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The impact of smallholder commercialisation of organic crops on food consumption patterns, dietary diversity and consumption elasticities

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Abstract

The impact of smallholder commercialisation on food consumption patterns in a rural community of South Africa was investigated. The dietary diversity, nutrient intakes and consumption patterns of certified, partially certified and non-members of an organic farmers' organisation were compared. Engagement in certified commercial organic farming promoted comparatively greater dietary diversity and improved nutrient intakes. While smallholder agriculture commercialisation has the potential to improve food consumption patterns and food quality through increased income and labour opportunities, caution should be exercised before claiming that such commercialisation can alleviate food insecurity and solve hunger in rural South Africa.

Keywords: agriculture; growth; smallholder; consumption; nutrition

1. The impact of agricultural growth on food security

'Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life' (Food and Agricultural Organisation (FAO), 1996). Food insecurity is rife in Africa and a major constraint to achieving Millennium Development Goal one to halve poverty by 2015 (African Union & NEPAD, 2008). Agricultural intensification and commercialisation may offer solutions to food insecurity in rural areas through increased income from farm and non-farm sources (Mellor, 1976:187, Hazell & Röell, 1983; Hazell & Haggblade, 1991; Delgado *et al.*, 1998; Haggblade *et al.*, 2007; Southgate *et al.*, 2007) as agricultural growth benefits both rural and urban poor by providing more food, raw materials at lower prices, capital and labour for development, reducing poverty and increasing the participation of the poor in the growth process.

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Agricultural growth is effective in reducing poverty and has been shown to have a stronger effect on poverty reduction than other sectors of the economy (Bresciani & Valdes, 2007, citing work by Datt & Ravallion, 1998 and Ravallion & Datt, 1996). However, even in Asia, where the Green Revolution of the 1970s drove substantial improvements in overall development and substantially reduced hunger and malnutrition, it is clear that economic growth alone is not sufficient to eliminate hunger (UN Millennium Project, 2005). Very little is understood about the mechanisms and the magnitude of the effects of macroeconomic policy on the nutritional status of the poor (Torlesse *et al.*, 2003). However, it is widely known that the poor tend to spend a large proportion of their income on food and that, in theory, an increase in income should enable diversification of dietary intake and allow households to purchase essential items not produced by the household, or allow them to spend more on non-food commodities (FAO, 1997; Faber & Wenhold, 2007; Kirsten *et al.*, 2007; Wenhold *et al.*, 2007). What is not known is whether any consumption changes that result from improved farm household incomes are beneficial in terms of energy and micronutrient intakes of the poor. In other words, does agricultural development drive positive and healthy consumption changes among the community?

Food insecurity and hunger are a reality in rural areas of South Africa (Rose *et al.*, 2002; Hendriks, 2005; Labadarios, 2005). While South Africa is nationally food secure, available data suggests that between 58.5 and 73% of South African households experience food insecurity; 15.9% consume less than adequate energy; about 22% of children under nine years of age are stunted; approximately 3.7 of children under nine years of age show signs of wasting, and approximately 30% of households experience hunger (Gericke *et al.*, 2000; Rose & Charlton, 2002; Hendriks, 2005; Labadarios, 2005).

The hungry and malnourished tend to be located primarily in agricultural areas, and hunger and malnutrition are more acute among the landless, pastoralists, smallholders and hired agricultural workers (Southgate *et al.*, 2007). Many poor households in developing countries lack the resources required to produce enough food or the means to purchase food to maintain adequate year-round nutrition, resulting in diets that are deficient in energy and micronutrients (Torlesse *et al.*, 2003).

Van Zyl *et al.* (1991), Belete *et al.* (1999), Ngqangweni (1999), Hendriks and Lyne (2003a), Hendriks and Lyne (2003b) and Browne *et al.* (2007) have shown that the demand for staple goods in South Africa is relatively non-responsive (inelastic) to changes in income compared to non-farm goods, but that farm tradables were responsive to income changes. Brown *et al.* (2007) found that

the expenditure elasticities for aggregate food expenditure were non-responsive (inelastic) to changes in income in the Embo ward of Umbumbulu, KwaZulu-Natal. Brown *et al.* (2007) found a seasonal difference in expenditure patterns, suggesting that responses to income changes are affected by seasonality of production. Brown *et al.* (2007) and Hendriks and Lyne (2003b) found that locally produced goods and services (non-tradables) are relatively income elastic in the sampled areas in KwaZulu-Natal. Potential exists for demand-led growth through increased demand for non-tradable goods and services - that could effectively stimulate demand-led growth (Hendriks & Lyne, 2003a, 2003b; Browne *et al.*, 2007).

Accelerated agricultural growth is imperative for alleviating poverty (Von Braun, 2008) and has been identified as the vehicle for economic development and addressing Millennium Development Goals in Africa (NEPAD, 2003; DFID, 2005; African Union & NEPAD, 2008; Commission of the European Communities, 2007; World Bank, 2008). While increased open trade provides opportunities for small agricultural producers in developing countries, many have not been able to take advantage of these potentially lucrative income opportunities by engaging in commercial production for niche markets (referred to here as commercialisation) due to rigorous safety and quality standards of food processors and retailers, and imperfect or missing markets (Von Braun, 2007). Considerable research is still required to understand the barriers to entry for small scale producers to engage in global markets to provide sustainable and appropriate policy and programme solutions to ending hunger and poverty in Africa. Moreover, little is understood about the impact of small scale commercialisation on poverty and household food security to inform macro-economic policy change and ensure that agricultural growth brings about widespread positive benefits for the most vulnerable in society.

Likewise, the potential for smallholder agricultural intensification and commercialisation to address poverty and food insecurity in South Africa's rural areas has not been widely investigated. It is not known which products are best to target, or what the direct and indirect impacts on hunger and malnutrition could be. This paper presents the results of a study to explore the impact of commercialisation of organic production of traditional root crops on dietary diversity, energy consumption, micronutrient intakes and food expenditure patterns among sampled smallholder farm households in a rural community in KwaZulu-Natal.

2. Study context

This paper contributes to a broader transdisciplinary study that set out to establish the potential for smallholder commercial production of organic crops to generate much-needed household income, stimulate beneficial consumption changes and drive economic development. The study was based in a rural community (Embo), 40 kilometres south west of the coastal city of Durban, KwaZulu-Natal, South Africa. The Ezemvelo Farmers' Organisation (EFO) is a group of traditional organic farmers (Modi, 2003) within the Embo community that produces and markets certified organic produce to South African supermarket chains. The EFO Agriculture in the communal area is mostly rain fed. The organisation was established in February 2001. In 2002, EFO became South Africa's first group of small-scale farmers to achieve organic certification. EFO farmers pool green beans, baby potatoes, sweet potatoes and *amadumbe (taro)* grown individually by its members, and sell them to a pack house, which markets fresh organic produce to a major retail chain.

EFO started with 48 members. The success of the group encouraged other community members to join EFO. By the time this study commenced in 2004, EFO's membership had expanded to 151 members, drawn from 127 households. The initial 48 members were fully certified organic farmers, having been endorsed by AFRISCO as satisfying their certification requirements. The remaining 103 members (termed partially certified here) were converting to organic production, but were not yet certified by AFRISCO.

3. Methodology

All the 127 households of the EFO members were interviewed in October/November 2004/2005 in two survey rounds. A comparative sample was drawn from a list of households whose members did not join the EFO, but reside in the same tribal wards as EFO members. A simple random sample of ten cases was drawn from each stratum (the tribal wards from which EFO members came). Expenditure data was collected for 39 food items consumed from purchases, gifts, payments and own production. Dietary diversity was estimated as the sum of different food types consumed over a month. To determine the nutritional value of the foods purchased over the previous month, the expenditures had to be converted into weights and volumes using price and average volumes acquired from the local community. Food volumes and masses were then converted into daily per capita energy (kJ/day), iron (mg) and vitamin A (μg Retinal equivalents) consumption using food composition tables (Langenhoven *et al.*, 1986) and following the methodology

applied by Rose *et al.* (2002). Whether the intakes of households were adequate or not was determined by comparing each household per capita intake for each macro nutrient and the selected micronutrients with Recommended Daily Allowances (National Academy of Sciences, 1989).

Analysis of variance (ANOVA) was used to compare the differences in the mean values of household food diversity (food counts) intakes and adequacy of energy, iron and vitamin A among the three study groups. These nutrients were chosen as they are typically lacking in South African rural diets (Labadarios, 2005). The Duncan Multiple Range test was used to categorise the means of the regressands (food diversity and energy and nutrient intakes) into weighted groups in relation to their regressors (three categories of farmers). A variant of the Working-Leser model, as used by Hazell and Röell (1983) and Delgado *et al.* (1998), was used to estimate the absolute budget shares (ABSs), marginal budget shares (MBSs) and expenditure elasticities for each commodity category. Household characteristics included in the equation (household size and the area under cropping) captured differences in family composition and their influence on household expenditure. Per capita expenditure (E_i) on commodity i was therefore expressed as:

$$E_i = a_i + b_i E + c_i E \log E + \sum_j (\mu_{ij} Z_{ji} + \lambda_{ij} E Z_{ji}) \tag{1}$$

where E was the total per capita consumption expenditure, Z_j denoted the j th household characteristic variable and a_i, b_i, c_i, μ_{ij} and λ_{ij} were parameters to be estimated. Share equations were estimated by ordinary least squares. The equation used for this study was:

$$S_i = b_i + a_i/E + c_i \log E + \sum_j (\mu_{ij} Z_j / E + \lambda_{ij} Z_j) \tag{2}$$

where $S_i = E_i/E$ is the share of commodity i in total per capita expenditure. Following Delgado *et al.* (1998), the equations used to estimate the budget shares and elasticities were:

$$MBS_i = \delta E_i / \delta E = b_i + c_i (1 + \log E) + \sum_j \lambda_{ij} Z_j \tag{3}$$

$$ABS_i = S_i \tag{4}$$

$$\epsilon_i = MBS_i / ABS_i \tag{5}$$

4. Description of the sample

The sample included 200 individual member respondents from 127 households. The randomly selected EFO non-member households (24% of the sample) served as a comparative group to compare the consumption patterns

of the certified EFO members (28 % of the sample) and the partially certified EFO members (in conversion to organic production certification and making up 48 % of the sample).

Household size ranged from one to 25, with a mean of eight members. Farm size varied from 0.01 to 8.90 hectares with a mean of 0.6969 hectares (0.48, 0.77 and 0.75 hectares each for non-members, partially certified members and certified members respectively). The mean monthly household income for the full sample was R2809 (1 Rand = 0.16US\$ in November 2004). The main sources of household incomes for all households were wages, state pensions and remittances.

Farm activities generated R499 per annum for the whole sample and non-farm incomes averaged R2310 respectively per month. Farm income contributed 2.36, 5.05 and 7.53% to household income of non-member households, households of partially certified and certified members respectively. The partially certified farmers generated 60% of farm income from the sale of organic crops. Certified EFO members sourced all farm income from the sale of organic crops, and farm income for this group was significantly higher ($P \leq 0.05$) than for households in the other two groups.

Food was sourced through purchases, gifts, food given as payments, and/or own production. More than 70% of food was purchased. Despite increased production and active sale of agricultural produce, only seven and 26% of food consumed came from own production in November and March respectively. The data showed substantial reliance on purchased maize, regardless of EFO membership status.

5. The impact of smallholder commercialisation on food diversity

Food diversity ranged from five to eight food items consumed per household per month, to 35 and 34 in rounds one and two respectively. EFO members enjoyed the greatest dietary diversity (Table 1).

Table 1: Food diversity per group, Embo, November 2004 and March 2005

Household categories	Diversity in round 1 (November 2004)				Diversity in round 2 (March 2005)			
	Min	Max	Mean	ANOVA (P≤ 0.01)	Min	Max	Mean	ANOVA (P≤ 0.01)
Non-members	5	30	18 ^a		8	34	21 ^a	
Part-certified members	6	35	19 ^a		12	34	24 ^{ab}	
Certified members	10	33	24 ^b	0.000**	15	34	26 ^b	0.000**

** = mean count differences significant at 99 % level of significance, a = the group with low mean food count while b is the group of high mean count; ab is the mid count group (Duncan Multiple Range Test).

Little difference was observed between the dietary diversity of partially certified and non-member households in round one. The dietary diversity of partially certified members improved in the second round following the peak harvesting period for staples and saleable crops. As the partially certified members were not able to sell organic produce during their three-year conversion period, many provided labour to certified members. Within food groups, little significant difference was observed between food diversity for the three groups for dairy and fruits in round one and baby foods and dairy in round two (Table 2). While almost all households consumed bread (89% of all households) and rice (97.5%), considerably more certified member households consumed flour (81%) and prepared cereals (21%) in round one than the partially certified and non-members households, influencing the dietary diversity results. Consumption of fats and oils increased for the partially certified members following the harvesting season for saleable crops in March 2005. The increased consumption of tinned fish in the second round for certified members could have indicated improved nutritional intakes with regard to many fat soluble vitamins, calcium and protein.

Considerable increases in the variety of vegetables consumed by the partially and fully certified member households were observed across the two rounds (Table 2). Overall, food diversity was found to be significantly higher among households engaged in certified commercial farming than for the other two groups, which should have influenced energy and nutrient intakes.

Table 2: Dietary diversity, Embo, November 2004 and March 2005

Food group	No of items in group	Round 1 (November 2004)				Round 2 (March 2005)			
		Mean number of foods consumed in a month				Mean number of foods consumed in a month			
		Non-members	Part-certified members	Certified members	ANOVA (P≤ 0.05)	Non-members	Part-certified members	Certified members	ANOVA (P≤ 0.05)
Baby foods	1	0.16 ^a	0.11 ^a	0.22 ^a	0.237	0.22 ^a	0.27 ^a	0.09 ^a	0.031*
Cereals	6	3.8 ^a	4.0 ^a	4.65 ^b	0.001*	4.53 ^a	4.65 ^a	4.65 ^a	0.734
Dairy	4	1.40 ^a	1.46 ^a	1.89 ^a	0.030*	1.63 ^a	1.88 ^a	1.89 ^a	0.388
Eggs	1	0.53 ^a	0.72 ^{ab}	0.78 ^b	0.015*	0.57 ^a	0.66 ^a	0.75 ^a	0.175
Fish	2	0.28 ^a	0.22 ^a	0.43 ^a	0.067	0.30 ^a	0.25 ^a	0.54 ^b	0.002*
Fruits	4	1.8 ^a	1.6 ^a	2.18 ^a	0.020*	1.53 ^a	2.13 ^b	2.63 ^b	0.001*
Legumes	1	0.92 ^{ab}	0.76 ^a	0.95 ^b	0.003*	0.73 ^a	0.83 ^{ab}	0.85 ^b	0.005*
Meat and poultry	4	2.40 ^a	2.20 ^{ab}	2.89 ^b	0.001*	2.46 ^a	2.44 ^a	2.61 ^a	0.478
Nuts	1	0.00 ^a	0.13 ^{ab}	0.16 ^b	0.016*	0.12 ^a	0.20 ^a	0.31 ^a	0.061
Oils	3	1.46 ^a	1.47 ^a	2.05 ^b	0.000*	1.89 ^a	2.29 ^b	2.20 ^{ab}	0.004*
Sugars	3	1.75 ^a	1.96 ^{ab}	2.20 ^b	0.022*	1.95 ^a	2.40 ^b	2.36 ^b	0.005*
Vegetables	9	3.61 ^a	4.14 ^{ab}	4.83 ^b	0.004*	4.91 ^a	6.36 ^b	7.10 ^b	0.000*

* = mean count differences significant at 95 % level of significance, a = the group with low mean food count while b is the group of high mean count; ab is the mid count group (Duncan Multiple Range Test).

6. Effect of smallholder commercialisation on nutrient intakes

Certified member households were better off nutritionally, with the greatest proportion of adequately nourished households in both rounds. It is clear from Table 3 that households of certified EFO members engaged in commercial organic production had average intakes of energy, iron and vitamin A in excess of the recommended dietary allowances per adult female equivalent, except for vitamin A in round two. The average adult female consumed about a quarter of the RDA (800 retinol equivalents) in survey round two. Households of partially certified EFO members showed deficit intakes in round one for energy and iron, but average consumption improved in round two, but not as marked an improvement as for the partially certified and non-member households. While non-member households had slightly lower adequate average intakes of energy, iron and vitamin A than the partially certified EFO member households, non-member household intakes exceeded requirements for energy and iron in the second round. Non-member household deficits for vitamin A were similar to those for certified member households in round two.

While the proportion of partially certified households consuming inadequate quantities of vitamin A almost halved between the first (81% of households consumed inadequate quantities of vitamin A) and second survey rounds (42%), the number of households consuming inadequate quantities of vitamin A in survey round two increased among certified member households (52 and

78% in rounds one and two respectively). This anomaly could not be explained from the data and was not expected, considering that the overall diversity of intake for fats and vegetables increased in the second survey round, although this does not mean that the overall quantity of fats and vegetables necessarily increased. Table 4 shows that the proportional contribution of fats to vitamin A intake was relatively low (2.99 and 2.88% in the first and second survey rounds respectively).

Vegetables contributed significantly to vitamin A intake among the sample households (86.32 and 90.50% in the first and second survey rounds respectively). Fruit and fruit juices contributed 1.33 and 1.06% of vitamin A in the two rounds. Consumed fruit and vegetables (fresh and tined) included: apple, banana, beetroot, carrot, citrus, green vegetables, pumpkin, tomato, wild vegetables. The findings show that increased availability of produce in March (the season of plenty) had beneficial consumption effects for nutrition, leading to considerable reductions in the number of households consuming inadequate energy, iron and vitamin A, except for vitamin A for certified households, who may have switched to more starch-based diets amidst the abundance of produce produced for the market, or may have used available cash to purchase foods that were not as rich in vitamin A. Consumption of vegetable from own consumption improved from 7 to 26% over the two rounds. This probably indicates a change in diet from purchased fortified foods (higher in micronutrients) in round one over more home-produced produce in survey round two.

Table 3: Food consumption deficits, Embo, November 2004 and March 2005

		Mean adequacy of intakes per female adult equivalent (figures in parentheses indicate the percentage of households with inadequate intakes)				ANOVA ($P \leq 0.05$)
		Overall Sample	Non- members	Part- certified	Certified members	
Energy (kj)	Round 1	-184.22 (75%)	-667.02 ^a (81%)	-438.51 ^a (80%)	932.53 ^b (59%)	0.000*
	Round 2	1458.82 (31%)	1199.55 ^a (38%)	1133.83 ^a (31%)	2484.99 ^a (26%)	0.082
Iron (mg)	Round 1	-3.66 (78%)	-5.80 ^a (85%)	-5.41 ^a (89%)	2.67 ^b (57%)	0.000*
	Round 2	39.33 (13%)	35.64 ^a (15%)	32.37 ^a (13%)	59.28 ^a (15%)	0.058
Vitamin A (Retinal equivalents)	Round 1	-187.33 (76%)	-430.14 ^a (91%)	-302.14 ^a (81%)	339.82 ^b (52%)	0.000*
	Round 2	121.48 (58%)	-230.11 ^a (81%)	436.77 ^b (42%)	-217.36 ^a (78%)	0.000*

Note: Negative values indicate consumption below the requirement, while + means the opposite.

* = significant at 95 % level of significance, a = the group with low mean food intake while b is the group of high mean intake (Duncan Multiple Range Test).

Table 4: Percentage contribution of each food category to the per capita energy and nutrient intakes, Embo, November 2004 and March 2005

Item	Percentage contribution of each food category to the household energy/ nutrient values (%)												
	Round	Cereals	Legumes	Vegetables	Fats and oils	Nuts	Dairy	Sugars	Baby foods	Meat	Eggs	Fish	Fruit/juices
ENERGY	Nov.04	61.58	6.16	4.62	9.13	0.86	1.58	8.91	2.14	3.11	0.57	0.49	0.83
	Mar.05	29.60	51.77	5.90	4.71	0.45	0.57	4.23	0.13	1.81	0.23	0.08	0.50
IRON	Nov.04	28.25	24.02	24.07	0.15	0.56	0.31	8.06	8.16	2.50	1.68	1.27	0.97
	Mar.05	22.62	31.15	34.30	0.12	0.46	0.17	5.88	0.79	2.24	1.04	0.33	0.91
VIT A	Nov.04	0.00	0.25	86.32	2.94	0.00	3.39	0.01	4.33	0.04	0.85	0.55	1.33
	Mar.05	0.00	2.90	90.50	2.88	0.00	1.62	0.01	0.39	0.04	0.48	0.13	1.06
PROTEIN	Nov.04	59.93	15.46	5.32	0.41	0.16	3.89	0.02	0.50	11.72	1.56	0.58	0.45
	Mar.05	16.57	72.61	4.53	0.12	0.05	0.90	0.00	0.12	4.21	0.51	0.18	0.19

The Duncan Multiple Range test identified significant rankings (implying change) for energy, iron and vitamin A for round one and for vitamin A in round two. In round one, the test was favourable for energy and nutrients for the certified member households and favourable for partially certified member households in round two for vitamin A. Households of non-members were worse off overall in terms of energy and iron than EFO member households.

Cereals and legumes were found to be primary sources of energy, and cereals and vegetables were dominant sources of iron in the first and second rounds respectively. Vegetables were the major sources of vitamin A in both survey rounds. Increased intakes of energy could be attributed to increased consumption of fruit, legumes, nuts and sugars (sugar, jams, jellies, sweets and soft drinks). Iron intakes showed the greatest increase over the two survey periods with the number of households that consumed inadequate iron decreasing from 78 to 12% over the two rounds. The iron intake increase was likely a result of the considerably increased consumption of a variety of vegetables in round two. The improved intakes of vitamin A could be attributed to increased consumption of fruit, legumes, nuts and green leafy vegetables. The proportion of households with inadequate intakes was consistently higher in round one than in the second round, highlighting a concerning seasonal variation in dietary adequacy.

Significant positive relationships were found between income from non-farm activities and household energy and nutrition availability in the second round for households of partially certified EFO members. Farm income was significantly and positively related to vitamin A intake in a Duncan Multiple

Range test. The results indicated that intensified farming had positive influences on the food consumption patterns of all farmers and may explain the improvement of certified farm household nutrition intakes.

7. The impact of smallholder commercialisation on consumption patterns

Due to the small sample size for certified EFO members and high homogeneity among sample households, no significant consumption elasticity equations were found for certified members. For partially certified members, significant equations close to unity were found for fruit (-1.18, $P \leq 0.05$), maize (-1.06, $P \leq 0.05$), rice (-1.18, $P \leq 0.01$) and legumes (-0.92, $P \leq 0.05$), indicating very little change in expenditure on these foods should incomes rise in survey round one (start of the agricultural season), but increased consumption of dairy products (1.65, $P \leq 0.05$) in the period following the main commercial harvest period should incomes rise (this would help address the deficient vitamin A intake identified in the section above).

Increased income was likely to lead to increased expenditure on fats and oils (1.64, $P \leq 0.05$), eggs (2.51, $P \leq 0.01$) and fish (3.19, $P \leq 0.01$) among non-member households in the first round only. Such consumption changes are expected, as explained in section 2. Some of the non-members were involved in agricultural production for subsistence and sale, but were not selling organic produce. The high elasticities for dairy and eggs seem to indicate that partially certified EFO members and non-member households may invest increased income in livestock, increasing the consumption of livestock products. Animals are seen as an investment of wealth in the community and EFO was exploring production of indigenous chickens at the time of the study.

It is difficult to draw many inferences and conclusions from the expenditure analysis as the very high homogeneity constrains analysis, especially as the functions used to estimate the elasticities typically include household characteristics to capture within-sample differences. While these were carefully selected, very few equations were significant.

8. Conclusions and recommendations

Smallholder involvement in commercial agriculture seems to have significant positive impacts on food diversity and improve the adequacy of nutrient intakes. Certified member households benefited from increased agricultural income in terms of food diversity and adequacy, showing that increased agricultural incomes impacted directly on dietary diversity and nutrient intakes. This income came principally from increased and extended

agriculture among certified EFO members. For partially certified farmers (who were converting their farms to organic production - typically a three year conversion period - and were not yet able to sell certified produce), agricultural incomes came primarily from labour provided to certified farmers. The non-members provided a control group against which to compare the benefits derived by EFO members from commercial production of organic produce for a commercial niche market. Comparisons of dietary diversity and the adequacy of nutrient intakes showed that engaging in commercial production of organic produce had indeed led to positive consumption changes for EFO members over non-members, and even more so for certified members over the partially certified members, particularly in the second survey round - harvest time for the key root crops sold to the niche market. There was significant improvement in energy, iron and vitamin A intakes in the second survey round over the first survey round, indicating that seasonality played a significant role in both the availability of produce and also in income to purchase foods. This raises concern over seasonality and its impact on nutritionally adequate diets, highlighting the importance of EFO and the Embo community investigating crops and production improvements to smooth consumption and incomes - primarily through diversification of crops and investment in technology such as irrigation, to extend production into the drier periods of the year.

While increased farm income certainly improved household food consumption and, in turn, the nutritional intakes of household members, it cannot be conclusively stated from the findings of this study that smallholder commercialisation that stimulates agricultural growth can alleviate hunger or solve malnutrition in Embo. The consumption elasticities show that positive consumption and nutrition trends are likely from increased income, but the study has not been able to show that it is income from agriculture that stimulates these benefits. Perhaps, too, the income is just not enough to raise consumption above the minimum adequacy levels for all households. The findings confirm the positive impact of agricultural development in terms of dietary diversity and nutritional adequacy, showing that agricultural development can drive positive and healthy consumption changes. The study also highlights the importance of using time-series data in evaluating the impact of agricultural development over seasons, as the potential impact would have been missed if the analysis had only been conducted for one (the first survey round or season before the harvest) as is typical of expenditure elasticity studies.

Caution should be exercised in pinning hopes on smallholder commercialisation as an effective means of addressing food insecurity, hunger

and malnutrition in communities such as Embo without further and deeper investigation, including analysis of nutritional status and further investigation of the impact of seasonality on food procurement, dietary diversity and consumption patterns. An understanding of just how much income is needed to ensure adequate nutrition for all household members is essential in understanding the magnitude of how much agricultural production would need to be scaled up, and what improvements in efficiency would be required in any agricultural development programme before promoting smallholder commercialisation as the panacea for food insecurity in all rural communities. Careful investigation of markets, profitability and the most suitable and marketable crops is also required. Perhaps these households, like many rural South African households, are simply too poor to invest in expanded and intensified agricultural production and would need direct support from government and the private sector to embark on such a venture.

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