

Global Status of Sweet Potato Cultivation

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ABSTRACT

Sweet potato [*Ipomoea batatas* L. (Lam.)] is a staple food in many of the developing countries of tropics and sub-tropics also serves as animal feed and raw material for the industries. Sweet potato area globally has been showing a declining trend. This decline was more predominantly seen in Asia followed by Latin America. Sweet potato yields globally showed an increasing trend in all periods, except during 2001-2010 where it recorded a significant decline at 1.0%/annum. This to some extent and significant production growth in Africa compensated for the effect of global decline in sweet potato area on production. Asia continued to have its dominance in spite of the fact that area, production and yield of the crop has showed a declining trend during the past decade. All the major sweet potato-growing African countries recorded significant growth in sweet potato area and production during 1961-2010. Serious and concentrated efforts are needed to exploit its potential in producing many value added products and promoting the orange fleshed sweet potato especially in the African continent to reverse the current declining trends.

Keywords: Africa, America, Asia, area, production trends

Abbreviations: CGR, compound growth rates; CIP, International Potato Centre; FAO, Food and Agriculture Organization; USA, United State of America; USRDA, United States Recommended Dietary Allowance

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INTRODUCTION

Sweet potato [*Ipomoea batatas* L. (Lam.)] is the seventh most important food crop and next to cassava among the root and tuber crops grown in the world (Ray and Ravi 2005) and is cultivated throughout the tropics, subtropics and warmer temperate regions. Globally sweet potato is cultivated in 111 countries in an area of 8.106 million ha producing 106.569 million tonnes with an average productivity of 13.147 t ha⁻¹ (FAOSTAT 2012). Asia is the world's largest sweet potato-producing region, with 88.51million tonnes of annual production. China supplies about 76% of the world's production, making it the leading supplier of sweet potatoes in the world. It ranks among the five most important food crops in over 50 countries and is a staple food in many of the developing countries. It is consumed both in fresh and processed forms. It is also used as animal feed. Nearly half of the sweet potatoes produced in Asia are used for animal feed, with the remainder primarily used for human consumption, either as fresh or processed products. In contrast, African farmers produce only about 14.39 million tonnes of sweet potatoes annually but most of the crop is cultivated for human consumption (CIP 2011).

Sweet potato has a long history as a life saver. The Japanese used it when typhoons demolished their rice fields. It kept millions from starvation in famine-plagued China in

the early 1960's and came to the rescue in Uganda in the 1990's, when a virus ravaged cassava crops. The crop can be considered for promoting nutritional security particularly in agriculturally backward areas as it is a rich source of protein, lipid, calcium and carotene besides carbohydrates. The orange-fleshed varieties of sweet potato can play a key role in alleviating vitamin A deficiency, which is rampant among children in Asia and Sub-Saharan Africa. Sweet potatoes are now being used in Africa to combat a widespread vitamin A deficiency that results in blindness and even death for 250,000-500,000 African children a year. About two-thirds of the children developing xerophthalmia, the blindness-inducing disease resulting from lack of vitamin A, die within a year of losing their sight. One cup of cooked orange fleshed sweet potato provides four times United States Recommended Dietary Allowance (USRDA) for β-carotene (precursor of vitamin A) when eaten with skin (Nedunchezhiyan and Ray 2010).

Sweet potato is used for both human consumption and as a healthy, cheap source of animal feed (Nedunchezhiyan and Ray 2010). Recent studies (cipotato.org) suggest that animals fed on high protein sweet potato vines produce less methane gas than with other feed, potentially contributing an important reduction in harmful global emissions. It has great potential as a raw material for the manufacture of a wide range of industrial products such as starch (23%),

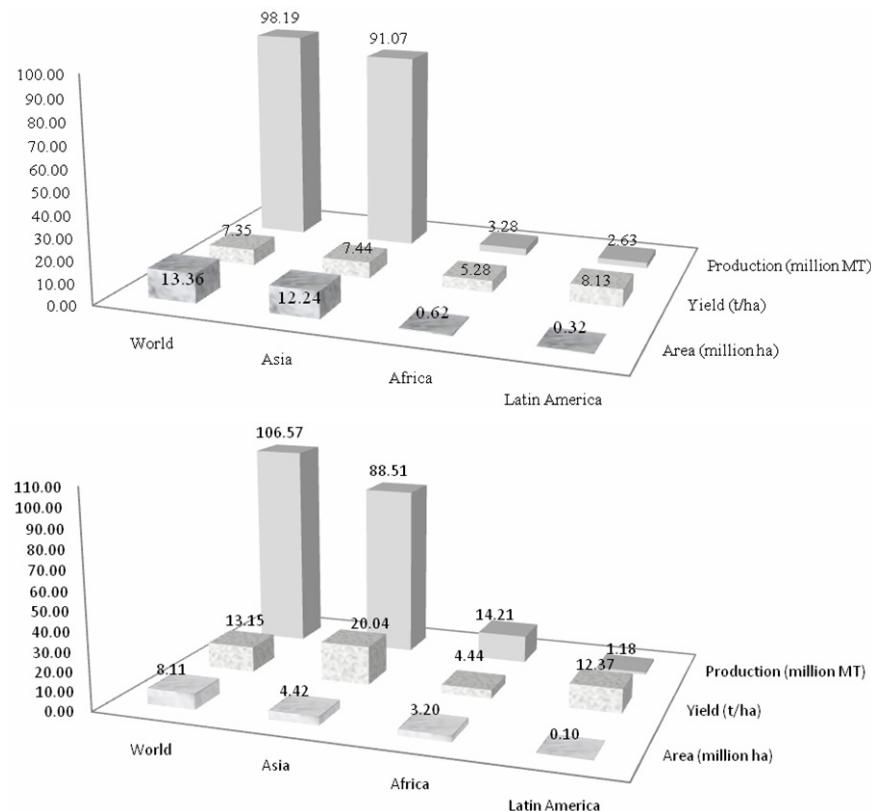


Fig. 1 Comparison of global area, production and yield of sweet potato during 1961 (top) and 2010 (bottom).

liquid glucose, citric acid, mono-sodium glutamate and ethanol (Woolfe 1992; Fuglie 2009). Other products are modification from starch which varies with technology and hence cannot be quantified. Sweet potato roots are also used as ingredient in a variety of food drink products and in protein and enzyme production (Nedunchezhiyan and Ray 2010).

TRENDS IN SWEET POTATO

Major sweet potato-growing countries in each continent were considered in understanding the trends in area, production and productivity. Area, production and productivity data for the major growing countries in Asia, Africa, Latin America and USA for the period from 1961 to 2009 were collected from www.faostat.org and estimated compound growth rates for two periods representing 1961-2009 and 2001-09. Major sweet potato-growing countries in each continent were considered in understanding the trends in area, production and productivity similar to the one that is used by Srinivas (2009). The following major sweet potato-growing countries were considered in the estimation of compound growth rates (CGR).

Asia: China, Indonesia, Japan, Vietnam, India, Philippines, Korea, Bangladesh

Africa: Angola, Burundi, Congo, Ethiopia, Ghana, Guinea, Kenya, Madagascar, Nigeria, Rwanda, Tanzania, Uganda

Americas: Brazil, Cuba, Haiti, USA

Papua New Guinea.

Global trends

A comparison of global area, production and yield of sweet potato in 1961 and 2010 was depicted in Fig. 1. Sweet potato area globally has been showing a declining trend. It has come down from 13.36 million ha in 1961 to 8.106 million ha in 2010. It has been declining significantly at the rate of 1.0% per annum since 1961 and during 1961-1970, the rate of decline was 2.0% per annum. This decline was more predominantly seen in Asia followed by in Latin

America. Global decline was mainly due to area decrease in the Asian continent from 12.24 million ha in 1961 to 4.42 million ha in 2010. However, it is heartening to note that the area in Africa has seen more than fivefold increase during the same period. The effect of this significant decline in Asia and Latin America was reduced due to more than 3.0% growth in sweet potato area in Africa.

Globally sweet potato production has showed an increasing trend with 0.1% growth per annum since 1961 (Table 1). Positive growth trend in global production was due to significant growth in Africa. The production in Latin America showed significant decline while there is no significant growth in Asia. However, there was 4.0% decline in the sweet potato production during 2001-2010. Currently 106.569 million tonnes of sweet potato is produced compared to 98.19 million tonnes in 1961.

Sweet potato yields globally showed increasing trend in all the periods, except during 2001-2010 where it recorded significant decline at 1.0% per annum. This to some extent compensated the affect of decline in sweet potato area on production. Average sweet potato yield in the world over has nearly doubled from 7.35 t ha^{-1} to 13.15 t ha^{-1} . Only in Asia, sweet potato yield showed increasing trend at 1.8% per annum. Productivity of sweet potato in Latin America and African continents declined at 0.1 and 0.4%, respectively.

Sweet potato in Asia

About 52% of sweet potato cultivated in the world over is from Asia. Lion's share in sweet potato area and production in Asia (83% and 92%, respectively) is from China, Indonesia, Vietnam, Philippines and India. China, Indonesia, Japan and India in Asia showed significant declining trends in area under sweet potato. Though China continued to have the largest area under the crop globally, significant area reduction was observed between 1961 and 2010. During 1961, 81% of the global sweet potato area (10.85 million ha) in China has become 43% of global sweet potato area (3.68 million ha) in 2010. It was observed in a study con-

ducted by CIRAD (2007) on Sweet potato in China: Economic Aspects and Utilization in Pig Production that both sweet potato and maize producers are facing great challenges in China. Policy distortions have penalized sweet potato and protected maize production. The social profitability of sweet potato is at least as high as maize in both Sichuan and Shandong, if not higher. The extent to which sweet potato can substitute for maize in pig feed will highly depend on the direction of future policies and technology developments affecting the two crops. With increasing economic growth and rapid urbanization in many parts of Asia, consumers decreased their demand for traditional starchy staples, such as fresh sweet potato in favour of meat, bread, potato and other preferred foods. Bulkiness, perishability and erratic year-to-year, season-to-season movements in supply and prices made it difficult to establish local sweet potato based agro industries in the Philippines (Cabanilla 1996). Decline in crop area in India is attributed mainly to lack of diversified uses to produce value added products, availability of food grains in sufficient quantities, changed food habits due to increased standard of living etc. However area under the crop has been growing at 3.3% per annum (**Table 2**) during 2001-10 and exploring the reasons for the same may throw interesting information. Sweet potato area during 2001-10 increased in Uttar Pradesh, Orissa, Madhya Pradesh, Assam and Chhattisgarh states of India.

All the sweet potato growing Asian countries recorded a significant decline in area and production growth between 1961 and 2010. Production growth for sweet potato in China is positive although it had contracted. The rebound is largely due to the explosive demand for meat and animal feed in the inland sweet potato production centers. Growth in demand both at home and abroad for processed food products made from sweet potato has also contributed to the upsurge in sweet potato output (Fugile *et al.* 1999; Zhang 1999). Improved, small scale processing of sweet potato roots has also boosted production by making household or village-level processing less onerous and more profitable (Wheatley *et al.* 1997). In addition new varieties have been adopted more widely in part because of the rebound in off farm demand. Vietnam only recorded positive and significant growth in area during 1961 to 2010. When the production growth was observed during 2001-2010, only India, Korea and Philippines showed increasing trend.

In all the major sweet potato growing Asian countries, sweet potato yields have recorded positive and significant growth except in Bangladesh, Philippines and Korea. It has increased three times in China from 7.12 t ha⁻¹ in 1961 to 22.04 t ha⁻¹ in 2010 recording 2.0% annual growth. But China's earlier isolation from western science and sweet potato's much lower priority than cereals or industrial crops such as cotton have handicapped more rapid improvement in productivity. It has increased at 0.7% per annum in India, which helped in minimizing the affect of area reduction on its production. During 2001-2010, growth in yield has been declining at 0.2% per annum though not significant.

Sweet potato in Africa

All African countries recorded significant growth in sweet potato area during 1961-2010 except Congo. As a whole 3.4% annual growth was recorded in the African continent. Currently 34.5% of global sweet potato area is in Africa (3.20 million ha) from a meager 4.6% cropped area in 1961 (0.62 million ha). Nigeria, Tanzania, Angola, Guinea, Ethiopia, Uganda and Rwanda recorded 10.5, 6.2, 4.1, 3.1, 3.0, 2.6 and 2.5% annual area growth rates respectively since 1961 (**Table 3**).

All the major sweet potato growing African countries showed positive and significant growth of 3.0% in production from 1961 to 2010. In the African continent, Nigeria showed the highest growth (7.7%) followed by Tanzania, Angola, Ethiopia (3.2% each), Uganda (3.1%). Most of the growth in production occurred in Eastern, Central and

Southern Africa in response to steadily increasing pressure on local food system due to the population growth, civil war and economic hardship (Tardif Douglin 1991; Bashaasha *et al.* 1995). In the Kivu region of Democratic Republic of the Congo, sweet potato has been used as a staple food for disaster relief (Tanganik *et al.* 1999). Decline or stagnation in output of other staples has also contributed to the interest by farmers and consumers in sweet potato in Malawi (Phiri 1998). Cash sales of tubers and nascent processing sector have added to the momentum in production in Uganda (Scott *et al.* 1999).

Nigeria, Tanzania, Guinea, Congo and Angola in Africa are showed declining trend in yield of sweet potato during 1961-2010. Kenya, Uganda, Ethiopia and Burundi showed positive growth trend in sweet potato yield. Increase in yield especially in Sub-Saharan Africa is difficult to achieve in the region because of nutrient poor soils, lack of irrigation and weak infrastructure (Spencer and Badiane 1995).

Sweet potato in Latin America

More than 70% of the sweet potato area in the Latin America is concentrated in Haiti, Cuba and Brazil. Only during the period 1961-70, the area recorded a 2.6% growth in Latin America. Thereafter a declining trend was observed with varying percentage of decline in different periods. Though area growth was negative in Latin America since 1961, it has been showing positive growth trend (2.0%) during 2001-2010 (**Table 4**).

Only in the period 1961-1970 a growth of 4.3% per annum in sweet potato production was observed and thereafter a declining trend was observed from 1971 onwards. Brazil and Haiti recorded significant negative growth from 1961 to 2010 at 3.5 and 0.7% per annum, respectively. Only in Cuba, it showed 1.0% growth per annum during the same period. Production of sweet potato stagnated or contracted due to urbanization and its associated shifts in eating habits. Imports of wheat flour for food and maize or concentrates for feed provided shifting competition for sweet potato in Peru (Blondet and Espinola 1998). Sweet potato use in Argentina was confined to niches for processed products in the domestic market or to exports of fresh roots.

Among the Latin American countries, productivity growth was positive and significant only in Cuba (0.7% per annum). The same has declined at 1.7 percent per annum in Haiti. For Latin America as a whole sweet potato productivity has been affected by weak demand. Most farmers have had little incentives to use yield-increasing technologies because potential commercial opportunities have yet to be exploited. The existing market outlets is limited and relatively thin. Other growers are generally resource poor farmers who choose to cultivate these commodities in part to avoid the financial risks associated with more input and cash incentive crops. As area planted with sweet potato has declined or at best stagnated, cultivation has been pushed into or confined to more marginal soils.

Sweet potato in North America

USA recorded positive growth rate in area, production and productivity in both the periods except for area during 1961-2010. An overall 2.1, 5.2 and 3.1% increase in area, production and productivity respectively was observed during 2001-2010. Significant growth rates of production and productivity were recorded during 1961-2010.

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Table 1 Global sweet potato growth trends.

1961-2010				2001-2010		
Continent	Area	Production	Yield	Area	Production	Yield
Asia	-1.9**	0.01 ^{NS}	1.8**	-4.7**	-4.7**	0.01 ^{NS}
Africa	3.4**	3.0**	-0.4**	4.5**	3.8**	-1.1 ^{NS}
Latin America	-1.2**	-1.1**	0.001 ^{NS}	2.3*	5.9**	3.7**
World	-0.9**	0.1 ^{NS}	1.0**	-1.3**	-3.6**	-2.3**

** Significant at 1%; * Significant at 5%; NS - not significant

Source: Compound Growth Rates are author calculations using the secondary data collected from www.faostat.org

Table 2 Sweet potato growth trends in Asia.

1961-2010				2001-2010		
Country	Area	Production	Yield	Area	Production	Yield
China	-1.9**	0.1 ^{NS}	2.0**	-5.3**	-5.1**	0.2 ^{NS}
India	-1.3**	-0.7**	0.7**	2.9**	3.6**	0.7*
Indonesia	-2.2**	-0.8**	1.3**	-0.3 ^{NS}	1.3*	1.6**
Japan	-3.9**	-3.4**	0.5**	-0.2 ^{NS}	-1.0 ^{NS}	-0.8 ^{NS}
Korea	-2.9**	-3.2**	-0.3 ^{NS}	2.5**	2.0*	-0.5 ^{NS}
Bangladesh	-1.1**	-1.4**	-0.3**	-2.6**	-1.7**	0.9*
Philippines	-0.6**	-0.8**	-0.1*	-1.2**	0.3 ^{NS}	1.4**
Vietnam	-0.3 ^{NS}	0.8**	1.1**	-5.9**	-3.4**	2.5**
Asia	-1.9**	0.01 ^{NS}	1.8**	-4.7**	-4.7**	0.01 ^{NS}

** Significant at 1%; * Significant at 5%; NS - not significant

Source: Compound Growth Rates are author calculations using the secondary data collected from www.faostat.org

Table 3 Sweet potato growth trends in Africa.

1961-2010				2001-2010		
Country	Area	Production	Yield	Area	Production	Yield
Angola	4.3**	3.4**	-0.9**	7.2**	13.4**	5.7**
Burundi	1.9**	1.7**	-0.2*	-0.01 ^{NS}	-7.1*	-7.1*
Congo	0.1 ^{NS}	-0.01 ^{NS}	-0.2**	2.3*	1.9*	-0.4 ^{NS}
Ethiopia	3.2**	3.3**	0.2**	7.4**	4.2**	-3.0**
Guinea	3.3**	1.6**	-1.6**	20.3*	11.4*	-7.7**
Kenya	1.6**	2.6**	1.0**	0.3 ^{NS}	3.4 ^{NS}	3.0*
Madagascar	1.7**	1.8**	0.1 ^{NS}	4.3**	8.8**	4.2 ^{NS}
Nigeria	11.2**	8.0**	-2.9**	12.0**	1.7 ^{NS}	-9.6**
Rwanda	2.4**	2.1**	-0.2 ^{NS}	-5.1**	-4.1**	-0.9 ^{NS}
Tanzania	6.3**	3.4**	-2.8**	0.6 ^{NS}	5.5**	4.9*
Uganda	2.6**	3.1**	0.5**	0.5 ^{NS}	1.1**	0.6**
Africa	3.4**	3.0**	-0.4**	4.5**	3.8**	-0.7 ^{NS}

** Significant at 1%; * Significant at 5%; NS - not significant

Source: Compound Growth Rates are author calculations using the secondary data collected from www.faostat.org

Table 4 Sweet potato growth trends in Latin America.

1961-2010				2001-2010		
Country	Area	Production	Yield	Area	Production	Yield
Brazil	-3.6**	-3.4**	0.1 ^{NS}	0.001 ^{NS}	0.2 ^{NS}	0.2 ^{NS}
Cuba	0.4*	1.1**	0.7**	1.4 ^{NS}	-0.6 ^{NS}	-2.0 ^{NS}
Haiti	1.0**	-0.7**	-1.7**	7.0**	5.2**	-1.7*
Latin America	-1.2**	-1.1**	0.001 ^{NS}	2.3*	5.9**	3.7**
North America	-1.3**	0.4*	1.7**	2.1*	5.2**	3.1**

** Significant at 1%; * Significant at 5%; NS - not significant

Source: Compound Growth Rates are author calculations using the secondary data collected from www.faostat.org

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