THE POTENTIAL FOR NUTRITIONAL BENEFITS FROM INCREASED AGRICULTURAL PRODUCTION IN RURAL KWAZULU-NATAL

S.L. Hendriks[1]

ABSTRACT

This paper reviews findings of South African nutritional studies and compares the findings of an expenditure elasticity study in two rural areas of KwaZulu-Natal to determine the potential for improved nutrition through promotion of increased agricultural production among rural households. The findings suggest that only once agricultural production progresses to commercialisation do household members benefit nutritionally from increased production at household level. Suggestions are made as to how nutritional benefit can be ensured through increased, intensified and/or expanded agricultural production at household level.

1. INTRODUCTION

Nutrition in agriculture "refers to much more than simply aligning production with targets to estimated nutritional needs, or to simply improving national food balances or even economic accounts. A focus on people and livelihoods will necessitate the agricultural sector addressing the social, economic, and nutritional effects of its activities; ..." (Gillespie & Mason, 1991:42). International studies have shown that income changes (usually national) are linked to changes in health and nutrition (Gillespie, 1997). Additions to income are not necessarily beneficial for nutrition (Gillespie and Mason, 1991) as increased income is not sufficient to improve nutrition. More food may simply not necessarily be bought with increased income, and those foods bought may not be the foods that provide the nutrients required for a balanced diet.

However, if the extra income leads to more dietary diversity (such as meat and dairy products, fruits and vegetables) then, even though energy intakes may not increase appreciably, the protein and micro nutrient intake may improve beneficially (Gillespie, 1997). A household's source of income and income patterns are crucial factors in determining the potential nutritional benefits of increased income. Lumpy sources of income from cash cropping (as an example) are often spent on non-food items, while smaller, consistent

[1] *Programme Director, Food Security, University of Natal, Pietermaritzburg.*

income from women's farming and other informal sector activities are more likely to directly benefit the nutritional status of households (Gillespie & Mason, 1991).

Knowing the likely impact of increased income on household consumption patterns is key to estimating the likely benefits of increased income on consumption of a range of food and non-food products. Moreover, knowing how expenditure will influence the demand for agricultural production with direct benefits for the wider population is vital for anticipating the nutritional impact of increased agricultural production and/or agriculture-led growth in South Africa. Hendriks and Lyne (2003a), predict that increased incomes for rural households in two communal areas of KwaZulu-Natal are likely to lead to proportional increased demand for meat, meat products and poultry and exceptionally high demand increase for horticultural products. Despite the possibilities of increased incomes for small-scale farmers who respond to this demand, increased consumption of these foods could considerably improve the nutritional status of rural populations.

This paper begins with a review of available nutritional studies for rural areas of South Africa over the past decade. Section two contains the summarised findings of South African consumption studies. These two sections will form the basis for the development of the argument, based on the findings of Hendriks and Lyne (2003a), that increases in rural incomes are likely to benefit the nutritional status of rural populations. As increases in rural incomes are more than likely to come from increased agricultural production and the resultant down stream linkages, agriculture-led growth has potential benefits for rural South African populations. The paper ends with a summary of conditions necessary for such a benefit.

2. REVIEW OF MORE RECENT AND RELEVANT SOUTH AFRICAN NUTRITIONAL STUDIES

Prior to 1994, no national South African studies had been conducted to evaluate nutritional status (Vitamin Information Centre (VIC), 2001). The first national nutrition study was conducted in 1994. The South African Vitamin A Consultative Group (SAVACG) conducted an anthropometrical survey of preschool children (Labadarios & Middelkoop, 1995, cited by VIC, 2001). The study showed that 24 percent of South African children were stunted and nine percent were underweight. Malnutrition was most prevalent in the Eastern Cape, Northern Province and KwaZulu-Natal. One third of the sampled children had marginal vitamin A status (0,20 g/dℝ), while approximately 20 percent of the sampled children were anaemic (Hb0,11 g/dP).

In the absence of national data on the nutritional status of South Africans, the South African National Nutrition Survey Study Group (Vorster *et al*, 1995 cited by Rose, Bourne & Bradshaw, 2002) conducted an extensive literature survey of regional and smaller ad-hoc studies conducted in the country since 1976. It was concluded that 2 - 6 year old non-urban African children had the lowest energy and micro nutrient intakes. The study surmised that the low energy intake of these children was due to the low consumption of fat and was possibly the cause of the high rate of stunting. The mean intake of calcium, vitamin B6, vitamin C, folate and zinc was low in African children compared to national Recommended Dietary Allowances (RDAs) (VIC, 2001). A follow-up study was conducted in 1997 to extend the information from various studies and other indicators of nutritional status (Vorster, Oosthuizen, Jerling, Veldman & Burger, 1997). Both the 1995 and 1997 surveys reviewed existing data initiated for a variety of purposes using diverse sampling and survey procedures (Rose *et al*, 2002).

One such smaller study was carried out by Schmidt and Vorster (1995). The study was based on the assumption that people who grow their own vegetables eat more vegetables than those who do not, and therefore the nutritional status of households who grow vegetables is better. The sample consisted of 18 children between the ages of 6 and 13 years whose parents participated in a communal garden in the former homeland of Bophuthatswana and a control group of children from non-community garden participating households. Study participants reported that the main advantages of the garden were that they saved money and had a greater variety of food. However, households only produced 20 percent of their minimum vegetable requirements on the 13 square metre plots they cultivated in the communal garden. The average household required 64 square metres of garden to cultivate sufficient vegetables to meet dietary requirements. Children's diets lacked diversity and diets varied little between households. Diets were very low in energy and protein. The children seldom ate meat or tinned fish, and consumed chicken once a month or less often. None of the participating households consumed vegetables every day, while most households reported that they rarely ate fruit. Comparison of the children's anthropometrics, macro and micro nutrient status could not differentiate between the children of households participating in the garden and those from non-participating households.

Schmidt and Vorster (1995) found that participation in a communal garden does not guarantee better nutritional status for households. Households that grew vegetables did not consume comparatively more vegetables. The gardens were not able to produce sufficient vegetables to meet minimum

requirements. Households who grew vegetables did not purchase additional vegetables, but used the savings to purchase other foods, such as oil and fat (which did affect biochemical findings). Therefore, vegetable gardens may have an indirect nutritional benefit through household income replacement. However, vegetable gardens are not able to address the increased energy consumption requirements desperately needed to overcome the high incidence of stunting among South African children.

Kirsten, Townsend, and Gibsons' (1998) study of the nutritional status of rural households is the first local study to link children's (0 - 60 months) nutritional status with agricultural production. Multivariate regressions and a logit maximum likelihood model were applied to agricultural production and anthropometric data from 173 rural households in two tribal wards of KwaZulu-Natal. Although 35 percent of sampled households had stunted children[2], and ten percent of households (from the same households) had underweight children, results show that "households which participate seriously in agricultural activities have better nutritional status" (Kirsten *et al*, 1998: 584). The participating households grew and sold a variety of crops and many kept livestock. In addition, the study found that households that purchased seed and used improved cultivation techniques had a lower probability of stunted children. Such household are likely to participate in production beyond the level of subsistence. The researchers conclude that improving agricultural productivity in less-developed areas of South Africa has potential to improve household and child nutritional status.

The 1999 South African National Food Consumption Survey was the first primary study to determine nutritional status in South Africa, although only for one population segment, namely children 1 - 9 years old. The study set out to determine the anthropometric status of a nationally representative, cross sample of children aged 1 - 9 years old, ascertain the children's usual food consumption patterns, nutrient intakes and the factors impacting on food consumption (Labadarios, undated; VIC, 2001). The cross sectional sample of children was drawn from the Census 1996 data. The final sample included 2894 children from 156 national randomly selected enumerator areas. The survey found that stunting remains the most common nutritional disorder, affecting nearly 25 percent of children. Stunting is most prevalent on commercial farms, and in tribal and rural areas. Only five percent of children were found to be underweight (Labadarios, 1999, cited by VIC, 2001).

---

[2] *Children who are short for their age according to an agreed reference standard, are considered stunted.*

The mean energy intake of children in all provinces was below that recommended for age, while protein intakes were above the RDA for all groups and in all provinces. However, the energy distribution between protein, carbohydrate and fats in terms of energy intake was skewed to carbohydrates, which formed more than the recommended 65 percent for the children's diets. The sample children's height-for age and height-for weight ratios were significantly correlated to their intake of animal protein, while their energy intakes were significantly related to the presence of stunting and underweight. Overall, the great majority of children consume a diet deficient in energy and of poor nutrient density. The study found that subsistence agriculture is not a major source of foods in South Africa. The majority of food (even maize) is purchased. Household income was found to be a decisive factor in the consumption and procurement of foods. Households at risk of hunger procured fewer food items. The study concluded that half the surveyed households experienced hunger, a quarter was at risk of hunger and only a quarter was classified as food insecure (Labadarios, undated).

In the absence of full, nationally representative data on food and nutrient consumption, Rose *et al* (2002) have developed a database describing the foods and nutrients available to South African households (more than just representative of children). Data on the food spending and home production patterns of 28 704 households from the October 1995 Income and Expenditure Survey (IES) formed the basis for this study. The innovative study used price index data and food composition databases to evaluate the mean household availability of seven broad food groups for a variety of provincial, rural-urban and racial groups. The survey indicates that cereal consumption (as a percentage of energy availability) is highest for rural African populations and lowest in terms of the availability of meats and fats (both saturated and cholesterol). The mean proportion of energy from fat was lowest for rural African populations (18 percent of total energy availability). The distribution of energy for the average household in rural KwaZulu-Natal is illustrated in Table 1.

The most current national nutrition study was conducted by Steyn, Abercrombie and Labadarios (2001) of 1998/1999 food balance sheets with data from dietary surveys and a similar study conducted in 1993/4 (Steyn *et al*, 1998 cited by Steyn *et al* 2001) in order to compare national and individual food insecurity. As the researchers concede, the use of food balance sheets has important limitations (ignoring inter and intra-household allocations and underestimating home production). However, the study indicates important trends in national food consumption patterns. Moreover, the results of this study confirm the findings of the National Food Consumption Survey

(reported above) for children aged 1-9 years. The study showed changes in consumption for fats and cereals over the period 1993 - 1998. Per capita fat consumption increased from 19 to 24 percent while cereal consumption decreased from 69 to 65 percent over this period. The researchers attribute these changes to increasing urbanisation, explaining that urbanisation is expected to increase the intake of energy and fat due to increasing access to convenience foods and a corresponding shift in the composition of dietary staples. The study indicates that large sectors of the South African population are food insecure.

Table 1: Mean proportion of energy from different macronutrients for rural households in KwaZulu-Natal (Rose *et al*, 2002:34)

Calories per day per adult female equivalent*	2163
Protein	0.101
Fat	0.209
Saturated fat	0.057
Carbohydrates	0.686
Sugars	0.194
Alcohol	0.004

* Standard value = 2200 calories per day

However, more recent smaller studies by Erik and Albertse (2002) and Theron, Amissah, Albertse, and Macintyre (2002) infer that inadequate intakes of micronutrients are not the direct cause of stunting among urban and rural children (12 - 24 months) in South Africa. Both studies were based on samples of identified stunted children who were pair matched with non-stunted children from the same populations. Theron *et al* (2002) conclude that stunting cannot be regarded only as a nutritional problem as the causes are multi-factorial. Erik and Albertse (2002) conclude that stunted children came from homes where hunger was always present, while it was reported that children from homes without stunted children experience hunger often. Erik and Albertse (2002) conclude that household food insecurity is the cause of stunting, rather than inadequate intakes of macro- and/or micronutrients.

Although South Africa has the lowest prevalence of underweight preschoolers (9 percent) compared with other African countries, stunting remains unacceptably high (23 percent) (Steyn *et al*, 2001). In sum, the studies indicate that rural African households show highest rates of stunting among children, a fair proportion of underweight children, and inadequate intakes of energy; fat; protein; calcium; vitamins A, B6, and C; iron and zinc. The studies confirm Kirsten *et al* (1998) finding that agricultural activities only have

positive and significant nutritional benefits for households who are 'seriously' involved in agricultural activities. Subsistence agriculture and communal vegetable gardening may have benefits for slight improvement in micronutrients status but do not yield sufficient produce to improve the energy intake of household members. The findings of these studies concur with the findings of a national survey on the impact of agricultural deregulation (Ebony Consulting International, 2002) that income remains the single most important determinant of a household's ability to meet its food security needs. Even where agriculture produces additional income or income replacements (as also surmised by Schmidt & Vorster, 1995), there is no guarantee that increases to income would automatically be spent on acquisition of more food, a wider variety of foods and/or foods of greater energy density. It is therefore important to explore the consumption patterns of South Africa's rural populations to determine how any income saving or income earned through agricultural production could be spent.

3. REVIEW OF RURAL HOUSEHOLD CONSUMPTION PATTERNS IN SOUTH AFRICA

A number of consumption studies have been conducted for rural areas of South Africa, showing consumption trends for rural populations. Van Seventer's (1987) study of income redistribution to black South Africans shows that increases in income usually leads to an increase in demand for food and semi-durables. However, other local studies of small farm households (Belete, Igodan, M'Marete, & van Averbeke, 1999; Van Zyl, Machethe, Sartorius Von Bach, & Singini, 1991; Nieuwoudt & Vink, 1989) have found the demand for food less responsive to changes in income than demand for other products. More specifically, Van Zyl *et al* (1991) and Nieuwoudt and Vink (1989) found that increases in rural incomes are roughly twice as likely to be spent on vegetables, fruit and meat, household durables and semi-durables (e.g. dothing) as on maize, the staple food in many rural areas. Van Rooyen and van Zyl (1990) estimate that increases of ten percent in expendable incomes of black consumers could result in consumption increases of 11.9 and 14.6 percent for meat and vegetables respectively.

Increased real incomes could alter rural consumption patterns, but demand for food (especially staples) would increase less than demand for more luxury goods such as clothing (Belete *et al,* 1999; Van Zyl *et al,* 1991 and Nieuwoudt & Vink, 1989). Evidently rural households display a preference for purchased goods (Van Zyl *et al,* 1991). Nevertheless, since demand for locally produced food, goods and services is *relatively* income elastic, and as most rural households have access to farmland (Thompson & Lyne, 1993), increased

agricultural incomes could have direct and indirect nutritional benefits for rural populations.

The findings of these studies are confirmed by an expenditure study of sample households in two communal districts (Swayimana and Umzumbe) in KwaZulu-Natal (Hendriks & Lyne, 2003a). Table 2 presents a comparison of significant average budget shares (ABS_i) estimated for each district. Expenditure on food accounted for the greatest share of total household expenditure. The corresponding elasticities are 1.092 and 0.983, indicating that expenditure on food in both districts varies in almost direct proportion to a small change in household income.

Table 2: Expenditure elasticities for significant aggregate commodity groups in Swayimana and Umzumbe, 1997 (n = 93) (Hendriks & Lyne, 2003a)

Expenditure group	F-statistic	Swayimana (n = 46)			Umzumbe (n = 47)		
		ABS	MBS	Elasticity	ABS	MBS	Elasticity
Consumer expendables	6.738	0.02 *4.23*	0.02 *13.41*	0.76 *9.52*	0.03 *6.68*	0.02 *19.65*	0.71 *18.50*
Durables	1.906	0.02 *0.76*	0.05 *6.84*	2.17 *8.29*	0.06 *1.99*	0.12 *18.23*	2.20 *22.32*
Food	1.829	0.70	0.76	1.09	0.59	0.58	0.98
		9.84	*44.81*	*8.48*	*8.36*	*34.28*	*1.31*
Housing	2.860	0.02 *0.50*	0.04 *5.09*	2.46 *6.79*	0.06 *1.69*	0.17 *19.12*	2.72 *27.16*
Social obligations	2.951	0.06 *2.11*	0.02 *2.73*	0.31 *13.61*	0.06 *2.32*	-0.02 *-2.84*	-0.29 *-28.14*
Transport	1.972	0.01 *0.44*	0.05 *15.37*	8.30 *30.40*	0.03 *2.25*	0.08 *23.65*	2.52 *32.06*

***Note**: Figures in italics are t-statistics for the null hypothesis that the predicted average and marginal budget shares are zero and that the expenditure elasticity is unity*

The commodity group for food was disaggregated into the following sub-groups for closer examination of the likely influence of income changes on expenditure: staple foods (maize, rice, root crops and wheat products), eggs, legumes, meat and poultry, and horticultural products. The equations estimated for eggs and legumes were not statistically significant and are therefore not reported and discussed.

Table 3 shows that expenditure on staple foods would remain virtually unchanged or possibly decrease as household incomes rise. Overall, the elasticities show little chance of increased demand for staple crops, should incomes rise. The equation estimated for meat, meat products and poultry included all meat, processed meat products and poultry, but excluded eggs.

Elasticities of 0.996 and 1.044 were computed for Swayimana and Umzumbe respectively, suggesting that an increase in income would result in a proportionate increase in demand for meat and poultry products. For poor households, it may have been expected that an increase in income would result in a proportionally larger increase in meat consumption. A possible explanation for this anomaly is the fact that sample households lacked slaughter and storage (refrigeration) facilities for these highly perishable products, making consumption response less elastic.

Table 3: Expenditure elasticities for significant food commodity groups in Swayimana and Umzumbe, 1997 (n = 93) (Hendriks & Lyne, 2003a)

Expenditure group	F-statistic	Swayimana (n = 46)			Umzumbe (n = 47)		
		ABS	MBS	Elasticity	ABS	MBS	Elasticity
Staples	5.330	0.34 *8.30*	0.06 *5.73*	0.17 *64.95*	0.25 *6.04*	-0.03 *-2.77*	-0.11 *-62.84*
Maize	5.323	0.13 *5.30*	0.01 *2.22*	0.10 *44.70*	0.07 *2.69*	0.00 *0.42*	0.04 *24.29*
Rice	1.751	0.07 *3.24*	-0.01 *-1.65*	-0.12 *-34.10*	0.09 *4.28*	-0.01 *-1.23*	-0.07 *-42.94*
Roots	6.887	0.05 *5.97*	0.01 *4.62*	0.19 *45.64*	0.03 *3.46*	-0.01 *-3.45*	-0.24 *-40.18*
Wheat products	2.971	0.09 *5.57*	0.04 *10.57*	0.44 *29.43*	0.06 *3.75*	-0.02 *-4.92*	-0.32 *-46.19*
Horticultural products	2.651	0.05 *1.18*	0.42 *38.87*	7.91 *76.37*	0.09 *2.06*	0.42 *39.10*	4.56 *68.62*
Meat and poultry	2.110	0.08 *4.49*	0.08 *18.07*	0.97 *1.44*	0.05 *2.84*	0.06 *12.36*	1.04 *1.18*

Note: *Figures in italics are t-statistics for the null hypothesis that the estimated average and marginal budget shares are zero and that the expenditure elasticity is unity.*

The results reported in Table 3 indicate a possible dramatic increase in expenditure on horticultural products (fresh and processed fruit and vegetables) in response to higher incomes, with elasticities of 7.906 and 4.555 for Swayimana and Umzumbe respectively. The strong likelihood that the consumption of fruit and vegetables will increase substantially with increased income concurs with findings for other South African studies (van Zyl *et al*, 1991; Nieuwoudt and Vink, 1989). In conclusion, there is little possibility of income-induced growth in the demand for food, except for horticultural products, and to a lesser extent, for meat, meat products, and poultry. For these two categories, the elasticities indicate likely growth as income increases, especially for horticultural products. Increased consumption of these foods would have significant benefits for rural diets.

4. THE POTENTIAL FOR NUTRITIONAL BENEFITS FROM INCREASES IN AGRICULTURAL PRODUCTION IN COMMUNAL AREAS

Hendriks and Lyne (2003b) have found that despite the high agricultural potential of the two communal study areas, the potential for agriculture-led growth in KwaZulu-Natal is relatively low in comparison to other South African and African studies (multiplier = 1.28[3]). Belete *et al* (1999) estimated a multiplier of 1.35 for a district in the Eastern Cape. These studies indicate far lower potential for agriculture to drive economic reform in rural South Africa, but indicate that some potential exists. However, even small increments to income are likely to have benefits for the local economy, especially with regard to non-farm enterprises. Agricultural production could increase for farm and non-farm households. Although rural South African consumers are likely to spend greater increments of increased income on imported goods, local demand for horticultural products (fruit and vegetables), meat and poultry products is also likely to increase. The prospect of such increases confirms Rose *et al's* (2002:v) assertion that changes to household food procurement are far more beneficial in the long run than other nutrition interventions: "Although nutritional problems affect individuals, it is the household that provides the entry point for many nutritional intervention efforts, since that is where food is procured and distributed".

Increased intakes of these foods would have positive nutritional benefits for rural populations, even if the increased consumption is marginal. Maunder, Matji, and Hlatshwayo-Molea (2001) explain that low energy intakes could be increased by increasing dietary diversity as the lack of availability of foods, the type of foods available (eg low fat content foods in rural areas) and the monotony of most rural diets contribute to a vicious cycle of low energy intakes, exacerbated by reduced micro-nutrient intakes. Therefore an increase in the variety of foods in rural diets would likely lead to improved micronutrient and energy intakes. Hendriks and Lynes' (2003a and 2003b) study indicates that increased dietary diversity is possible given the estimated elasticities of expenditure on meat and horticultural products. These findings support recently developed South African food-based dietary guidelines (Gibney & Vorster, 2001), which recommend increased intake of a variety of foods such as fruits, vegetables, meat and legumes (Maunder *et al*, 2001).

---

[3] *Growth multipliers estimate the resultant additions (from consumption and production of farm and non-farm non-tradables) to gross income of local households following an initial income shock of one South African Rand. Non-tradables are goods that are neither exported outside of the district of study, nor imported into this district, and for which there are no close substitutes. Services are by nature non-tradable.*

As discussed above, the major source of energy for rural households is cereals. The expenditure study does not infer an increase in the consumption of cereals (the staple food for these populations) should incomes rise. However, increased consumption of animal products would be most beneficial in improving the intake of protein and fats, offering potentially significant increases in the energy intake of household members. In addition, increasing the consumption of meat and poultry would also increase the intake of calcium, iron, zinc, and B vitamins (Scholtz, Vorster, Matshego & Vorster, 2001). Animal fat also provides rich sources of vitamin A. So too the consumption of additional green leafy vegetables would increase the intake of vitamin B6 and iron (ACC/SCN, 1991). Citrus fruits and fruit such as guavas could make available much-needed vitamin C (Love & Sayed, 2001), while green leafy vegetables, and yellow and orange produce could address prevalent vitamin A deficiencies in rural populations (ACC/SCN, 2000). Fresh and preserved fruit is also a source of additional energy, especially palatable for children.

Increased agricultural production on a wider scale would lead to increased food supply within local communities, decreasing the local price of food, thus making food more affordable for rural households. Moreover, greater dietary diversity could be promoted by increased availability of foods. Increased production diversity is quite likely as producers seek to exploit untapped, niche and under-supplied markets in search of maximising profit. Such increased diversity not only smoothes household income but also smoothes food supply, both of which are beneficial in improving food security, thereby improving nutrition. The income replacement effect of home production of food (not only vegetables) is seemingly beneficial in increasing dietary diversity and energy consumption.

Although Hendriks and Lynes' (2003a and 2003b) study included expenditure on healthcare, and other food groups such as legumes, eggs, etc, the findings were not statistically significant and the impact of increased income on these categories of expenditure can therefore not be commented upon, although these expenditure categories would also be important in the improvement of nutritional status of households in rural communities in South Africa.

Therefore, agriculture ensures a more stable food supply and improves nutrition at household level, both directly through improved dietary diversity and increased macronutrient intake and indirectly through income replacement behaviour that seems to have greater impact on improving energy intakes among South Africa's rural populations. The magnitude of the nutritional benefits seems primarily based on whether the scale of production

occurs beyond subsistence level production. The net social benefits of improved nutrition are undisputed. Nutrition is both an effect and a cause of income-opportunities (Gillespie, 1997). Improved nutrition leads to greater production capacity; improved ability to benefit from education that increases access to information (agricultural and nutritional) and improved health and resistance to disease.

5. CONCLUSIONS

Improved nutrition is clearly a positive externality for increased agricultural production in South Africa's rural areas. However, the scale of agricultural production strongly determines the magnitude of these nutritional benefits. To have significant impact on nutritional status of rural populations, agricultural production must develop beyond subsistence level. While production for home consumption increases the availability of vegetables and increases micronutrient intake, the income 'savings' derived from home production seems to have more positive influences on the nutritional status of rural populations. Income replacement leads to increased purchases of energy-dense foods such as fats, oils and meat.

Various South African expenditure studies confirm that increased household incomes are likely to increase local demand for meat, poultry, vegetables and fruit, which would significantly and positively influence food intake. While increased micronutrients have undisputed benefits for nutrition, increased protein and energy from fats and meat would contribute more significantly to reducing South Africa's unacceptably high rate of stunting among children, while simultaneously benefiting micronutrient deficiencies. Increased incomes from agricultural sales are also likely to lead to increased dietary diversity, increasing the nutritional adequacy of rural diets. Improved nutrition would lead to a number of additional positive benefits related to improved health, resistance to disease, increased productivity and improved human capacity.

6. CONDITIONS FOR REAPING NUTRITIONAL BENEFITS FROM AGRICULTURE-LED GROWTH

As raised by the nutritional studies summarised above, nutritional benefits from agricultural production seem evident only if households are actively and productively engaged in agriculture beyond the level of subsistence. Although not confirmed for South African households, international literature asserts that household (subsistence) gardens have some benefit in terms of improved micronutrient intakes; they do not make a significant contribution to improving the energy intakes of household members. Household and

community gardens therefore have limited nutritional benefits, and by no means reduce the incidence of stunting among nutritionally at-risk populations (Makhotla & Hendriks, 2002; Schmidt & Vorster, 1995 and Gillespie & Mason, 1991). The following five conditions are necessary for reaping nutritional benefits from agriculture in South Africa's rural communities.

First, nutritional benefits from agriculture are most likely to accrue only if households are engaged in agriculture at a level beyond subsistence. However, incentives for increased production are lacking in the South African rural economy (Lyne, 1989; Nieuwoudt & Vink, 1989 and Nattrass & May, 1986). Secondly, household level incentives are needed to encourage more households to participate in expanded agricultural production. The prospects of additional income and reasonable return from improved agricultural production are needed and could be found in supportive agricultural services, accessible, affordable inputs and technology. However such technology needs to be carefully introduced since some technologies increase the productivity of labour (which induces wider benefits in terms of household incomes through increased labour opportunities), yield-enhancing technologies increase production (Gillespie & Mason, 1991), but often at the cost of labour opportunities and environmental sustainability.

Third, to ensure wide nutritional benefits from agricultural production, it is necessary to ensure that markets exist for the sale of small-holder produce. This requires the existence of a number of infrastructural provisions such as transport; access to inputs, information and technology; and reduction of transaction costs. In addition, smallholder and/or emerging farmers need access to lucrative, efficient markets and adequate storage to minimise losses (Gillespie & Mason, 1991).

Fourth, the nutritional benefits of agriculture will only remain positive if the dietary changes that do occur comply with South Africa's recommended dietary guidelines. Trends such as urbanisation and consumer preference for convenience foods (such as rice over maize), threaten the beneficial characteristics of traditional rural diets (usually low in fat and animal protein), compromising the health of rural and migrating populations and exposing them unduly to health risks. Lastly, consumer preferences for commercial goods require behavioural changes to ensure maximum realisation of the nutritional benefits of agriculture-led growth. Effective promotion of the value of agriculture and the savings of home production should be part of any food security and/or poverty alleviation strategy.

REFERENCES

ACC/SCN, 1991. Controlling iron deficiency: A report based on an ACC/SCN Workshop. ACC/SCN State-of-the-art Series, Nutrition Policy Discussion Paper No.9. United Nations Administrative Committee on Coordination - Subcommittee on Nutrition: Geneva.

ACC/SCN, 2000. Nutrition through the life cycle: 4th Report on the World nutrition situation. United Nations Administrative Committee on Coordination - Subcommittee on Nutrition in collaboration with the International Food and Policy Research Institute: Geneva.

BELETE, A., IGODAN, C.O., M'MARETE, C. & VAN AVERBEKE, W., 1999. Analysis of rural household consumption expenditure in South Africa: The case of food plot holders in the Tyefu irrigation scheme in the Eastern Cape Province. *Agrekon,* 38(2):194-201.

EBONY CONSULTANCY INTERNATIONAL, 2002. The food security effects of deregulation of agricultural marketing in South Africa. Report by ECI to the National Agricultural Marketing Council. ECI: Woodmead, Pretoria.

ERIK, M. & ALBERTSE, E.C., 2002. Household food security as a potential risk factor for stunting among young children in South Africa. Paper presented at the 1st Africa Nutritional Epidemiology Conference, Vaal Triangle Technikon in cooperation with the University of Westminster, 19-20 August, Vanderbijl Park, p 24.

GIBNEY, M. & VORSTER, H., 2001. Editorial: South African food based dietary guidelines. *South African Journal of Clinical Nutrition,* 14(3):S2.

GILLESPIE, S. & MASON, J., 1991. Nutrition relevant actions: Some experience from the eighties and lessons for the nineties. ACC/SCN State-of-the-art Series, Nutrition Policy Discussion Paper No.10. United Nations Administrative Committee on Coordination - Subcommittee on Nutrition: Geneva.

GILLESPIE, S., 1997. Chapter one: An overview. In ACC/SCN (eds). Nutrition and Poverty: Papers from the ACC/SCN 24th Session Symposium. March 1997, Kathmandu.

HENDRIKS, S.L. & LYNE, M.C., 2003a. Expenditure elasticities and consumption patterns for households in two communal areas of KwaZulu-Natal. *Development Southern Africa,* 20(1):105-127.

HENDRIKS, S.L. & LYNE, M.C., 2003b. Agricultural growth multipliers for two communal areas of KwaZulu-Natal. *Development Southern Africa,* 20(3):425-466.

KIRSTEN, J., TOWNSEND, R. & GIBSON, C., 1998. Determination of agricultural production to household nutritional status in KwaZulu-Natal, South Africa. *Development Southern Africa,* 15(4):573-587.

LABADARIOS, D., undated. Executive summary. National food consumption survey in children Aged 1-9 years: South Africa 1999. [WWW document]. URL: http://www.sahealthinfo.org/nutrition/foodsummary.htm.

LOVE, P. & SAYED, N., 2001. Eat plenty of vegetables and fruits everyday. *South African Journal of Clinical Nutrition,* 14(3):S24-32.

LYNE, M.C., 1989. Distortion of incentives for farm households in KwaZulu. Unpublished PhD Thesis, Department of Agricultural Economics, University of Natal, Pietermaritzburg.

MAKHOTLA, L.A. & HENDRIKS, S.L., 2002. Do home gardens improve the nutrition of rural preschoolers in Lesotho? Paper presented at the 1st Africa Nutritional Epidemiology Conference, Vaal Triangle Technikon in cooperation with the University of Westminster, 19-20 August, Vanderbijl Park, p 19.

MAUNDER, E.M.W., MATJI, J. & HLATSHWAYO-MOLEA, T., 2001. Enjoy a variety of foods: Difficult but necessary in developing countries. *South African Journal of Clinical Nutrition,* 14(3):S3-11.

NATTRASS, N. & MAY, J., 1996. Migration and dependency: Sources and levels of income in KwaZulu. *Development Southern Africa,* 3(4):583-99.

NIEUWOUDT, W.L. & VINK, N., 1989. The effects of increased earnings from traditional agriculture in southern Africa. *The South African Journal of Economics,* 57(3):257-69.

NGQAGWENI, S.S., 2000. Promoting income and employment growth in the rural economy of the Eastern Cape Through Smallholder Agriculture.

Unpublished PhD Thesis. Department of Agricultural Economics, Extension and Rural Development, University of Pretoria.

PUETZ, D., 1993. Improving data quality in household surveys. In von Braun, J. & Puetz, D., (eds.). Data Needs for Developing Countries: New directions for household surveys. p173-85.

ROSE, D., BOURNE, L. & BRADSHAW, D., 2002. Food and nutrient availability on South African households: Development of a nationally representative database. Technical Report 2002. Health and Development Research Group WHO Collaborating Centre for Urban Health Burden and Disease Research Unit. Medical Research Council: Cape Town.

SCHMIDT, M.I. & VORSTER, H.H., 1995. The effect of communal vegetable gardens on nutritional status. *Development Southern Africa,* 12(5):713-724.

SCHOLTZ, S.C., VORSTER, H.H. (Jr.), MATSHEGO, L. & VORSTER, H.H., 2001. Foods from animals can be eaten every day : Not a conundrum! *South African Journal of Clinical Nutrition,* 14(3):S39-47.

STEYN, N.P., ABERCROMBIE, R. & LABADARIOS, D., 2001. Food security: An update for health professionals. *South African Journal of Clinical Nutrition,* 14(3):98-102.

THERON, M., AMISSAH, A., ALBERTSE, E.C., MACINTYRE, U.E., 2002. Inadequate intakes of macro-nutrients are not the direct cause of stunting among urban and rural children in South Africa. Paper presented at the 1st Africa Nutritional Epidemiology Conference, Vaal Triangle Technikon in cooperation with the University of Westminster, 19-20 August, Vanderbijl Park, p 20.

VAN ROOYEN, J. & VAN ZYL, J., 1990. Agricultural restructuring in South Africa: Some considerations on the food question. In Csaki, C., Dams, T.J., Metzger, D. & Van Zyl, J., (Eds.), Agricultural Restructuring in Southern Africa: Inter-conference Symposium of the International Association of Agricultural Economists, 24-27 July, Association of Agricultural Economists of Namibia: Swakopmund, Namibia. p452-9.

VAN SEVENTER, D.E.N., 1987. Income distribution, economics structure and employment in South Africa. *Development Southern Africa,* 4(1):133-45.

VAN ZYL, J., MACHETHE, C., SARTORIUS VON BACH, H. & SINGINI, R., 1991. The effects of increased earnings from traditional agriculture in Lebowa. *Agrekon,* 30(4):276-8.

VITAMIN INFORMATION CENTRE (VIC), 2001. National food consumption survey in children aged 1-9 years: South Africa 1999. Medical Update Number 37, April.

VORSTER, H.H., OOSTHUIZEN, W., JERLING, J.C., VELDMAN, F.J. & BURGER, H.M., 1997. The nutritional status of South Africans: A review of literature from 1976-1995. Health Systems Trust: Durban.