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Benchmarking Food Crop Diversity in Southern Africa: The Case of Potatoes and Potato Products 1961-2010

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Abstract:	No other region in the world is experiencing the pressures on food production and utilization like Sub-Saharan Africa. With growth rates for population over 2.0%/yr in many countries and urban consumers often eager to diversify their diets, new markets are also opening up. Given these developments, growers, traders and governments are seeking out new ways to capitalize on these developments. This paper examines the evolution of growth rates in potato production, utilization and trade in Southern Africa over nearly the last half century using FAO annual secondary data. After highlighting the different roles that potatoes have played in crop diversification across the sub-region, the paper identifies some key issues for future research as well as some opportunities for industry both large and small. Ninguna región en el mundo enfrenta las presiones sobre la producción e ultilización de alimentos que desafian Africa Sub-Sahariana. Con tasas de crecimiento anual poblacional encima de 2,0% en muchos paises y con consumidores urbanos con ganas de diversificar sus dietas, nuevos mercados están abriendo. Dado esta situación, productores, comerciantes y gobiernos están interesados en aprovechar dichas tendencias. Este articulo examina la evolución de las tasas de crecimiento de la producción, utilización y comercio de la papa en Africa del Sur durante casi el ultimo medio ciclo utilizando los datos de la FAO. Despues de subrayar los diferentes papeles que la papa ha tenido en la diversificación agricola a lo largo de la sub-region durante ese periodo, se identifica algunos temas clave para futuras investigaciónes además de algunas oportunidades para la industria tanta grande como pequeña.

Benchmarking Food Crop Diversity in Southern Africa: The Case of Potatoes and Potato Products 1961-2010

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Abstract No other region in the world is experiencing the pressures on food production and utilization like Sub-Saharan Africa. With growth rates for population over 2.0%/yr in many countries and urban consumers often eager to diversify their diets, new markets are also opening up. Given these trends, growers, traders and governments are seeking out new ways to capitalize on these developments. This paper examines the evolution of growth rates in potato production, utilization and trade in Southern Africa over nearly the last half century using FAO annual secondary data. After highlighting the different roles that potatoes have played in crop diversification across the sub-region, the paper identifies some key issues for future research as well as some opportunities for industry both large and small.

Resumen Ninguna región en el mundo enfrenta las presiones sobre la producción e ultilización de alimentos que desafian Africa Sub-Sahariana. Con tasas de crecimiento anual poblacional encima de 2,0% en muchos paises y con consumidores urbanos con ganas de diversificar sus dietas, nuevos mercados están abriendo. Dado esta situación, productores, comerciantes y gobiernos están interesados en aprovechar dichas tendencias. Este articulo examina la evolución de las tasas de crecimiento de la producción, utilización y comercio de la papa en Africa del Sur durante casi el ultimo medio ciclo utilizando los datos de la FAO. Despues de subrayar los diferentes papeles que la papa ha tenido en la diversificación agricola a lo largo de la sub-region durante ese periodo, se identifica algunos temas clave para futuras investigaciónes además de algunas oportunidades para la industria tanta grande como pequeña.

Keywords: Markets; trade; production; consumption; technology; private sector

Introduction

No other region in the world is experiencing the pressures on food production and utilization like Sub-Saharan Africa (SSA). Population growth rates over 2.0%/yr in many countries represent one challenge. Breakneck urbanization constitutes another. The advent of climate change is but one more. In the wake of these developments over the next roughly twenty-five years, not only will the demand for food skyrocket but the locus of consumption will shift radically from the countryside to the cities putting enormous pressure on all participants engaged in trying to match supply and demand in the process.

As dramatic as these changes are, they did not emerge overnight. Rather they represent the latest phase of a prolonged process dating back decades but that only now is coming into sharper focus. As food systems evolved over the last half century, shifts in production patterns assaulted by wars, political turmoil, natural disasters and periodic, if not

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recurrent, policy changes have become more common place while at the same time more problematic to fully appreciate on a year-to-year basis.

In the midst of these developments and demands on local food systems, policymakers' perceptions of agriculture have begun to change (Binswanger-Mkhize et al. 2011). Recurrent food shortages, the rise of international commodity prices, and crop diversification in other developing country regions have raised the possibility of replicating that experience in SSA. Potatoes have captured particular interest as a possible means to help meet mushrooming urban food requirements, contribute to efforts to enhance food security at both the household and national level, and reduce the incidence of poverty in the countryside (Thiele et al. 2010).

Growers and entrepreneurs have also shown a renewed interest in potatoes. Farmers have demonstrated an eagerness to diversify food supplies at the farm level and to develop new sources of cash income (Reyes et al. 2012). The private sector sees new opportunities for developing new products and markets based on potatoes (Demo et al. 2009). Furthermore, while the notion of crop diversification involving potatoes in Southern Africa is not entirely new (Autrey et al. 1991; Serage et al. 2002), recent trends in output, area, and yields for potatoes in SSA (Walker et al. 2011) have surpassed previous projections (Scott et al. 2000). After a brief review of the latest production data, one analyst concluded that potato production "...in developing countries, especially those situated in sub-Saharan, as the main engines of growth..." for global output of this commodity in the years ahead (Prakash 2010).

Interest in potatoes for crop diversification is particularly keen amongst the countries in Southern Africa (SA) of late for a variety of reasons. Some countries such as Malawi see crop diversification in potatoes as means of reducing the overwhelming dependence on maize and offsetting the need for massive imports in the case of shortfalls in domestic food production (Demo et al. 2007, 2009). Others like the Republic of South Africa (RSA) have embraced potatoes to help satisfy rapidly changing urban tastes and preferences that include more snack foods and as a way to diversify agricultural exports (Anaya 2009; NAMC and Commark Trust 2007). The end to the 27-year civil war in Angola has focused attention on rebuilding domestic food systems (FAO 2009), diversifying domestic food production to reduce cereal imports (Allen et al. 2003), and offering new, more diverse, income-generating activities to poor farm households in the process (Reyes et al. 2010, 2012).

A variety of different publications have examined some aspect of potato production and use in SA over the last five decades. Typically, these studies have fallen into one of three types. One group have analysed global trends for potatoes in which the countries of SA are given brief mention (CIP 1999, 2010; Guenthner 2001; Horton 1978). Others have examined these trends as part of a broader look at the evolution of food systems for potatoes in SSA (Ewell 1997; Scott 1992) or in developing countries more generally that includes some brief discussion of SA (Guenthner 2001; Horton et al. 1984; Horton 1987; Low et al. 2007; Scott 2002; Scott and Suarez 1992; Van der Zaag and Horton 1983; Walker et al. 1999, 2011). A few of these have included projections for future production, area and yields with different target years (Anonymous 1995; Scott et al. 2000). A third type has examined some aspect of potato production and use in one or more of the countries in SA at a particular point in time (Autrey et al. 1991; Black 2008; Demo et al. 2005; Emongor et al. 2004; Godfrey-Sam-Agrey 1980; Gondwe 1986; Joyce 1986; Rasolo et al. 1987; Reyes et al. 2012; Saka 2000; Serage et al. 2002). Very few of these publications have had a specific focus on trends in SA as a whole (Anaya 2009). All these previous publications have been handicapped by their shorter time horizons. Few have considered potatoes in relation to the production or consumption of other food crops grown in SA.

This paper presents the results of an analysis of FAO annual secondary data and the growing body of literature on potatoes in SA to identify changes in production, utilization and trade over nearly the last half century. In so doing, the paper also tries to analyse the results presented for potatoes in the broader context of related information on other food crops as well as trends for the potato industry in other parts of the developing world where relevant. One key theme is the extent to which the long-term evolution of these trends foreshadows the most likely future scenario for potato production and use in SA in the decades ahead and the associated opportunities for industry.

Materials and Methods

The analysis of growth rates in potato production and use in SA over nearly the last half century presented here utilized a three-step approach as previously presented in Scott (2011) for Latin America and then further developed in Scott and Suarez (2011, 2012a, 2012b) for Asia. As a first step, FAO times-series data served to estimate average annual growth rates on a point-to-point basis beginning with production, area and yields for potatoes and then

including other crops. The use of FAO data facilitated international comparisons across countries for key potato parameters and an analysis of the crop's performance versus that of other food commodities. To that end, annual averages calculated for key production indicators for potatoes for the beginning (1961-63) and end (2008-10) of the period under consideration anchored the analysis and estimates of growth rates over the entire 49-year period. Subsequently, comparable averages for 1984-86, or roughly the mid-point in the overall time-series, were used as reference points to calculate growth rates over the first (vs. 1961-63) and second (vs. 2008-10) halves of the times-series in an initial attempt to determine if growth rates were slowing down or speeding up. A review of similar growth rates calculated for the other major food crops in SA helped to better contextualize regional developments in the potato sector over the last five decades.

A second step in this study involved tracking the rate of change in average compound growth rates (ACGRs) for potato production, area harvested and yields on a more continuous basis during the last five decades. In other words, as referencing a particular set of years (e.g., 1984-86) or a given sub-set of time periods is arbitrary, this study also estimated, then analysed the evolution of the growth rates themselves. Hence, ACGRs for potato production and area were calculated utilizing all the data for every ten-year period beginning with 1961-1971. In other words, growth rates were calculated on a moving ten-year basis, i.e. 1961-1971, 1962-72, then on up to 2000-10. These growth rates were then plotted to observe the changes in their trajectory over the last five decades and then examined to compare over time the shifting relative importance of growth rates for area versus those for yields in relation to those for production.

As a third step, the estimated growth rates were also compared with earlier studies for clarifying the factors behind these tendencies and analyzing their relative importance. In that regard, it attempts to synthesize the major findings of both published and unpublished material (Scott 1995) as a means of helping to explain the trends that have been quantified or qualify the growth rates presented. The combined set of growth rates, data analysis, and synthesis of the related literature provide an empirical basis on which to evaluate previous projections and alternative future scenarios for potatoes in SA in the decades ahead. In so doing, the paper also draws attention to the more readily apparent inconsistencies and/or gaps in the data—a point of particular relevance in SA—both as a word of caution relating to their interpretation and as one basis for highlighting areas for possible future research and emerging opportunities for industry.

Results

Potato production in SA averaged 3.95 million metric tonnes (mt) in 2008-10 or roughly eight times the 515,000 metric tonnes (mt) harvested in 1961-63, nearly half a century earlier (Table 1). This absolute level of production is nearly 50% less than the figures reported by FAOSTAT due entirely to a downward adjustment of the figures for Malawi (see below and Appendix for details). Notwithstanding, as growth in potato production in SA surged upward—particularly since the late 1990s (Fig 1), output in SA now accounts for 42% of the total for SSA.

The increase in potato output in SA resulted from an annual growth rate for potato production that averaged 4.4%/yr for nearly the last 50 years. However, this overall upward trend masks the quasi-cyclical evolution of growth rates over the 49-year period (Fig 1). In particular, while the overall growth rate for production slowed in the latter half of the 49-year period (Table 1), the most recent trend in these growth rates displays a sharp upward tendency. The moving 10-year average rose from 2.0%/yr during 1985-95 to 5.2 %/yr for 2000-10 (Table 2).

Area harvested in potatoes in SA averaged 256,000 ha in 2008-10 as increases in area were primarily responsible for the growth in potato production over the last five decades (Table 1 and 2). As a result, SA accounts for 22% of SSA´s area in potatoes. Nevertheless, as area harvested expanded much more rapidly elsewhere in the region over the last 25 years (Table 1; Goossens, 2002), SA´s share of regional area harvested actually fell from 38% in 1961-63 (FAOSTAT accessed August 2012).

ACGRs for area harvested were generally well in excess of those for yields throughout the last half century and like production followed a quasi-cyclical pattern, albeit with a much more extended decline and shaper recovery over the last three decades (Fig 2). They were strong in the 1960s up to the mid-1980s, then slowed considerably in the 1990s when many countries, most notably Angola, continued to be wracked by civil war or political unrest, weak agricultural research and extension, and limited contact with sources of new technology (Allen et al. 2003; FAO 2009). By the turn of the century, ACGRs started to accelerate very rapidly reaching their apex during the interval 1997-2007 before cooling slightly in recent years (Table 2).

Average yields for potatoes in SA (15.5 mt/ha) remain above the continental average of 12 mt/ha largely because of the RSA. With RSA as the noteworthy exception, growth rates for average yields over the last 25 years were nearly flat or negative in four of six largest potato-producing countries in SA (Table 1; Fig 3). Several of those countries register among the lowest average yields in all of Africa. Furthermore, growth rates for yields have turned sharply negative since the mid-1990s (Table 2).

One explanation suggests as potato cultivation spread into new and/or less favourable growing areas (e.g. Angola, Malawi), it simply became harder to sustain earlier growth rates in productivity. Important inputs may be in short supply due to geographic isolation thereby handicapping growers´ efforts to optimize yields (Demo et al. 2005; Reyes et al. 2010). As a corollary, as at least some of these farmers may have taken on potato cultivation to boost household food supplies and/or supplement cash incomes, they may simply have been less familiar with the crop and its agronomic requirements (Demo et al. 2009).

Concentration of production

As growth in potato output in SSA took off during the last two decades, it nonetheless remains fairly skewed. Eight of the region´s 48 countries account for nearly 80% of output. Conversely, ten countries in SSA produce less than 10,000 mt/yr while a further 15 report producing no potatoes (Table 3). Nonetheless, potato cultivation in SSA is much more diffuse than in Latin America (Scott 2011) or Asia (Scott and Suarez 2012a) where fewer countries harvest most of the output.

In SA itself, three of the thirteen countries: Angola, Malawi and RSA account for over 86% of the sub-regional output (Table 1). These same three countries harvest 75% of the sub-region´s area in potatoes (Fig 4) as well and were responsible for the overwhelming bulk of the increase in output and area over the last nearly 50 years. Three other countries: Madagascar, Mozambique and Lesotho make up the better part of remaining output and area harvested in the sub-region.

Potatoes versus other major food crops

Growth rates for potato production and area harvested have been faster than those for the five major food crops in SA except sweet potatoes (Table 4). Hence, within SA, potatoes rank 5th in terms of total production among the 11 major food crops. However, the level of total output for potatoes remains but a fraction of that for the most important food crops grown in a region where cassava and maize frequently dominate food production. Of the 48 countries in SSA, potatoes are the most important food crop in terms of total production only in Lesotho (CIP 2010).

Potato production in SA is largely concentrated above 1200m. Under highland growing conditions, the plant´s relatively short vegetative cycle, high yields, and adaptability have long given it a comparative advantage vis-à-vis other food commodities such as maize (Dürr 1986; Saka 2000). It appears that most of the recent expansion in output has taken place in highland production zones (e.g. Angola), but some observers have noted that dry season production at lower altitudes in bottom lands or along receded riverbanks is a fairly longstanding practice in Malawi (Gondwe 1986).

Discussion

Within SA, trends in potato production and area harvested have been heavily influenced by RSA, Malawi, and Angola as major potato-producing countries. In RSA itself, potatoes are a minor secondary crop cultivated overwhelmingly for sale. As such the growth in output has been atypical. Production doubled over the last quarter century due entirely to improvements in yields rather than an expansion of area (Table 1). Over that same time period, RSA's potato sector went through a technical restructuring. The number of commercial farms fell by nearly 70% (hence, farm size has clearly risen) as irrigated cultivation went from 50% of area to 75% (Fig.5; NAMC and Commark Trust 2007). Although potatoes are harvested all year long in RSA, four of the 16 potato-producing regions: Limpopo, Eastern Free State, Western Free State and Sandveld, account for some 60% of production and area.

RSA´s 3.3% growth rate in potato productivity over the last half century has been among the most rapid in the world (Scott 2011, Scott and Suarez 2012a). These improvements in yields have been sustained by a program of technology

development and transfer noteworthy for its highly effective linkages between university-based research, government programs, commercial growers and industry (NAMC and Commark Trust 2007). While potato production is currently carried out by some 700 technically advanced, commercial growers with an average area in potatoes of 70 ha (Prof J Kirsten, U of Pretoria, personal communication), much less is known about the small, semi-subsistence growers estimates of which vary from a few dozen (NAMC and Commark Trust 2007), to 1500 (Prof Kirsten), to as many as 300,000 as cited by Black (2008).

The booming fast food sector (http://en.wikipedia.org/wiki/Famous_Brands_Limited accessed August 2012)—one local chain has some 480 restaurants around the country, and the growing consumption of crisps together have become increasingly important sources of demand as over 60% of RSA´s 50 million inhabitants now reside in urban areas (World Bank 2011). Given that, growers´ have shifted their market orientation to increasingly supply processors—these shipments currently absorb 16% -20% of output (350,000-400,000 mt/yr), then ship to supermarkets—another 20%, and are moving away from sales into public wholesale markets (Black 2008; NAMC and Commark Trust 2007; http://www.potatoes.co.za/industry-information/national-annual-information.aspx accessed June 2012). Potato exports represent roughly another 7% of total annual output. These shipments include both seed and ware potatoes to neighbouring countries principally Angola and Mozambique (Demo et al. 2005; Reyes et al. 2012), but some exports in particular seed are sent as well to Botswana, Malawi, Namibia, Zambia, Zimbabwe (Anaya 2009; Emongor et al. 2004) and even Mali (http://www.abtassociates.com/Impact/2009/Strengthening-Agriculture-and-Trade-in-Mali.aspx accessed August 2012) and Ivory Coast (Black 2008).

In Malawi, potatoes constitute the fourth major food crop after maize, sweet potato and cassava. In the main potato-producing districts, potatoes are the principal cash crop and the second most important food crop after maize (Demo et al. 2009). Although what FAO reports as production and area of potato actually represents potato and sweet potato—where sweet potato accounts for some 75% of the total (see the Appendix for further details), the sharp upward trend in potato output is still noteworthy albeit at far reduced absolute levels of production (Table 1).

The 11-fold increase in potato production in Malawi —from 66,000 to 742,000 mt/yr—since 1992 has been driven by the tripling in area during the 1990s. While at one point during that period over 80% of production was reportedly harvested in Lilongwe (60%) and Blantyre (20%) districts (Saka 2000), more recent field work suggests that potato cultivation has spread into new areas. A recent survey (n=81) found that farmers in Malawi typically planted less than 0.5 ha in potatoes total per year spread over two growing seasons (Demo et al. 2009). Moreover, results from that same study showed that 46% of the potato farmers (n=81) interviewed had not grown the crop before (Ibid.).

Growing demand for food in general in Malawi (pop. 14 million) and in the cities and towns in particular—themselves a function of rapid population growth (3.1%) and urbanization (World Bank 2011)—has driven the expansion in potato area. Moreover, growers report receiving attractive prices and incomes from cultivating this commodity (Demo et al. 2007, 2009). Further evidence of the strong demand for potatoes is manifest in the imports of fresh potatoes from neighbouring RSA (Anaya 2009) and Mozambique (Demo et al. 2005). In light of these trends, government policy has sought to stimulate additional potato production as a means of reducing food imports, improving food security at both the national and household level in the wake of periodic shortages of maize—Malawi's basic staple and the primary focus of public sector initiatives in support of agriculture (FAO 2008a; Minot 2010), and as part of strategy to raise rural incomes and lower poverty in the countryside. In recent years these efforts have included public-private partnerships to stimulate and then sustain potato-based agro-industry to produce potato chips. A series of initiatives (e.g., the release of new, improved varieties suitable to growing local conditions aimed to achieve yield potential (Kagona 2008; Labarta 2012), grower contracts with potato processors) have all been intended to improve the efficiency of the value chain for both fresh tubers and processed potato products (Demo et al. 2009).

Angola saw potato output go from a reported 29,000 mt in 2000 to over 840,000 mt in 2010; area jumped from 8,800 to over 104,000 ha over the same period (FAOSTAT accessed June 2012). Potato production and use in Angola did benefit from the end to the 27 years of civil war in 2002 (FAO 2009). As one of the most sparsely populated countries in all of Africa (14 inhabitants/km^2), the peace agreement ushered in natural resource-based industries in petroleum and diamonds (World Bank 2007) as well as megaprojects in agriculture focused on biofuels, e.g. producing ethanol from sugarcane, but including food crop production by small farmers (Allen et al. 2003). Rising incomes and increased urbanization combined to generate greater effective demand for food. These trends, in turn, spurred rapid expansion in potato production (FAO 2009) to meet domestic market requirements, reduce ware potato imports—largely from South Africa (Anaya 2009), and bolster food supplies and incomes at the farm household

level (Reyes et al. 2010). In that regard, two recent farm surveys found that potato production is dominated by small farmers planting less than half a hectare of the crop, utilizing small amounts of chemical fertilizer and under rain-fed conditions (Reyes et al. 2010, 2012). These growers also fall into one of two groups: those who sell nearly 90% of the 200 kg they harvest or those who produce only a fraction of that amount entirely for on-farm consumption (Ibid.) Cultivation appears to be concentrated in the central highlands in particular (http://en.wikipedia.org/wiki/Geography_of_Angola accessed August 2012).

Madagascar is only major potato-producing country in Africa that saw production decline over the last quarter century (FAOSTAT accessed August 2012). Area harvested was practically stagnant and the "growth" rate in yields was actually negative (Table 1). The fall in output is all the more remarkable given the tripling in production to 380,000 mt/yr from the 1970s to mid-1980s according to national statistics (Rasolo 1986).

The bulk of potatoes in Madagascar have been traditionally harvested by small farmers (1 +/-) in the Faritany Antananarivo and Vakinankaratra regions of the Central Highlands (Ibid.). Growers cultivate potatoes up three times during the year (Rakoto 1986). The main crop is grown on the hillsides in the primary rainy season Aug-Sept to Dic-Feb. In some instances, it is supplemented by a second hillside crop during the (*contre saison*) produced Jun-July to Oct-Nov. A third crop is planted during the dry season in the harvested rice paddies on the valley floors from roughly Jan-March to May-July. While Madagascar witnessed a steady program of potato research from the 1960s up to the late 1980s (Rakotondramanana 1986), subsequent attempts to revitalize the sector by strengthening the research and extension program appear simply to have proved unsustainable over time. Instead, soil erosion from continued population pressure on the hillsides, the shortage of good quality planting material and the isolation of production zones from major urban markets due to the extremely poor road network have undermined efforts to improve productivity and raise output. This despite evidence gathered in fieldwork (Rasolo et al. 1987) pointed to strong domestic demand for potatoes as an off-season substitute for rice, the traditional staple, and a source of cash income for highland households. In that regard, it appears that in subsequent years supermarkets and the restaurant trade à la French fries (Rasolo 1986) have yet to play a catalytic role in the increased production of basic food commodities in Madagascar--as has proved to be the case for potatoes in RSA, for example--as the low per capita incomes of the vast majority of consumers have restricted demand for food including potatoes and potato products (Minten 2008).

Unlike the other countries of SA, Mozambique has witnessed a much less erratic evolution in production and area harvested over the last several decades (Table 1). While growth rates for potato output, area and yields have slowed considerably in recent times, they also have avoided the double-digit expansion or negative tendencies exhibited elsewhere in the sub-region. Absolute levels of production (100,000 mt) and area (8,000 ha), however, remain fairly modest relatively speaking. Although baseline fieldwork provides only limited information regarding the factors behind these trends (Demo et al. 2005), preliminary indications suggest that output has been spurred by efforts to diversify food production away from an overwhelming dependence on cassava and maize, help reduce food imports in the form of rice (300,000 mt/yr) and wheat (550,000 mt/yr) as well as capitalize on opportunities for cross-border trade in potatoes with neighbouring countries, e.g. Malawi, Zimbabwe among other considerations. Some 90% of production is harvested in two districts in Tete province in the far northwest part of the country (Ibid.). Despite multiple planting seasons, potato cultivation has been constrained by a shortage of chemical fertilizers that in the past itinerant traders brought into the country from Malawi. Furthermore, Mozambique's weak organizational base for national potato research and development efforts combined with the limited resources of the average grower have resulted in a shortage of good quality planting material that in turn has hampered efforts to expand area under cultivation, raise productivity and reduce dependence on seed and ware imports from RSA (Ibid.).

Utilization and Trade

The overwhelming bulk (73%) of all the potatoes produced in SA goes for human consumption (Table 5). Most of the remainder goes for seed (7%) or so-called "other uses" (13%). Unlike in Europe (Haase and Haverkort 2006), no potatoes serve for industrial use (e.g., starch)—with much more abundant quantities of cassava available for such uses instead (Table 4). Only modest quantities (7%) are fed to livestock, primarily in RSA.

According to FAO data, the principal changes in potato use patterns over the last five decades involve the declining share of potatoes utilized as seed (Table 5). As area has expanded (e.g., Angola) and as this has been increasingly done by small farmers in more marginal production zones (e.g., Mozambique), then it seems likely that they use less

seed per hectare equivalent because the tubers in general are scarce, expensive and hard to come by helping to drive down their use as a percentage of total available supply in the process (Demo et al. 2005, 2009; Reyes et al. 2010, 2012).

Potato basically plays two primary roles in diets across SA. At the farm level in much of the region, potatoes serve as as a complement to maize as average per capita consumption remains minor (≤ 19.6 kg/capita/yr) by comparison (Table 6). In addition, potatoes can serve a food security commodity either during the "hungry season" before the maize crop is ready for harvest (e.g., Malawi) or should shortfalls of basic staples after harvest generate the need for a home-grown food supplement (e.g., rice in Madagascar). While most growers in much of SA will eat at least part of what they harvest, the commercial growers in RSA sell practically all of what they harvest.

In urban areas, potatoes eaten as a snack (chips) or French fries have become increasingly popular (NAMC and Commark Trust 2007). But other than in South Africa and major cities elsewhere (e.g., Blantyre, Luanda, Maputo), SA has yet to see the emergence of quick service restaurant chains on a scale that has become common in Latin America (Scott 2011) or East Asia (Scott and Suarez 2012c)—nor the industrial potato processing facilities to supply them. Instead, small informal enterprises have captured a hefty niche in this urban market by integrating procurement, processing and retail sales direct to the public, or the processing is done "in-house" by the restaurants and hotels themselves (Rasolo 1986). In RSA, a reported 15% of potato processing is done cottage industry (NAMC and Commark Trust 2007). Given this situation, it is noteworthy that potatoes are one of only a few commodities that experienced an increase in per capita consumption over time and across sub-regions as the evolution has closely mirrored that of production adjusted for population (Table 6, Fig 6). At the same time, potatoes still play a very minor role in the average diet, although their relative importance varies from major production zones (seasonal), to urban areas (moderate), to rural areas where potatoes are not grown (negligible at best).

Prospects for greater potato exports have long been of interest in SA (Anaya 2009; Black 2008; Rasolo et al. 1987; Scott 1990, 1992, 2002). In the post market-liberalization era in particular, trade in general has been seen as a driver of economic growth and development. In the specific case of potatoes, trade is often considered as a possible source of foreign exchange. In that regard, potatoes were sometimes considered as a less attractive food commodity (e.g., maize in Malawi, rice in Madagascar) with a corollary in some cases that potato exports potentially represented a way of offsetting the cost of cereal imports to meet domestic food requirements (Rasolo et al. 1987). Alternatively, several recent studies have highlighted the interest in reducing imports of potatoes and potato products as a possible means of stimulating greater domestic production and capturing the associated value added (Allen et al. 2003; Demo et al. 2007, 2009; Saka 2000).

Although average annual total trade (imports plus exports for the combined total of fresh tubers including seed, frozen French fries, and potato flour) represents just 6% percent of annual production in SA, potato imports have expanded rapidly over the last five decades (Table 1 and 7). The overwhelming bulk of registered trade of regional origin consists of exports from RSA to neighbouring countries in the form of table potatoes and seed (Anaya 2009; Emongor et al. 2004; NAMC and Commark Trust 2007; Table 7). RSA also exports small quantities of frozen French fries to countries in East Africa (Tesfaye et al. 2010).

Various more recent reports have called attention to the informal, cross-border trade in potatoes, e.g. from Mozambique to Malawi (Demo et al. 2005). But the volumes involved are hard to quantify in anything more than an anecdotal way. The sparse empirical evidence suggests this trade is highly localized given the high cost of transport in relation to the low value to weight ratio for potatoes. Nevertheless, the cross border shipments can be highly dynamic in response to shifting supply and demand patterns. At the Mozambique-Malawi border, an important regional market for potatoes at Aldeia Biri Biri (http://www.tripmondo.com/mozambique/provincia-de-tete/aldeia-biri-biri/ accessed August 2012) supplies central and northern Mozambique, southern and central Malawi and even Zambia, Zimbabwe, and Tanzania (Ibid.; Demo et al. 2005). Although in some years it served as the focal point for Malawi's potato exports to adjacent countries, more typically this market has functioned as the shipping point for a large part of Mozambique's potato exports into Malawi.

At least in parts of Southern Africa—most notably RSA, the evolution of the domestic market for potatoes has perhaps been more dynamic than that for foreign trade. Supermarkets are capturing greater market share across the continent (Weatherspoon and Reardon 2003), but in RSA in particular their expanding presence at the retail level has led to a restructuring of procurement practices via firm created and run regional assembly centers and away from

more traditional public wholesale markets (NAMC and Commark Trust 2007). Nevertheless, it should be pointed out that RSA is much more urbanized than many other countries in the region

Past Projections and Future Prospects

Earlier FAO-CIP short-term projections (Anonymous 1995) for average annual growth rates for potatoes for the period 1988 to 2000 were for Africa in total and not by sub-region. Be that as it may, those projections for production (3.73%) and area (2.18%) proved too ambitious for SA during that time span as ACGRs for output (2.9% to 3.5%) and in particular areas (0.2% to 0.5%) were far below the FAO-CIP estimates (Table 2). In the case of yields, the projected growth rate (1.49%) was actually too conservative for SA (2.8%, see Table 2). As it turns out, the time period in question was during the civil war in Angola and political unrest elsewhere in the sub-region. Given that, the data suggest these events acted as a constraint to area expansion and production for several of the major food crops (Table 4). Conversely, once peace broke out, growers other than in RSA made a major push to expand area and contributed to the fall in average yields for potatoes.

In light of these more recent developments, longer-term projections for production, area, and yields in SA for the period 1993 to 2020 developed using FAO data for all of SSA have proved too modest (Scott et al. 2000). Projected growth rates for production (3.01%) and area (1.25) for SSA when applied to SA have proved to be well below the average annual growth rates of 4.0% for output and 2.9% for area harvested observed during the last quarter century (Table 1). Nonetheless, projected growth rates for yields of 1.25% have been roughly in line with the growth rate for yields so far (1.1%).

Conclusions

Potato production expanded more rapidly in SSA than in any other part of the world over the last five decades. Within SSA, the SA sub-region exhibited an array of different tendencies at the country level. In Angola, Malawi and apparently Mozambique, the bulk of that increase in output came from an expansion of area harvested including into more marginal production zones to meet the growing rural and in particular urban demand. RSA experienced just the opposite trend. Rising productivity drove increases in production as area harvested actually declined modestly. Mozambique fell between these two major trends as area grew faster than in RSA and productivity faster than Angola and Mozambique. Both potato production and yields contracted in Madagascar in recent decades.

Future prospects for potatoes in SA seem equally diverse. RSA, for example, seems unlikely to experience any massive increase in area under cultivation given the farm-level consolidation that has taken place over the last fifteen years and the relatively mature state of the domestic market. Nevertheless, there is growing concern about the possible negative effects of climate change (Hijmans 2003) and in the context of broader discussions regarding the availability of water in the longer term nationwide, the crops's heavy dependence on irrigation stands out. Notwithstanding, population growth rates for RSA as well as for contiguous countries such as Botswana, Lesotho, Swaziland, and Zimbabwe are running at less than 1.5%/yr. In RSA and Botswana, over 60% of the population already resides in urban areas with some RSA estimates showing the rate of urbanization roughly double that for population as a whole. Given these various trends, growing urban demand and exports could continue to provide a stimulus for further increases in potato output, but the foreign trade component will depend very much on efforts in neighboring countries such as Angola and Malawi to expand both seed and ware production. A corollary to that development would be the extent to which the apparent preference for fresh potatoes in some major restaurant chains in RSA, among other things, will serve to stimulate further efforts to continue to improve the quality and price of locally produced processed potatoes thereby discouraging possible additional imports of frozen French fries. A baseline study of price differentials for the two products as carried in Peru recently (Scott and Zelada 2011) might well provide a benchmark against which to evaluate future developments in this growing segment of the domestic market. Given this scenario, crop diversification in the case of potatoes in RSA means diversifying markets for final use for direct human consumption and exports of seed and ware potatoes.

For the emerging potato-producing countries such as Angola, Malawi and Mozambique the situation is quite different. Population growth rates of 2.8%/yr, 3.2%/yr and 2.3%, respectively, are still high. With the exception of Angola (59%), urbanization is still low: Malawi (16%), Mozambique (31%). Under these circumstances, potatoes role in crop diversification revolves around improving food security and developing new income-generating activities for the vast majority of small farmers that make up the potato sub-sector and the growing numbers of small-scale entrepreneurs

doing business in urban areas. In that regard, aside from basic FAO statistics on production, area and yield, relatively little is known about potatoes in these countries. Hence, besides efforts--already underway in Malawi-- to increase the supply of improved quality planting material, baseline studies of potato production, marketing and consumption aimed at pulling together from national sources the basic statistics, government and research reports could provide common ground for the more detailed debate among the different stakeholders about where and how to develop the sector going forward. A key dimension to such studies would be articulating product flows and marketing practices beyond the farm gate so as to widely disseminate information about commercial opportunities for potatoes and potato products to a broader audience of potential participants in value-added activities. Several earlier studies carried out in other African countries might readily serve as a template for this exercise as well as provide the methods materials about how to go about it. A similar exercise in Madagascar might not only serve to up-date information that is now over 20 years old, but also provide the focal point for initiatives to revitalize the potato sub-sector in that country.

Appendix. Some reflections on statistics for potatoes in Sub-Saharan Africa.

The literature on potatoes in Africa is riddled with examples—some acknowledged, others not—of inconsistencies in the data on production and utilization as has been noted by a number of previous studies: Scott (1988) for Democratic Republic of the Congo (ex- Zaïre), Ferris et al. (2001) for Uganda; Dürr (1983) and Goossens (2002) for Rwanda, Gildemacher et al. (2009) for Ethiopia, to cite but a few examples. The vast majority of instances, but by no means all, involve published statistics for production, area, and yields and the differences between national figures versus those published by FAOSTAT. Another substantial set of differences concern discrepancies between national reporting agencies, for example, the Ministry of Agriculture versus the Census Bureau or the National Agricultural Research Institute. Given this reality, a number of observations are in order.

Firstly, problems with the accuracy of data on potatoes in SA are by no means peculiar to this region (Scott and Suarez 2012b). For decades, informed observers have pointed to the various features of potatoes in developing countries (e.g. grown by small farmers, in isolated production zones, in multiple-cropping or relay cropping patterns, intercropped with other commodities such as maize, characterized by staggered harvests in the same field and with little foreign trade) that lend it to being susceptible to inaccurate reporting (Horton 1981, 1987, 1988)—even in industrialized countries (Scott 2002). However, many of the same considerations apply to other crops and livestock in developing countries.

Secondly, it might be argued that the abovementioned factors are more acute for potatoes in SA given the political and therefore institutional instability that has characterized the region´s history over much of the last five decades. In addition, the crop is well down on the list of major food commodities in most the countries even in some where production is relatively high. In effect, where resources are scarce, less attention is given to those commodities that are perceived as less important. Unfortunately for potatoes, the extent to which the crop is underreported, these sorts of circumstances make for something of a self-perpetuating scenario.

Thirdly, several of the major potato-producing countries simply have not collected and/or disseminated annual statistics on potato production, area and yields in perpetual fashion. For example, Gildemacher et al. (2009) refer to unpublished data on potato production in Ethiopia 1995-2000. Hence, aside from the question of their accuracy, the historical time-series on potato output are incomplete (e.g. for Madagascar, see Rasolo 1986) or sometimes unavailable.

Finally, given this situation, the discrepancies are there. Hence, the question what if anything can be made of them? For Malawi, the most blatant case of overestimation, various sources have noted the major difference between the figures reported by FAO and those disseminated by other, national sources (Saka 2000; Demo et al. 2009; Minot 2010). Conversations with crop specialists have confirmed this phenomenon. But, in this particular case, an alternative exists in the form of times-series data on production and area that we have extended back in time to have a complete set of statistics for the period in question (Table 8). These data also offer a reasonable explanation of why the differences between data sets exist and therefore a justification for their use instead of FAO figures in this paper. FAOSTAT reports that Malawi produces no sweet potatoes when the data and FAO mission reports indicate that it does (FAO 2002).

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Table 1 Average annual growth rates for potatoes for countries in Southern Africa, 1961-2010

	2008-2010			Growth rate[a]								
Region/country	Production	Area	Yield	Production			Area			Yield		
	(000mt)	(000ha)	(mt/ha)	1	2	3	1	2	3	1	2	3
Africa	17,937	1,518	11.8	4.8	4.5	4.6	3.8	3.7	3.8	0.9	0.8	0.8
Sub- Saharan Africa[b,c]	9,501	1,185	8.0	4.1	4.7	4.4	3.3	4.6	4.0	0.8	0.1	0.4
Southern Africa[c]	3,954	256	15.5	4.9	4.0	4.4	2.5	2.9	2.7	2.3	1.1	1.7
Rep of South Africa	1,993	59	33.7	4.7	2.8	3.7	1.1	-0.3	0.4	3.5	3.1	3.3
Malawi[c]	742	48	15.5	7.1	11.5	9.3	6.5	8.2	7.3	0.6	0.6	1.9
Angola	684	85	8.1	3.5	12.6	8.0	1.9	12.1	7.0	1.5	0.4	1.0
Madagascar	223	40	5.6	5.2	-0.7	2.1	5.3	0.1	2.6	-0.2	-0.8	-0.5
Mozambique	108	8	13.8	7.4	2.2	4.7	3.6	1.1	2.3	3.6	1.0	2.3
Lesotho	93	7	14.0	10.1	5.2	7.6	10.0	5.6	7.7	0.1	-0.4	-0.1

[a] 1 = 1984-86 vs 1961-63; 2 = 2008-10 vs 1984-86; 3 = 2008-10 vs 1961-63 where the average annual growth rate is calculated as follows

$$\left[\left(\frac{\text{Ending } 3-\text{year average}}{\text{Beginning } 3-\text{year average}}\right)^{\frac{1}{\text{Number of years between beginning and end mid-points}}}-1\right]*100$$

[b] Sub-Saharan Africa consists of Africa less North Africa that in turn is made up of Algeria, Egypt, Libya, Morocco, and the Western Sahara*, and includes West Africa includes Benin, Burkina Faso, Cameroon, Cape Verde, Chad, Côte d´Ivoire*, Gambia*, Ghana*, Guinea, Guinea-Bissau*, Liberia*, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone*, and Togo*; Central Africa is made up of Burundi, Central African Republic, Congo, Equatorial Guinea*, Dem. Rep. of the Congo, Gabon*, Rwanda, and Saõ Tomé and Príncipe*; East Africa consists of Djibouti*, Eritrea, Ethiopia, Kenya, Seychelles*, Somalia*, Sudan (FAO does not yet report separate data for Sudan and the Rep of South Sudan, Tanzania, and Uganda; Southern Africa consists of Angola, Botswana*, Comoros, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Rep. of South Africa, Swaziland, Zambia, and Zimbabwe; * according to FAO, these territories reported producing no potatoes during 2008-10

[c] Data for Sub- Saharan and Southern Africa include statistics for Malawi based on Ministry of Agriculture and Food Security data for 1994-2010 (see FAO, 2008; Saka, 2000) plus estimates for this study for years 1961-93 and not FAOSTAT; see Appendix for details

Source: FAOSTAT (accessed May 2012) and calculations for this study unless otherwise indicated

Table 2 Average compound growth rates (ACGRs) for potato in Southern Africa, 1961-2010.[a]

Years	Production[b]			Area[b]			Yield[b]		
	R^2	ACGR (%)	Signific.	R^2	ACGR (%)	Signific.	R^2	ACGR (%)	Signific.
1961-71	0.96	6.3	***	0.31	1.9	*	0.63	4.3	***
1962-72	0.96	6.3	***	0.26	1.7	n.s	0.66	4.6	***
1963-73	0.91	5.3	***	0.39	2.2	**	0.46	3.1	**
1964-74	0.90	5.3	***	0.57	2.9	***	0.32	2.3	*
1965-75	0.89	5.1	***	0.63	3.2	***	0.26	1.9	n.s
1966-76	0.88	4.4	***	0.72	3.5	***	0.10	0.8	n.s
1967-77	0.91	3.9	***	0.66	3.0	***	0.11	0.9	n.s
1968-78	0.90	3.7	***	0.65	2.9	***	0.08	0.8	n.s
1969-79	0.88	3.5	***	0.67	2.1	***	0.26	1.3	n.s
1970-80	0.84	2.8	***	0.73	2.3	***	0.05	0.4	n.s
1971-81	0.84	3.1	***	0.74	2.2	***	0.17	0.8	n.s
1972-82	0.81	3.9	***	0.94	2.8	***	0.21	1.1	n.s
1973-83	0.88	4.4	***	0.93	2.9	***	0.42	1.5	**
1974-84	0.88	4.5	***	0.93	3.2	***	0.33	1.2	*
1975-85	0.89	4.8	***	0.95	3.8	***	0.27	1.0	*
1976-86	0.91	5.0	***	0.92	3.5	***	0.44	1.5	**
1977-87	0.89	4.8	***	0.86	3.1	***	0.51	1.7	**
1978-88	0.89	4.8	***	0.85	2.9	***	0.62	1.9	***
1979-89	0.89	4.9	***	0.87	3.1	***	0.57	1.7	***
1980-90	0.88	4.5	***	0.78	2.7	***	0.59	1.9	***
1981-91	0.92	3.9	***	0.78	2.5	***	0.44	1.3	**
1982-92	0.87	3.2	***	0.70	2.2	***	0.33	1.0	*
1983-93	0.72	2.7	***	0.40	1.3	**	0.68	1.4	***
1984-94	0.69	2.2	***	0.07	0.5	n.s	0.67	1.7	***
1985-95	0.66	2.0	***	0.01	0.2	n.s	0.68	1.8	***
1986-96	0.69	2.5	***	0.08	0.5	n.s	0.70	2.0	***
1987-97	0.71	2.8	***	0.15	0.8	n.s	0.69	2.0	***
1988-98	0.72	2.9	***	0.02	0.3	n.s	0.75	2.6	***
1989-99	0.72	3.0	***	0.01	0.2	n.s	0.76	2.8	***
1990-00	0.80	3.5	***	0.07	0.5	n.s	0.79	3.0	***
1991-01	0.86	4.4	***	0.15	0.8	n.s	0.91	3.6	***
1992-02	0.95	5.1	***	0.57	2.2	***	0.73	2.9	***
1993-03	0.95	5.1	***	0.69	3.8	***	0.15	1.3	n.s
1994-04	0.95	4.8	***	0.74	5.4	***	0.02	-0.5	n.s
1995-05	0.94	4.4	***	0.77	6.9	***	0.24	-2.2	n.s
1996-06	0.95	4.0	***	0.74	6.6	***	0.27	-2.3	n.s
1997-07	0.95	4.5	***	0.77	6.9	***	0.25	-2.2	n.s
1998-08	0.95	4.6	***	0.73	6.6	***	0.16	-1.8	n.s
1999-09	0.95	5.0	***	0.72	6.4	***	0.09	-1.4	n.s
2000-10	0.95	5.2	***	0.69	5.9	***	0.03	-0.7	n.s

*** = Significant at 1% level; ** = Significant at 5% level; * = Significant at 10% level; n. s. = not significant

[a] Calculated using the following expression: $\ln Y = \ln b_0 e^{b_1 t}$, *i.e.* $\ln(Y) = \ln(b_0) + b_1 t$; where, Y = Variables (Production, Area or Yield); ln= natural log; and b_1 = ACGR

[b] Data for Southern Africa include statistics for Malawi based on Ministry of Agriculture and Food Security data for 1994-2010 (see FAO, 2008; Saka, 2000) plus estimates for this study for years 1961-93 and not FAOSTAT; see Appendix for details

Source: FAOSTAT (accessed August 2012) and calculations for this study unless otherwise indicated

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Table 3 Distribution of potato producing countries in Sub-Saharan Africa, 2008-10

Annual production (000 mt)	Sub-Saharan Africa [a]			
	West	Central	East	Southern [b]
0 or no data	7	3	3	1 [c]
> 0 <10,000	4	3	1	2 [d]
> 10,000 < 50,000	5	--	--	3 [e]
> 50,000 <250,000	1	1	--	4 [f]
>250,000	1	1	5	3 [g]
Total	**18**	**8**	**9**	**13**

[a] See Table 1 footnote b for a list of the countries in each sub-region

[b] Data for Southern Africa include statistics for Malawi based on Ministry of Agriculture and Food Security data for 1994-2010 (see FAO, 2008; Saka (2000) plus estimates for this study for years 1961-93 and not FAOSTAT; see Appendix for details

[c] Botswana

[d] Comoros, Swaziland

[e] Mauritius, Namibia, Zambia

[f] Lesotho, Madagascar, Mozambique, Zimbabwe

[g] Angola, Malawi, Rep. of South Africa

Source: FAOSTAT (accessed August 2012) unless otherwise indicated

Table 4 Average annual growth rates for major food crops in Southern Africa, 1961-2010

Region/country	2008-2010			Growth rate [a]								
	Production (000mt)	Area (000ha)	Yield (mt//ha)	Production 1	Production 2	Production 3	Area 1	Area 2	Area 3	Yield 1	Yield 2	Yield 3
Sub- Saharan Africa [b]												
Cassava	120,823	11,911	10.1	2.6	3.1	2.9	1.3	1.9	1.6	1.2	1.2	1.2
Maize	52,156	28,839	1.8	2.3	3.1	2.7	1.3	1.6	1.5	0.9	1.5	1.2
Yams	47,723	4,580	10.4	1.6	6.2	3.9	1.9	4.3	3.1	-0.3	1.8	0.8
Plantains	26,788	4,303	6.2	2.4	1.9	2.2	2.3	0.9	1.6	0.2	1.0	0.6
Sorghum	22,190	25,551	0.9	1.4	2.0	1.7	1.3	1.6	1.4	0.1	0.4	0.2
Rice, paddy	17,712	8,537	2.1	3.4	3.8	3.6	2.4	2.6	2.5	0.9	1.1	1.0
Sweet potatoes [c]	17,008	3,400	5.0	2.5	4.4	3.5	2.8	4.3	3.6	-0.2	0.1	-0.1
Potatoes (11) [c]	9,501	1,185	8.0	4.1	4.7	4.4	3.3	4.6	4.0	0.8	0.1	0.4
Southern Africa												
Cassava	25,418	2,496	10.2	1.8	5.0	3.4	1.2	1.4	1.3	0.5	3.6	2.1
Maize	21,880	10,144	2.2	1.5	2.2	1.9	0.9	0.2	0.5	0.6	2.0	1.3
Sweet potatoes [c]	5,545	599	9.3	2.6	7.2	4.9	2.2	5.2	3.7	0.4	1.9	1.2
Rice, paddy	4,759	1,605	3.0	1.5	3.0	2.3	1.5	0.8	1.1	0.0	2.2	1.1

Potatoes (5) [c]	3,954	256	15.5	4.9	4.0	4.4	2.5	2.9	2.7	2.3	1.1	1.7
Wheat	2,094	717	2.9	4.2	-0.5	1.8	1.2	-4.3	-1.6	3.0	3.9	3.5
Bananas	1,774	189	9.4	2.8	2.8	2.8	2.5	1.7	2.1	0.2	1.1	0.7

( ) indicates the order of importance in terms of the volume of production

[a] 1= 1984-86 vs 1961-63; 2= 2008-10 vs 1984-86; 3= 2008-10 vs 1961-63

[b] See Table 1 footnote b for a list of the countries in Sub-Saharan Africa and in the Southern Africa sub-region

[c] Data on potato and sweet potato production include statistics from Malawi's Ministry of Agriculture and Food Security for 1994-2010 (see FAO, 2008; Saka, 2000) and estimates for this study for 1961-63; see Appendix for details

Source: FAOSTAT (accessed August 2012) and calculations for this study unless otherwise indicated

Table 5 Food Balance Sheets for potato in Sub-Saharan Africa, 1961-63 to 2007-09[a]

Region		1961-63	1976-78	1991-93	2007-09
Sub-Saharan [b,c]	Domestic supply (000 mt)	1,258	2,486	4,341	9,047
	Food (%)	73	75	78	75
	Feed (%)	3	3	3	3
	Seed (%)	14	12	9	11
	Processing (%)	0	0	0	0
	Other uses (%) [d]	9	10	10	11
Southern Africa [c]	Domestic supply (000 mt)	517	1,053	1,857	3,733
	Food (%)	67	73	75	73
	Feed (%)	8	8	8	7
	Seed (%)	16	10	7	7
	Processing (%)	0	0	0	0
	Other uses (%) [d]	9	9	10	13

[a] Totals may not sum due to rounding

[b] See Table 1 footnote b for a list of the countries in Sub-Saharan Africa and in South Africa sub-region

[c] Data for Sub- Saharan and Southern Africa include statistics for Malawi based on Ministry of Agriculture and Food Security data for 1994-2010 (see FAO, 2008; Saka, 2000) plus estimates for this study for years 1961-93 and not FAOSTAT; see Appendix for details

[d] According to FAOSTAT "other uses" refers to "waste" and "other uses"; in previous years it referred only to waste (Anonymous 1995; Horton 1988)

Source: FAOSTAT (accessed August 2012) and calculations for this study unless otherwise indicated

Table 6 Average per capita food supply (kg/yr) in Sub-Saharan Africa 1961-2009

Region [a]	1961-63	1971-73	1981-83	1991-93	2001-03	2007-09
Sub-Saharan Africa						
Cassava	103.5	97.7	95.2	109.0	92.3	75.9
Fruits	52.0	54.6	54.6	53.3	53.5	52.8
Maize	36.6	36.5	38.3	42.8	41.0	39.8
Meat	13.6	13.6	14.1	13.4	13.6	14.8
Milk	27.1	29.3	33.2	27.9	30.7	33.2
Potatoes [b]	4.0	4.8	5.7	6.4	9.0	8.5
Sorghum	29.1	22.1	20.1	20.7	20.7	20.7
Sweet Potatoes [b]	11.7	11.7	12.0	10.7	15.9	16.7
Wheat	10.2	14.4	17.2	17.2	20.9	23.2
Southern Africa						
Cassava	91.1	88.2	76.2	74.3	88.9	88.1
Fruits	34.9	41.8	37.4	36.5	38.9	36.7
Maize	100.0	96.2	98.1	94.2	95.2	89.0
Meat	21.9	23.7	23.4	24.6	25.3	31.7
Milk	47.2	55.5	52.1	36.7	34.1	34.0
Potatoes [b]	7.5	10.9	12.6	13.7	16.8	19.6
Sorghum	9.5	8.8	4.8	3.1	3.1	3.3
Sweet Potatoes [b]	8.9	8.6	8.8	8.2	18.4	25.6
Wheat	25.1	33.5	35.6	33.2	33.4	38.7

[a] See Table 1 footnote b for a list of the countries in Sub-Saharan Africa and in South Africa sub-region

[b] Data for Sub- Saharan and Southern Africa include statistics on potato and sweet potato production from Malawi's Ministry of Agriculture and Food Security for 1994-2010 (see FAO, 2008; Saka, 2000) and estimates for this study for 1961-63; see Appendix for details

Source: FAOSTAT (accessed August 2012) and calculations for this study unless otherwise indicated

Table 7 Trade volumes and values for potatoes in Sub-Saharan Africa[a]

Region/Country	Imports				Exports			
	1961-63 (000 mt)	1984-86 (000 mt)	2007-09 (000 mt)	2007-09 (000 US$)	1961-63 (000 mt)	1984-86 (000 mt)	2007-09 (000 mt)	2007-09 (000 US$)
				Potatoes				
Sub-Saharan Africa[b]	62	50	255	77,138	27	11	0	14,323
West Africa	24	28	134	29,328	1	1	2	349
Senegal	11	11	71	10,708	0	1	0	18
Ivory Coast	3	9	19	6,220	0	0	0	63
Central Africa	8	4	2	1,333	0	0	1	271
Rwanda	0	0	0	127	0	0	1	271
East Africa	9	3	21	9,094	7	4	13	2,507
Kenya	2	0	2	143	4	0	1	122
Southern Africa	21	15	98	37,382	19	6	36	11,196
Botswana	1	5	20	7,535	0	1	0	7
Mozambique	6	2	16	4,808	0	0	0	0
Angola	2	2	14	6,386	0	0	0	0
South Africa	7	0	0	42	17	5	35	10,762
				Frozen potatoes[c]				
Sub-Saharan Africa[b]	0	0	34	24,199	0	0	6	2,128
West Africa	0	0	6	4,060	0	0	1	74
Senegal	0	0	1	796	0	0	0	55
Cape Verde	0	0	1	710	0	0	0	4
Central Africa	0	0	3	1,992	0	0	1	34

East Africa	0	0	1	471	0	0	1	102
Kenya	0	0	0	56	0	0	0	52
Uganda	0	0	0	45	0	0	0	5
Southern Africa	0	0	25	17,677	0	0	4	1,918
South Africa	0	0	19	13,530	0	0	4	1,803
Zambia	0	0	1	217	0	0	0	71
			Potato flour [c]					
Sub-Saharan Africa[b]	1	3	67	8,278	1	0	20	5,689
West Africa	0	1	7	1,620	0	0	0	4
Central Africa	0	0	30	759	0	0	0	20
East Africa	1	0	13	1,497	1	0	1	716
Kenya	0	0	0	22	0	0	0	82
Uganda	0	0	0	14	0	0	0	7
Southern Africa	0	1	17	4,403	0	0	19	4,949
South Africa	0	1	4	1,820	0	0	7	3,535
Total	63	53	407	109,616	27	11	79	22,140

[a] Totals may not sum due to rounding
[b] See Table 1 for details about the classification of countries by region and sub-region
[c] Fresh weight equivalent with a conversion rate of 2:1 for frozen potatoes and 5:1 for potato flour
Source: FAOSTAT (accessed August 2012)

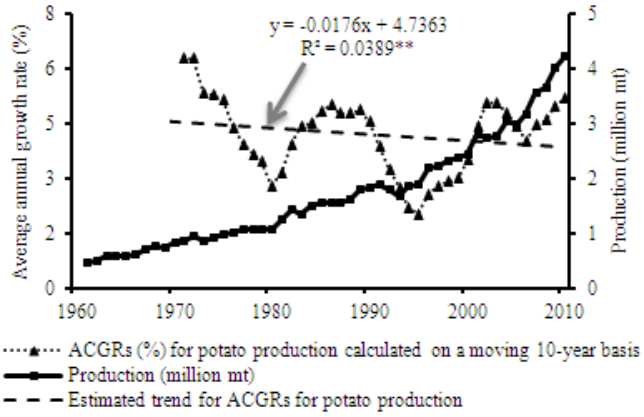
Table 8 Potato production in Malawi according to different sources, 1961-2010

Year	FAOSTAT		Ministry of Agriculture and Food Security[a]					
	Potato		Potato + Sweet potato		Potato		Sweet potato	
	Production (000 mt)	Area (000 ha)	Production (000 mt)	Area (000 ha)	Production (000 mt)	Area (000 ha)	Production (000 mt)	Area (000 ha)
1961	60	10	60	10	11	2	49	8
1962	62	10	62	10	11	2	51	8
1963	64	10	64	10	12	2	52	8
1964	66	11	66	11	12	2	54	9
1965	68	11	68	11	12	2	56	9
1966	70	11	70	11	13	2	57	9
1967	78	12	78	12	14	2	64	10
1968	80	12	80	12	14	2	66	10
1969	84	13	84	13	15	2	69	11
1970	86	13	86	13	16	2	71	11
1971	83	13	83	13	15	2	68	11
1972	85	13	85	13	15	2	70	11
1973	235	35	235	35	42	6	193	29
1974	240	35	240	35	43	6	197	29
1975	245	35	245	35	44	6	201	29
1976	250	35	250	35	45	6	205	29
1977	255	36	255	36	46	6	209	29
1978	260	36	260	36	47	6	213	30
1979	260	36	260	36	47	6	213	30
1980	270	38	270	38	48	6	221	32
1981	280	40	280	40	50	7	230	33
1982	285	40	285	40	51	7	234	33

1983	290	40	290	40	52	7	238	33
1984	295	42	295	42	53	7	242	35
1985	300	42	300	42	54	7	246	35
1986	310	43	310	43	56	7	254	36
1987	320	32	320	32	58	5	262	27
1988	330	32	330	32	59	5	271	26
1989	340	47	340	47	61	8	279	39
1990	350	34	350	34	63	6	287	28
1991	360	54	360	54	65	9	295	45
1992	350	26	350	26	63	4	287	21
1993	370	41	370	41	67	7	303	34
1994	350	41	173	37	42	4	131	33
1995	397	68	366	63	70	7	296	56
1996	703	78	867	94	100	9	767	85
1997	975	102	982	102	115	10	868	92
1998	1, 553	148	1, 455	140	117	12	1, 339	128
1999	1, 840	164	1, 821	165	149	13	1, 672	152
2000	2, 037	178	2, 032	174	173	14	1, 859	161
2001	2, 852	211	2, 713	205	310	22	2, 403	183
2002	1, 404	111	3, 103	239	350	28	2, 753	212
2003	1, 884	144	1, 935	146	399	30	1, 535	116
2004	2, 183	181	2, 006	183	431	33	1, 575	149
2005	1, 486	164	2, 006	183	431	33	1, 575	149
2006	2, 309	173	2, 309	173	528	41	1, 782	132
2007	2, 859	188	2, 901	191	594	40	2, 307	151
2008	2, 994	205	3, 036	208	673	46	2, 362	162
2009	3, 428	212	3, 472	214	776	48	2, 696	166
2010	4, 706	241	3, 674	229	776	49	2, 898	180

Source: FAOSTAT (accessed June 2012); Ministry of Agriculture and Food Security 1994-2010 data are from the same Ministry (see FAO, 2008; Saka, 2000); data for 1961-1993 represent estimates derived via interpolation calculated for this study based on the 1994-2010 data

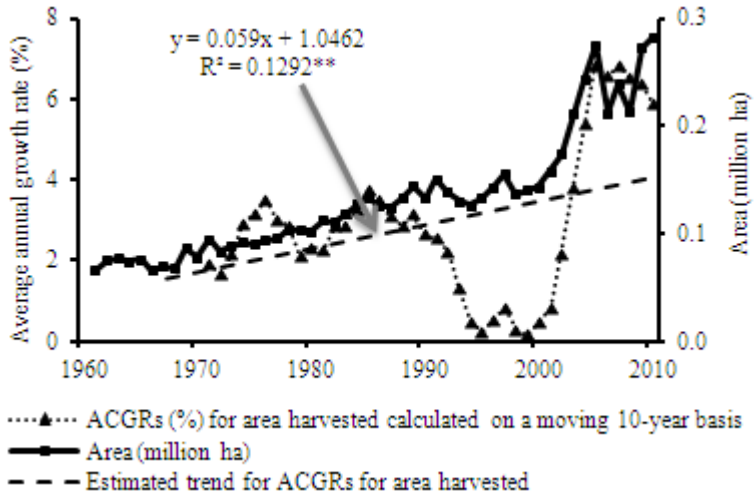
Fig. 1 Potato production and ACGRs for production in Southern Africa, 1961-2010[a]



[a] Data points for the ACGRs are taken from Table 2; see Table 2 for details. *Double asterisks* R^2 indicates the estimated trend line for growth rates is significant at the 1% level

Source: Table 1, 2 and 8

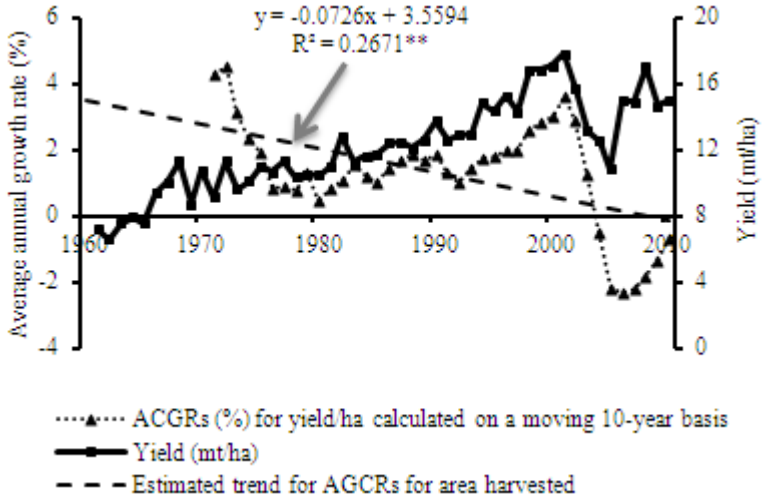
Fig. 2 Area harvested for potato and ACGRs for area in Southern Africa, 1961-2010 [a]



[a] Data points for the ACGRs are taken from Table 2; see Table 2 for details. *Double asterisk* R^2 indicates the estimated trend line is significant at the 1% level

Source: Table 1, 2 and 8

Fig. 3 Yield/ha for potato and ACGRs for yields in Southern Africa, 1961-2010 [a]



[a] Data points for the ACGRs are taken from Table 2; see Table 2 for details. *Double asterisk* R^2

indicates the estimated trend line is significant at the 1% level

Source: Table 1, 2 and 8

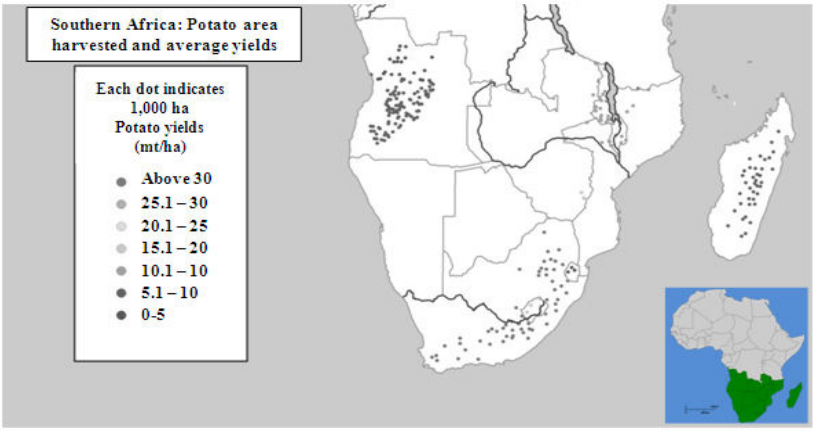


Fig 4. Potato area in Southern Africa

Source: CIP´s Research Informatics Unit

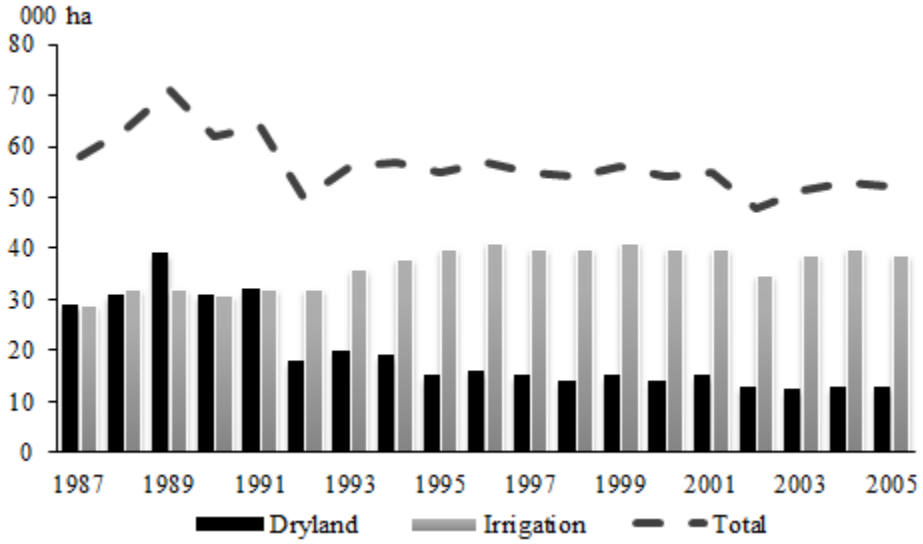


Fig. 5 Dry-land versus irrigated potato area in the Rep. of South Africa, 1987-2005

Source: Potatoes SA

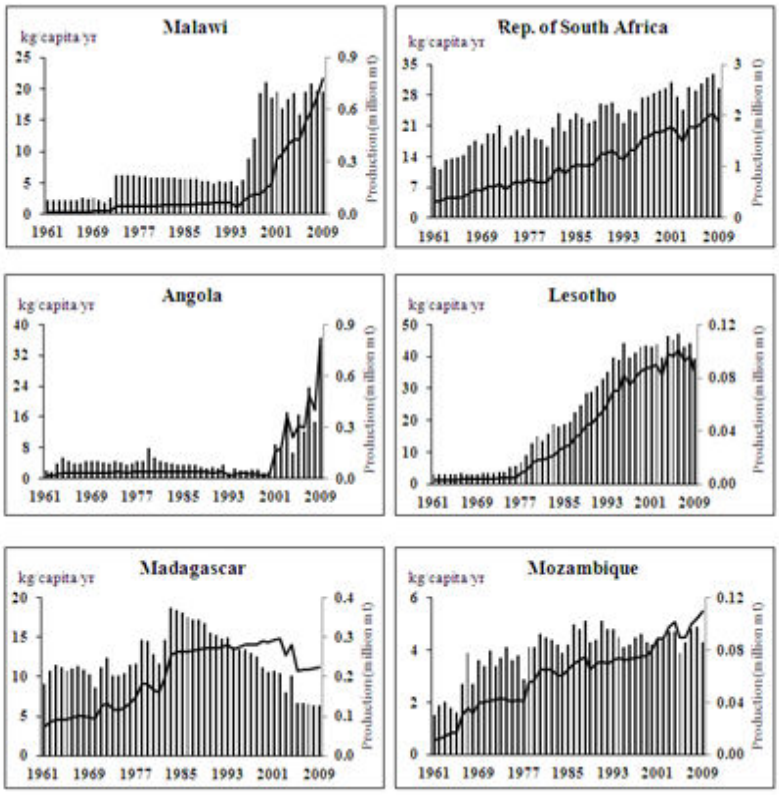


Fig. 6 Annual average potato consumption for selected countries in Southern Africa, 1961-2009

Source: FAOSTAT (accessed July 2012)