

ROOTS AND TUBERS FOR THE 21ST CENTURY: TRENDS, PROJECTIONS, AND POLICY OPTIONS

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The major roots and tubers—cassava, potato, sweetpotato, and yam—play a significant role in the global food system. They contribute to the energy and nutrition requirements of more than 2 billion people in developing countries and will continue to do so over the next two decades. They are produced and consumed by many of the world's poorest and most food-insecure households. Roots and tubers also constitute an important source of employment and income in rural, and often marginal, areas, and for women. Moreover, they adapt to a wide range of uses: food security crop, regular food crop (consumed in fresh or processed form), cash crop, feed crop, and raw material for industrial uses. Indeed, cassava, potato, and sweetpotato rank among the top 10 food crops produced in developing countries.

Not surprisingly then, roots and tubers have become the subject of increasing attention in recent years. The tendency to treat roots and tubers as undifferentiated commodities, however, has obscured their varying uses and performances by region, hindered the analysis of their roles in the global food system, clouded understanding of their future prospects, and handicapped formulation of appropriate policies to exploit their unrealized potential.

TRENDS IN USE AND PRODUCTION

The supply of and demand for roots and tubers in developing countries began to change significantly in the 1960s and 1970s. These changes—surging potato production in South Asia and West Asia and North Africa (WANA), for example—accelerated over the next two decades, particularly during the 1990s. With a few noteworthy exceptions, the trend has been toward greater diversification in use and greater specialization in production by crop and region.

Between 1983 (average of 1982-84) and 1996 (average of 1995-97), developing-country consumption of roots and tubers as food increased by 45 million metric tons, or 22 percent, to reach 253 million metric tons. Cassava, at 93 million tons, accounted for the largest share of roots and tubers consumed as food in 1996, followed by sweetpotato (69 million tons), potato (65 million tons), and yam (16 million tons). Potato consumption increased the most in absolute terms between 1983 and 1996; cassava consumption was a close second. Although yam consumption increased the most rapidly, it was from low levels. Consumption of sweetpotato as food actually contracted. Sweetpotato use as animal feed, however, increased fairly rapidly during the period. Altogether, developing-country root and tuber use as animal feed, of importance mainly in China and Latin America, rose by 50 percent to 96 million tons during 1983-96.

Root and tuber use as both feed and food varied greatly by region due to differences in population and economic growth, cultural factors, and urbanization. In much of Asia and WANA, for example, rising incomes and urbanization, and a desire by consumers to diversify away from strictly cereal-based diets, have increased demand for potato as food in fresh and, more recently, in processed form. The same forces have influenced cassava and sweetpotato use in Asia, but toward starch, feed, and processed food products.

Sub-Saharan Africa achieved both the highest level and the sharpest absolute rise in per capita food consumption of roots and tubers between 1983 and 1996. Population growth, low and stagnant per capita incomes, and rapid urbanization have generated tremendous demand for a cheap, starchy staple such as cassava to feed poor rural and urban consumers alike.

In Latin America, changing diets in some countries and the emergence of a fast food and snacks subsector in others have increased potato consumption. Cassava demand stagnated.

Developing-country root and tuber production increased by 30 percent between 1983 and 1996 to reach 449 million tons. In Sub-Saharan Africa cassava output grew at twice the global rate, and yam output slightly exceeded the global average. Cassava and yam's hardiness and low input requirements make these crops appropriate for the region's food and farming needs. More than half the output growth for yam and cassava in the region came from area expansion rather than from productivity growth.

In Asia, increases in potato production were driven by strong off-farm demand, the crop's highly flexible vegetative cycle, and improvements on the production and marketing sides. China is now the world's largest potato producer. Cassava production remained virtually flat due to stagnant demand for cassava products in the European Union. Sweetpotato, Asia's most important root and tuber crop, is produced almost exclusively in China, where income growth has decreased demand for the crop as food but increased it as feed.

In Latin America, cassava and sweetpotato production stagnated or contracted due to urbanization and its associated shifts in eating habits. Production of potato, the region's second most important root and tuber crop, benefited from these shifts.

PROJECTIONS TO 2020

The adaptability of roots and tubers to the emerging needs of local food systems will make them even more important as population and urbanization increase and persistent poverty remains in the midst of rising incomes. To assess the future roles of roots



and tubers in the global food system, IFPRI's International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) was used to project supply, demand, trade, and international prices for roots and tubers to 2020.

Under the baseline scenario—a best, albeit conservative, estimate of the future effects of income growth and technological change—total use of roots and tubers in developing countries is projected to increase by 232 million tons to 635 million tons between 1993 and 2020, a 58 percent increase. Cassava's share of the increase will be 44 percent, potato's 29 percent, and sweetpotato and yam's 27 percent. Demand for potato and cassava will increase the fastest and at rates similar to those for the major cereals. Even so, potato demand will lag significantly behind recent historical trends under these estimates. Food demand will outpace feed demand for cassava and potato, but not for sweetpotato. Under the baseline scenario, production will roughly parallel demand, but the source of production growth will shift away from area expansion to yield growth.

Sub-Saharan Africa is expected to experience the fastest growth in food demand for all roots and tubers, largely driven by rapid population growth. Its share of the increase in developing-country demand will be 53 percent, with cassava accounting for two-thirds of this rise. Asia is expected to consume an additional 79 million tons of roots and tubers by 2020, with potato accounting for a little less than two-thirds of this increase. Growing urbanization, rising incomes, and a desire by consumers to increasingly diversify diets will help spur potato consumption, especially in processed form. But even in Asian countries with high projected growth rates in potato consumption, per capita consumption in 2020 will be a third or less than a third of current consumption in developed countries. Cassava will dominate the increase in root and tuber use in Latin America. Demand for the crop as feed will outpace demand as food as consumers continue to switch to cheaper sources of energy.

Under a more optimistic, but quite reasonable, high demand and production growth scenario, total use of roots and tubers will increase by 64 million tons beyond the baseline scenario. Crop and regional positions will change in this alternative scenario: for example, the importance of potato will increase even more than in the baseline scenario, though growth in demand for the crop will still remain below recent historical levels. The baseline scenario shows that roots and tubers will decline slightly in economic importance in comparison to other food and feed crops. But under the more optimistic scenario, the economic importance of roots and tubers will increase slightly. In both scenarios, increases in root and tuber production will be driven by demand for potato and yam as food, and cassava and sweetpotato as feed and starch.

ENVIRONMENTAL EFFECTS

Increased production and use of roots and tubers in developing countries have drawn attention to their potential benefits

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and risks to the environment and health. Available evidence indicates that these effects vary from crop to crop. Risks from pesticide and fertilizer use, for example, are much more important in the case of potato and problems of soil erosion more acute in the case of cassava. While these and other environmental problems, such as water pollution from fertilizer runoff and postharvest activities, merit greater attention, there are also clear signs that new technologies, institutional innovations, and better policies not only can meet the challenge but also exploit the potential of roots and tubers more effectively and thus help sustain the natural resource base.

CONCLUSIONS AND RECOMMENDATIONS

The adaptability of roots and tubers to marginal environments, their contribution to household food security, and their flexibility in mixed farming systems and end uses make them an important component of a targeted strategy for improving the welfare of the rural poor and linking smallholder farmers to markets. To accomplish this, continuous generation and diffusion of improved production and postharvest technology is essential, as are policies and institutions that facilitate adoption of this technology. Such efforts will prove successful only if the public and private sectors make substantial investments in agricultural research to overcome the obstacles to greater root and tuber production and use. Potato and yam primarily face supply-side constraints, which require the development of more effective disease-resistant or drought-tolerant varieties, better pest management, improved systems for diffusing planting material, and policies and procedures that stabilize within-year and year-to-year flows of supply onto the market. Cassava and sweet potato mainly face demand-side constraints. In their case, lower costs, better quality and improved availability of raw material, and more efficient small agro-enterprises can help producers exploit latent demand for these crops as feed and processed food products.

Appropriate policies in both developed and developing countries are needed to ensure that the environmentally sound production of a diversified range of high-quality, competitive root and tuber products for food, feed, and industry will help eradicate poverty, assure access to adequate food, and improve incomes. Policymakers in developing countries can support this effort by, for example, eliminating overvalued exchange rates, subsidies on imported substitutes, and policy distortions that promote the improper use of pesticides and fertilizers on roots and tubers.

Policymakers in developed countries can help improve the growth prospects for roots and tubers in developing countries by, among other things, abandoning trade arrangements that limit import demand for these commodities, eliminating subsidies on exports of competing food products, and facilitating technology transfer to strengthen local production and use of roots and tubers (for example, small- to intermediate-scale processing equipment and expertise).

"A 2020 Vision for Food, Agriculture, and the Environment" is an initiative of the International Food Policy Research Institute (IFPRI) to develop a shared vision and a consensus for action on how to meet future world food needs while reducing poverty and protecting the environment. Through the 2020 Vision initiative, IFPRI is bringing together divergent schools of thought on these issues, generating research, and identifying recommendations. The *2020 Briefs* present information on various aspects of the issues. The 2020 Vision gratefully acknowledges support during 2000 from the following donors: CIDA, CTA, DANIDA, Government of Spain, the Rockefeller Foundation, SIDA, and SDC.