.065
Use of ditches to control soil erosion	
Did not use	0.015

**Significance value- indicates how important the factor is in explaining stunting, important if value is less than 0.10.*

The results shown in Table 12 are based on a set of variables representing the following clusters: child birth and mother-related factors, gender empowerment factors, nutrition education and knowledge factors, household wealth and agricultural production characteristics. These variables represent factors within the clusters that had the strongest influence on stunting in children, which are further discussed below.

4.1 Effect of Gender on Stunting

Results from the multivariate econometric analysis support the descriptive findings that women empowerment plays a role in reducing the risk of stunting. Households with women that were unable to decide on daily tasks and take charge of their time were 18.6 percent more likely to have stunted children, while not being confident to engage in public affairs increased the likelihood of having a stunted child by 11.7 percent. The ability of a woman to have confidence in the community is an indicator that as a mother she is able to address food and nutritional concerns when it comes to child welfare in her own home. While the link may not be obvious or very strong, results suggest that the ability to negotiate and

comprehensively make decisions enables women to access resources that affect children's nutritional outcomes. These findings suggest that there is need to identify and implement strategies that enhance women empowerment. In particular, reducing the time burden on women requires female-friendly agricultural labour-saving technologies such as mechanisation that allow women to work faster and expend less energy so that they can better care for other responsibilities, especially those related with reproductive roles and childcare. Agri-mechanisation would attract more men into the farms compared to the use of rudimentary hoes. As evident from descriptive results, women that spend more than average time in agriculture are less likely to breastfeed their children any time or ensure sanitation of their children, which leads to child stunting.

Further access to productive resources, like credit, was one of the most important determinants for stunting in children that emerged from the analysis. On average, households where women lacked active participation in credit groups were 46.6 percent more likely to have children that are stunted. The large magnitude of credit reflects the complementary benefits these women derive from participation in credit groups. Participation in other non-finance related groups did not have a similar significance, drawing attention to the importance of access to capital that can be used for farm production and income generation purposes or supplementing consumption. In addition to credit access, such groups are platforms for information exchange on production and childcare; and provide social insurance to deal with risks.

4.2 Effect of Productivity and Market Access on Stunting

The survey results bring out significant relationships between the use of productivity-enhancing technologies such as chemical fertilisers and soil erosion control and nutrition. The use of these improved agricultural practices correlate with better nutrition for children under 24 months. While majority of households do not use mineral fertilisers, the results from the multivariate analysis show that, on average, these households that

do not use chemical fertilisers were about 15 percent more likely to have stunted children than those who use chemical fertiliser. This means that imperfections in the input market which hinder better access and utilisation of land-enhancing inputs negatively affect nutrition through lower productivity.

The negative relationship from use of ditches was surprising and implies that households that are using these soil conservation measures might have adopted them when land was already severely degraded and consequently continue to harvest less than their food needs. Thus households trying to practice soil conservation measures may already be residing on extremely unproductive pieces of land such that the efforts at production are not generating enough food. Improving the nutrition of such households would require further investigation on the land management practices of these households and associated technologies that are better suitable under such circumstances. All in all, results from this analysis support the conclusion that among the large number of potential interventions for improving nutrition in Rwanda, increasing productivity is still critical despite progressive improvements in the recent past.

5.0

CONCLUSIONS

Stunting is evident in children 0-5 months and increases with age between 6-47 months, with a small decrease in the 48-60 age group. Stunting in the surveyed population is of high public health concern among children aged 12-60 months. The prevalence is higher in boys than girls. In most sectors, except Gisenyi sector, the situation is either high prevalence (30-39%) or very high prevalence $\geq 40\%$, with Matyazo sector being the most affected. Overall prevalence of stunting in the screened population was 32 percent (high prevalence).

Anaemia is evident in both stunted and non-stunted children, and although the prevalence is higher in children with stunted growth, it is of moderate public health concern in both groups. Surprisingly, in Matyazo sector, where stunting is an important public health problem (45.2%), anaemia is not a public health problem ($<4.8\%$). On the other hand, Gisenyi sector that had the lowest rates for stunting (16.4%) had the highest rates for anaemia (65.2%). The severity of childhood anaemia in Gisenyi sector is alarming.

For maternal nutrition, in six out of the nine sectors, the prevalence of underweight in the screened population was below 5 percent. However, in the other

3 sectors – Cyanika, Kibeho and Rusororo – the prevalence is between 5-9 percent, making this low prevalence but warning that monitoring is required. On the other hand, the prevalence of overweight in Gisenyi sector is 48 percent, which should trigger a public health concern.

When examining causes of malnutrition, it is clear that nutritional status is determined by three broad factors: (i) access to sufficient, safe and nutritious food; (ii) access to quality water, health services and sanitation (WASH); and (iii) care practices of women and children. The study findings indicate that having sufficient and diverse foods is protective but food alone is not sufficient to eradicate stunting in Rwandan households. For WASH factors, access to improved sources of water and access to portable water was extremely important in reducing the risk of stunting in children. The results do indicate multiple determinants of stunting in children and it is clear that no single sector can address malnutrition alone; several sectors have a role to play as indicated in the following paragraphs.

The study findings provide evidence of access factors such as crop

production and/or income from off-farm employment as the underlying barriers to alleviate malnutrition. Households that continue to have stunting are those that have relatively low production as a result of low use of land productivity-enhancing inputs such as fertilisers and, or, farming on degraded land. These households either produce less, or earn little from their off-farm related activities and consequently lack access to sufficient quantities or diversity necessary for better nutrition outcomes. The capacity to access food by these households can be enhanced through targeted interventions to increase the productivity with a package of technologies that address soil fertility, land management and improved crop variety seed. For example, intensification of livestock crop integration would increase household access to organic manure that can be used to increase productivity. Possession of larger livestock units like cattle was rare, reported by less than 5 percent of the households in the study areas. Though organic manure on its own was not significant enough to distinguish between the two groups, it would appear that efforts at micro-dosing (with chemical fertilisers) are a major complement to the current organic manure usage. Further efforts are needed to strengthen seed systems to enable farmers' access to

higher quality seed to replace seed and varieties regularly.

It is also clear that there are other complementary pathways to reducing malnutrition in Rwanda. The importance of factors such as poor health and sanitation especially among women; access to nutrition-related information; women empowerment regarding work burden, and access to financial resources such as credit facilities was evident from the analysis. Therefore there is need to mainstream gender in land intensification programmes and health education strategies to address malnutrition and achieve higher nutrition outcomes. Labour-saving technologies that are friendly for women and attractive to men, and nutrition education programmes are examples of such complementary interventions that should be promoted.

Finally, the study results provide no strong evidence that marketing part of the harvest is significantly contributing to the persistent malnutrition in Rwanda. On the contrary, low use of inputs such as fertilisers, access to information on production and nutrition appear to be stronger areas of intervention to increase nutrition outcomes. Some of the interventions should account for the current imperfections in the

input markets that constrain access.

Efforts targeting nutrition education and awareness, knowledge, attitudes and practices can address the malnutrition problem, in addition to addressing agricultural productivity and gender empowerment in the households. Results strongly point to the need for multi-sectoral efforts and coordination among the different agencies involved in combating nutrition challenges.

6.0

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A SYNTHESIS OF THE RWANDA NUTRITION, MARKETS & GENDER ANALYSIS 2015

An integrated approach towards
alleviating malnutrition among
vulnerable populations in Rwanda



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Organization



World Food
Programme



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