

Strategy elements to transform the banana sector in Africa

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Endorsement

Vision: An invigorated commercial banana sector in Africa that can deliver economic growth while assuring food security

This strategy document is the product of expert opinion and detailed discussion among diverse stakeholders in Africa's banana sector. FARA considers that it provides an informed and realistic foundation for prioritizing banana research and development. The goal is to use this strategy to invigorate the commercial banana sector in a sustained manner, while protecting food security, by encouraging partnerships that increase the impact of research and adoption of technological innovations. FARA encourages international, regional and national public research organizations, development agencies, NGOs and the private sector to use the priorities set out herein to guide their activities and investment decisions.

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Other key outputs from the international conference: **banana2008** include a book of abstracts and an edition of Acta Horticulturae published by ISHS (www.banana2008.com).



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Introduction

Nobody knows who brought bananas to Africa, estimated to be between 2000 and 6000 years ago, long before the arrival of other important crops such as maize and cassava. What is certain is that bananas were adopted with enthusiasm, both as a vital staple food and to generate income. People in the highlands of Central Africa eat more bananas than anyone else in the world, some deriving up to 35% of their daily calories from the crop. Bananas are also a crucial money-earner for smallholder farmers, mainly sold in nearby markets as fresh fruit or fermented or distilled into alcoholic beverages. Moreover, these tough perennial plants are the backbone of many farming systems, protecting the soil from erosion and surviving floods, drought and civil conflict, to recover quickly and provide people with food when they need it most.

Yet the banana sector in Africa remains relatively static, compared to other crops in Africa and compared to banana enterprises in other continents. The vast bulk of production is carried out by smallholders, who need creative assistance to cope with challenges such as declining soil fertility, pests and diseases, pre- and postharvest losses and market linkages. Only a small minority of African banana farmers are organized, for effective production or marketing of their crop and to ensure that their voices are heard. When they do succeed in selling their fruit into distant markets, the majority lack adequate information on prices and, selling through an inefficient chain of intermediaries, receive only a small fraction of the price paid by consumers. Most of the bananas produced in Africa are sold as perishable fruit, with high loss of quality and value along the way. The news is hardly better for export markets: although Africa grows almost one-third of the world's bananas, it accounts for only 4% of world trade in the fruit.

The economy of Africa is dominated by agriculture, and this sector therefore offers a route to equitable development. International research has shown that economic growth generated in agriculture is much more effective than growth generated in other sectors in benefiting the poorer half of the population. Ironically, the underdevelopment of the banana sector means that it has huge potential as a driver of development. With a large production base already in place to supply local needs, the groundwork is laid for bananas to respond to increasing demand from expanding markets both in the region and internationally.

So what will it take to transform this ubiquitous but neglected crop into an engine of economic growth for Africa? This is not a simple challenge. It must be seen against the backdrop of a rapidly changing world – growing population, rapid urbanization, fluctuating food prices, evolving consumer preferences and an unpredictably changing climate are just some of the factors currently in flux that have significant implications for all food systems. Yet there are numerous examples of successful banana-based businesses in Africa to serve as models and some areas of tremendous dynamism in Africa's banana sector.

Encouraged by these precedents, a consortium of national, regional and international organizations came together in 2008 to meet the challenge of mobilizing Africa's banana sector. They organized a conference, **banana2008**, which brought together over 400 people from 60 countries, representing the broadest possible range of stakeholders from the private and public sectors, policy makers and development investors, production researchers and economists, and of course the banana farmers themselves. The meeting made every possible effort to capture the full range of perspectives represented: conveners gathered the key issues from three days of thematic presentations and discussions and on the fourth day participatory methods were used to focus the collective wisdom of all the participants on developing the elements of a strategy.

A summary of the strategy outlined by the conference is presented in this document. It reviews the current status of bananas in Africa; it identifies the priorities of 'what needs to be done' for each of the main types of banana – plantains, highland cooking bananas and dessert bananas – and for each market sector: local, regional and international; and it identifies who needs to work together to create more efficient and equitable market chains, that can deliver economic growth while assuring food security. The strategy aims for achievable change in the short and medium term (the next 10 years), while respecting issues of long-term sustainability.

No single organization has the mandate or authority to implement such a strategy. However, the priorities identified should serve to guide and link the actions of stakeholders. The conference generated a unique consensus and essential buy-in from the many and diverse groups involved. It is now up to the private- and public-sector development investors to take the next steps, to build on this momentum and carry forward the enthusiasm demonstrated by the conference participants to transform the banana sector in Africa into an economic driver for development.

Background: bananas in Africa

In Africa, banana and plantain have traditionally been grown and consumed locally, mainly as 'starchy staple' foods or fermented beverages. Plantains predominate in the humid forest zone of West Africa and in lowland Central Africa, while East African highland bananas are prevalent in mountainous areas of Central and East Africa. Both are grown by smallholders, mainly in traditional farming systems. Dessert bananas were introduced to Africa much later, during the colonial period, as a plantation crop for export, and continue to be cultivated in this way.

These three banana systems; cooking/brewing, plantain and dessert, continue to account for the majority of banana production in Africa. However, the distinctions are becoming blurred as increasing quantities of dessert bananas are grown by smallholders, and as all three types are sold as cash crops in local or more distant, urban markets. Moreover, other types of banana – including dessert 'finger' bananas, Asian cooking bananas, and modern hybrids (plantains, cooking bananas and dessert bananas) – have been widely introduced and are becoming increasingly important in commerce.

The box *Banana types and origins* describes in more detail the different types of bananas grown in Africa today. For simplicity, however, discussions in this document focus on the three main banana types – plantains, East African highland bananas and dessert bananas – and the term 'banana' is used to encompass all three.

Access to reliable data on crop production and marketing is vital for effective planning in research and economic development, yet few countries in Africa have the resources to collect such data systematically. This is especially true for a crop distributed across many households' backyards and in small plots. Improving the system used to record banana data will be important for strategy implementation (see box *Banana data: current constraints and new approaches*); in the meantime, the present discussion of status and trends uses estimates published by the *Centre de coopération internationale en recherche agronomique pour le développement* (CIRAD) in the journal *FruiTrop*, that are based on official data published by the Food and Agriculture Organization of the United Nations (FAO) on behalf of member states but supplemented by commercial trade data.

Production and trade: current situation and trends

Plantains

Nigeria and Ghana are Africa's largest producers of plantains, with significant production also in Cameroon, Côte d'Ivoire and Democratic Republic of Congo (DR Congo) (Figure 1). While plantains have traditionally been a starchy staple food of rural populations in the humid lowlands, farmers are increasingly selling plantains as a cash crop to urban consumers; with rapid urbanization and the growing prosperity of city-dwellers, demand is outstripping supply, prices have risen and the rural poor are turning to other crops, especially cassava, for food security. However, most plantain production is still from low-input, mixed farming systems and productivity in such systems is falling, due to declining soil fertility and increasing nematode problems, associated with increased pressure on land and reduced bush-fallow periods. Attempts to introduce more intensive plantain production techniques from Latin America and to organize a more consistent year-round supply have had only limited success.

A substantial cross-border trade in plantains is developing within Africa but exports outside Africa are negligible. For instance, the substantial imports to European countries, to meet demand from populations of West African origin, are being met mainly by imports from Latin America. Only a small proportion (approximately 15%) of plantain production is currently being processed into flour and deep fried chips, almost entirely for local markets.

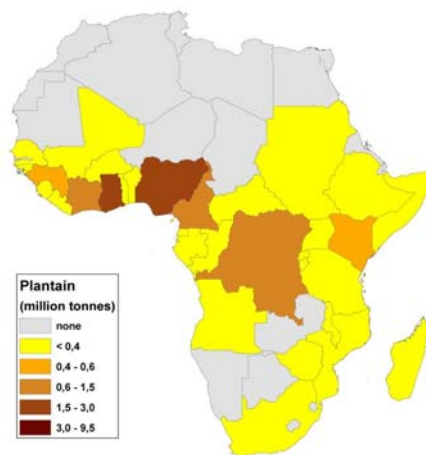


Figure 1. Production of plantain in 2006, *FruiTrop*

Banana types and origins

Bananas and plantains originate in the Asia-Pacific region, where they are derived from two wild species, *Musa acuminata* and *Musa balbisiana*. Scientists classify the cultivated forms according to the sets of genetic material that they have inherited from each wild parent. Thus plantains are denoted AAB, because they have two sets of chromosomes from *M. acuminata* (A) and one from *M. balbisiana* (B), while East African highland bananas and commercial dessert bananas also have three sets of chromosomes, all derived only from *M. acuminata*, and are therefore described as AAA. The distinction is important because AAA bananas tend to be higher yielding while AAB and ABB varieties with the B genome tend to be more resistant to biotic and abiotic stresses (such as diseases and drought).

Although domesticated banana and plantain are seedless and are propagated vegetatively by farmers, mutations have accumulated and useful ones have been preserved over generations, with the results that lowland Central and West Africa has become a 'centre of diversity' for plantains (with at least 130 varieties), harbouring over 10% of the world's recognized cultivars. Bunches of plantain consist of rather small numbers of long, tapered fruit, loosely spread along the stalk; the fruit remain firm and 'starchy' even when ripe and are roasted or steamed before consumption. Plantains grow relatively slowly and yields are lower than for bananas and for 'starchy staple' root crops such as cassava; however their preferred taste and texture commands a higher price and tends to compensate for lower yield.

East African highland bananas also have a long history in Africa and numerous subtly different varieties (about 70) have been described. They form large bunches of tightly packed fruit. In the highlands of East and Central Africa the fruit are harvested green and cooked while still starchy, providing the main staple food over large areas. Some cultivars have high juice content and are mainly ripened and used for brewing beer or distilling alcohol.

Commercial dessert bananas also have large, dense bunches, providing high yields under favourable conditions, but are eaten raw. The first globally traded dessert variety of banana, Gros Michel (which is still grown in small quantities in East Africa as "Bogoya"), was decimated by an outbreak of *Fusarium* wilt (commonly known as 'Panama disease') and has now been almost entirely replaced in international trade by varieties of the resistant Cavendish. Though the Cavendish varieties have different names (Williams, Valery, Grande Naine etc.), they are genetically very similar and tend to be susceptible to drought and black leaf streak disease (commonly known as 'black Sigatoka') – and are now under threat from a new variant of *Fusarium* wilt that is spreading in Asia (known as Tropical Race 4).

Varieties of a quite different kind of dessert banana, small 'finger' or apple bananas, with an AAB genetic make-up, have also become widely distributed in Africa. They are hard to commercialize because their yield is low, the skin is thin and easily damaged and the fruit are readily shed from the bunch; however, their superior flavour makes them a favourite for fresh consumption and the peeled fruit can be partially dried into banana 'figs', mainly for export.

A range of traditional Asian starchy cooking bananas – Bluggoe, Saba and Pisang Awak – has also been brought to Africa in recent decades. These plants are triploids but with a double set of B chromosomes (ABB) and tend to be resistant to BLS, drought and other stresses. They are rarely preferred for traditional banana dishes but are often used for making beer, processed foods, or fried snacks in lowland or mid-altitude areas. Pisang Awak has become so popular as a beer banana in East Africa, where it is known as Kayinja or Kisubi, that it is often regarded as a traditional African variety.

Finally, the breeding programmes of the *Fundación Hondureña de Investigación Agrícola* (FHIA), the International Institute of Tropical Agriculture (IITA) and the *Centre Africain de Recherches sur Bananiers et Plantains* (CARBAP) in collaboration with national programmes have produced a number of new hybrids, triploid and tetraploid, that are vigorous, high-yielding and variously have the characteristics of plantains, cooking bananas or dessert bananas. Though rarely preferred for traditional uses, they are now widely grown for sale into urban markets or for processing. They are adaptable to traditional mixed cropping systems and more intensive plantation production.



Plantain (AAB)



Highland banana (AAA)



Dessert banana (Cavendish, AAA)



Asian cooking banana (AAB)



Modern hybrid (FHIA25, AAB)

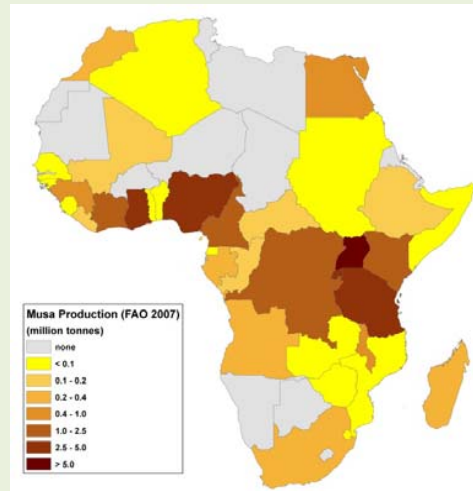
Banana data: current constraints and new approaches

Data published annually by FAO on behalf of member countries are widely regarded as an authoritative guide to crop production, yet many question their accuracy. In the case of banana and plantain, the general problem of data collection is further compounded by the lack of a consensus among countries and international organizations on whether to collect and publish data on banana and plantain separately or in aggregate, and on how to apply the terms 'banana' and 'plantain'. Moreover, these data are reported according to large political and administrative units (usually within national boundaries) and so can give a misleading impression of the intensity and distribution of production, especially in large countries with a variety of agro-climatic zones. Production data are also published periodically by FruiTrop (*c.f.* Fig 1)

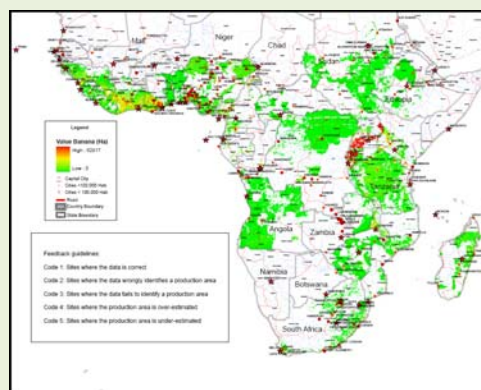
As part of a global effort to map the production of major food crops more accurately, the International Food Policy Research Institute (IFPRI) has developed a spatial allocation model (SPAM). The model aims to allocate crop production statistics available for countries or states (as published by FAO) to individual pixels. The colouring of each pixel (green = low to red = high) illustrates the area (in ha) used for crop production. Using the national data as a starting point, allocation is modified based on an interpretation of available spatial data, including land cover, farming systems, population density, irrigated areas, crop suitability and any sub-national production statistics available.

When the map of banana production in Africa was presented at the **banana2008** conference, participants were immediately able to identify mapped units that were at odds with their personal experience of banana production (marked with red stars on the adjacent map). These discrepancies served as a catalyst for a Musa Mapping Project initiated during the conference ('Musa' serving as a catch-all term for all kinds of banana and plantain). Experts from each country were invited to mark on a map of their country the most important banana growing areas, and to provide further information for example on cultivar types, production technologies and pests and diseases. The information has been entered into a Geographical Information System (GIS) and new versions of the map will be produced as additional information becomes available (current version at right).

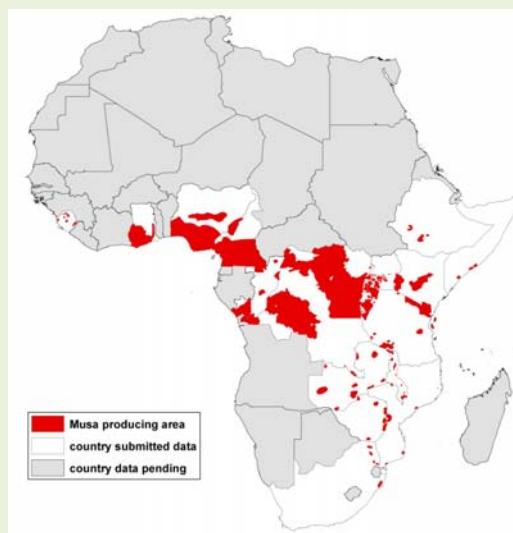
While mapping of production areas and yields is essential for strategic planning, this reflects only part of the picture. Similar exercises are needed to collate trade data i.e. where are these bananas sold and through which value chains? Participants recommended that both production and trade data need to be collected and reported systematically and combined with climate data.



Official FAO statistics for production of banana and plantain (combined) in 2007



Banana and plantain production mapped by IFPRI, using the SPAM model. Deviations from personal observation of Banana 2008 participants are indicated with red stars



Banana- and plantain-producing areas as mapped by participants in the Banana 2008 conference

Cooking and brewing bananas

In currently available production data (Figure 2), East African highland bananas are usually combined with other forms of cooking banana, including modern hybrids and traditional cultivars from Asia (and may erroneously include some data on dessert bananas too). However, it is clear that the main production of highland bananas is in Uganda, Rwanda, Burundi, NW Tanzania, and highland areas of eastern DR Congo, where these bananas provide both the main staple food and the principal source of cash income, being sold to urban centres as a staple food or used as a raw material for preparing beer and spirits. Especially at higher elevations, several varieties of highland bananas are typically grown together, under intensive management that is usually considered sustainable with local recycling of banana organic matter. Increasing demand of bananas to urban markets, however, has led to concerns about over-intensification of production systems, leading to ‘nutrient mining’ and increased disease inoculum.

At lower altitudes, highland bananas are combined with, or replaced by, Asian cooking bananas and modern hybrids. Under these conditions, problems of drought stress, black leaf streak disease, banana weevil and nematodes are of increasing importance, reducing the productivity and longevity of highland bananas. New and more acute threats are presented by banana *Xanthomonas* wilt (BXW), caused by a bacterium that spread from Ethiopia, through Uganda to DR Congo, Kenya, Rwanda and Tanzania; and from banana bunchy top disease (BBTD), caused by a devastating Asian virus now reported in 12 countries of Central, Southern, and North Africa.

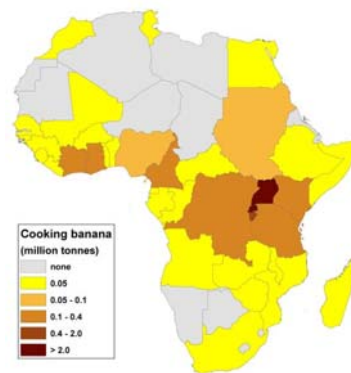


Figure 2 Production of cooking banana in 2006, FruiTrop

Supply chains to urban markets have been characterized by numerous links, adding little value and resulting in only a small proportion of retail price reaching farmers and providing little incentive for investment to improve production. Furthermore, profits are affected by fluctuating fuel prices. Nonetheless, in some countries such as Uganda the efficiency of supply chains has been improved by efforts to organize farmers and provide current market information. Attempts to develop a formal processing sector are at an early stage, with successful industrial brewing of beer in Tanzania and some transformation of bananas into flour and chips in Uganda. There is currently no significant international trade in cooking and brewing bananas from Africa.

Dessert bananas

For many years, three countries were Africa’s main producers of Cavendish dessert bananas for export: Côte d’Ivoire, Cameroon and Somalia, the two former under humid coastal conditions typical of export banana production in the Americas and the latter irrigated under dry conditions. Dry atmospheric conditions greatly reduce the pressure of black leaf streak disease and with it the need to routinely spray fungicides. Such dryland production is now spreading along major river valleys, for instance in Mali and Sudan. The North African countries also produce significant quantities of irrigated bananas, some in tunnels (‘protected cultivation’). South Africa has significant plantations, some organically certified, grown under sub-tropical conditions to supply domestic markets. Numerous countries, notably Kenya, have seen increasing smallholder production of Cavendish bananas to supply urban markets and there is a regional market for dessert bananas, with Mozambique, for instance, supplying South Africa (Figure 3).

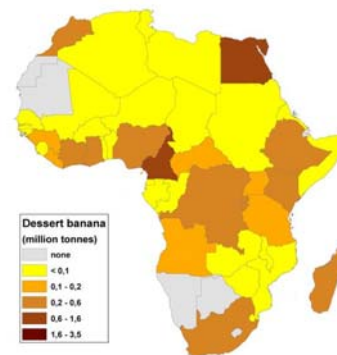


Figure 3 Production of dessert banana in 2006, FruiTrop

Access to the European market is heavily regulated but has been encouraged by preferential tariffs (favouring African producers over Latin American), but these are being removed. The Middle East market is growing, supplied mainly by Egypt and Sudan. Ghana is now increasingly exporting organic bananas through a grower-owned company. Some countries, such as Rwanda and Uganda, have developed limited niche export markets (by air) for fresh ‘finger’ bananas, while several countries are exporting partially dried ‘banana figs’. *Fusarium* wilt is widespread but usually of sporadic occurrence while the spreading and increasingly destructive outbreak of BBTD is of great concern to dessert banana producers in DR Congo, Malawi and elsewhere.

A 10-year strategy for the banana sector in Africa

This section describes the steps taken during the **banana2008** conference towards a 10-year strategy for bananas in Africa. Ten years was seen as a realistic planning horizon, given the rapid change in the economic and social context on the one hand and the relatively slow rate of agricultural innovation on the other.

Identifying priorities

The first three days of the conference focused on three themes: (1) markets and trade, (2) production and (3) innovation systems. Within each theme, subthemes were identified to stimulate discussion and in particular to encourage participants to consider the whole commodity chain, and not just the area in which they work. Subthemes were:

Markets and trade	Production	Innovation systems
Market segments	Plant health	Tracking adoption and impact
Policies and trade	Post-harvest	Turning farmers into business people
Supply	Agronomy	Innovating delivery systems
Processing	Seed systems	Profiling country perspectives
	Genetic improvement	

A reporting system from sessions over the first three days was designed to draw out participants' views on what needs to change within the banana sector, under the three themes. The identified priorities then fed into the fourth day, designated 'Strategy Day', which was organized under the three banana types. During this fourth day, participants worked to define the key priorities for each banana type at three different market levels: local, regional and international. The local market was defined as village to national, regional as trade to neighbouring countries, and international as requiring air/sea freight beyond the region. Participants chose which banana type they wished to discuss, and were seated in groups of eight with colleagues whom they had not previously worked with, in order to promote active discussion from different perspectives. Open discussions led to each group reaching a consensus on the three key priorities that need to be addressed in order to make progress in the next 10 years. Results are presented in Table 1.



Local market chains (left) are currently characterized by poor infrastructure, lack of information flow, and the dominant influence of traders, rather than producers

Priorities for local banana markets as diagnosed by the conference participants (right)



Strategy elements to transform the banana sector in Africa

Table 1. Priorities for the banana sector in Africa, by banana type and market level

Where every group (of 8 people) selected an issue as one of their key three priorities, the symbol ● is shown; where more than 50% of groups selected the same priority the symbol ϕ is shown; and if less than 50% of groups (but more than none) highlighted a priority the symbol o is shown.

Loc = local market, Reg = regional market, Int = international market

Priorities	Banana type and market level								
	East African highland banana			Plantain			Dessert		
	Loc	Reg	Int	Loc	Reg	Int	Loc	Reg	Int
Markets and trade									
Match supply and demand	●	●	●				●	o	
Recognize consumer preferences	o	o	o	●	●	●			
Stabilize raw material inputs for processing				●	●	●			
Tailor technologies to scale and level of industry					ϕ	ϕ	o	o	
Develop business plan (including models and policy)							ϕ	●	ϕ
Growers select most suitable market type	o	o	o				o		
Involve market representatives throughout value chain	o	o	o						
Liberalize trade (agreements)						o	o	o	
Improve input supply systems				o	o	o			
Match exports with regional needs					o	o			
Production									
Disease-free planting material (micro and macro propagated)	●	●	ϕ	●	●	●			
Rapid and reliable disease diagnostics	o	o	o	ϕ	ϕ		o	ϕ	
Control methods for pest and disease control	o	o	o	o			●	●	
Ecological durability of intensified cultivation systems	o	o		ϕ	ϕ	ϕ	o	o	
Genetic improvement of available varieties			o	ϕ	ϕ	ϕ			
Phytosanitary standards developed and regulated				ϕ	ϕ	ϕ			
Reduction in post-harvest losses	o						●	ϕ	
Ripening technologies							o	o	
Innovation systems									
Linkages with agricultural research for concerted action, impact evaluation and feedback	●	●	●	●	●	●			
Information services to farmers and communication of results with researchers	ϕ	ϕ		ϕ			●	ϕ	ϕ
Mechanisms for small farm sectors to influence research and policy					ϕ	ϕ		ϕ	
Reward and train research and development actors to increase efficiency of impact pathways				ϕ	ϕ	ϕ			
Effective organizations and infrastructural linkages	ϕ						o		

Priorities shared by two or more banana types

Matching supply and demand, and growers selecting the most suitable market types, are key priorities for both dessert bananas and East African highland bananas under markets and trade. For East African highland bananas and plantain, recognition of consumer preferences is an important priority (to integrate the needs of consumers in technology development and dissemination). For plantain and dessert bananas, the need to tailor technologies to scale of industry, and liberalizing trade, are crucial.

High priorities for production across all banana types are control mechanisms for pests and diseases, and technologies for rapid and reliable disease diagnostics. Two diseases dominated discussions: banana Xanthomonas wilt (BXW) and banana bunchy top disease (BBTD). These diseases are currently spreading rapidly in Africa and are of special concern, both because of the severe losses they cause and because all types of varieties seem to be susceptible. BXW can be confused with Fusarium wilt, and the early stages of BBTD are difficult to identify, hence the need for rapid and reliable diagnostics. Fusarium wilt is a major problem for finger bananas and the widespread Kayinja (Pisang Awak, ABB) variety.

Another production priority for all banana types is ecological durability for intensified farming systems (especially the sustainability of nutrient use efficiency and knowledge of appropriate agronomic methods). Seed systems to produce disease-free planting material and improved varieties are crucial for East African highland bananas and plantain. For East African highland bananas and dessert bananas, excessive post-harvest losses are a vital factor that needs to be tackled. During discussion, research on farming systems and water management was also identified as a key priority for East African highland and dessert bananas.

Improved information systems are high priority for all banana types in order to promote innovation. Growers need access to useful, high-quality information, tools, services and support institutions. For East African highland bananas and plantain, linkages with agricultural science and technology need to be strengthened to increase innovative capacity and to learn continuously from feedback and impact evaluation. For East African highland and dessert bananas, improved support to help develop farmer and marketing organizations is key, to build business capacity and strengthen farmer-orientated marketing arrangements. In general, innovation systems need to be more responsive to the needs of smallholder farmers, with stronger mechanisms for farmers and farmer organizations to provide feedback to researchers and to the decision-makers guiding the research agenda.



Banana-based beverages, either in the form of fresh juice (left) or fermented into beer or wine (above) provide the basis for successful medium-scale businesses in West and East Africa, respectively

Additional priorities for East African highland bananas

As well as the priorities shared with other banana types, for East African highland bananas the involvement of market representatives throughout the value chain is vital. This will help establish major and lasting benefits for small-scale farmers in existing local and regional markets, as well as potential international markets, and reduce the influence currently exerted by middlemen. During discussion, the need for an effective extension service was identified to supply technical information and facilitate on farm demonstrations, for all three market orientations.

Additional priorities for plantain

For plantain, in addition to the priorities shared with other banana types, the following are seen as key: for markets and trade, improved input supply systems and stabilization of raw material inputs for processing; for production, the need to develop and regulate phytosanitary standards under the production; and, for innovation systems, the need was highlighted to train and reward research-and-development actors, so that organizations and staff deliver science for impact through more effective pathways.

Additional priorities for dessert banana

Important priorities for dessert bananas, in addition to those shared with other types, include the development of business plans that include models and advocacy for policies. This is needed for all market orientations. During discussions this priority was reinforced, with an expressed need to analyse the value chain and to strengthen it through the identification and engagement of committed leaders, particularly for local and regional markets but also for international markets. Post-harvest ripening technologies are also a priority for dessert bananas at local and regional market levels (but not international, as it is perceived that freight operators are aware of appropriate techniques). Across all market levels, institutional building is important as well as capacity building to enable farmers to become more business orientated.

From priorities to action

Priority setting is a first step in strategy development. The next step is identifying who needs to do what to achieve these priorities. Participants addressed this in a plenary session that aimed to identify the types of organizations and their roles and responsibilities for achieving the priorities set out in the strategy. Principal stakeholders in the banana chain in Africa as identified by participants at **banana2008** are shown in Table 2. The essence of this discussion is presented below, grouped under key themes.

Improving linkages

Improving linkages across the value chain is crucial and urgent if the banana sector is to be transformed. Better linkages, which depend on improved information provision and communication between actors, are key to achieving many of the identified priorities. Within markets and trade, for example, successful matching of supply and demand depends to a large extent on information flow through effective linkages. Similarly for production, improved linkages are critical to solve the current disjunct between science and practice, and allow farmers to access knowledge so that they can address production constraints. And effective linkages are at the heart of successful innovation systems, which are key to a transformed banana sector.

All stakeholders must recognize their responsibility to nurture synergistic relationships along the commodity chain. Principal actors (growers, traders, agri-business, processors, retailers and consumers; see Table 2) must be open to sharing information with other stakeholders, while supporting actors (who provide services, inputs and technologies) and those determining the operating environment (governments and sub-regional trade organizations) have a key role in initiating and promoting new ways of working that encourage stronger linkages. Extension services provide a particularly critical link in the banana chain and need to be strengthened – a role and responsibility of governments.

To improve linkages across regions, participants suggested creating formal ‘knowledge platforms’ to share current knowledge and to facilitate multi-site testing, training and education with farmer groups. Regional platforms would feed into a pan-African ‘system’ for consultative priority setting that is charged with information exchange, strengthening capacity, forging partnerships and developing policy to support banana production and trade across the continent.

Empowering farmers

The banana sector will only be successfully transformed if infrastructure is improved and the position of producers strengthened. Farmers are greatly empowered by working together in cooperatives or farmer associations. Farmers who work together in groups are in a much better position to address production constraints and to respond to markets. Information sharing and training are greatly facilitated, and effective innovation systems can develop more easily as economy of scale is increased from individual farmers to farmer organizations. Supporting actors, such as NGOs and community-based organizations, have a key role in promoting development of farmer groups. It is also in the interest of agri-businesses to support the creation and operation of farmer groups, as it is more efficient and therefore financially viable for them to work with groups, for example for supply of inputs and purchase of greater volumes of product.

Table 2. Principal actors in the banana chain in Africa (identified by participants at [banana2008](#))

Principal actors in the banana market chain

Smallholder farmers, private commercial farmers
National and multi-national banana companies
Private plant multiplication centres
Farmer organizations
Local traders and middlemen, Regional traders, International traders
Airlines, shipping lines and freight companies
Individual and community-level food processors
Industrial food processors
Arts and crafts producers
Industrial fiber and fuel producers
Small- and medium-scale retailers
Supermarkets
Consumers

Supporting actors providing technical and other services

National extension services
Local, regional and international development NGOs
Community-based organizations
Consultants
Input suppliers (planting material, fertilizer, pesticides, irrigation equipment etc.)
Microfinance providers
Private investors
Credit and financial institutions

Other actual or potential stakeholders/actors

Social and health-care workers
Local religious and cultural leaders
Local, national, regional and international media

Sources of new technology and innovation

University agricultural faculties, agricultural schools and colleges
National agricultural research organizations
Regional research organizations
Regional banana networks (BARNESA, MUSACO¹)
International agricultural research centres
Advanced research institutes
Other international agricultural R&D and information organizations

Actors determining and affecting policy and the operating environment

Government ministries (agriculture, finance, infrastructure, education, technology etc.)
National, regional and international phytosanitary regulators
Other regulatory agencies (food safety etc.)
Certification organizations (fair trade, organic etc.)
Chambers of commerce
Local authorities
Port and airport authorities
Regional economic and development organizations (e.g. CAADP, COMESA)
Regional policy organizations (FARA)
Subregional research organizations
Donors (to agricultural R&D, infrastructure etc.)

¹BARNESA, *Banana Research Network for Eastern and Southern Africa*; CAADP, *Comprehensive Africa Agriculture Development Programme*; COMESA, *Common Market for Eastern and Southern Africa*; FARA, *Forum for Agricultural Research in Africa*; MUSACO, *Réseau Musa pour l'Afrique Centrale et Occidentale*.

Production

Better linkages and farmer organization will greatly facilitate optimization of production practices, and also help to guide research priorities. Key actors to work with farmers in addressing production priorities are those providing technical services, particularly extension services, and those working to develop new technologies and stimulate innovation, particularly NARS and the international research community. Actors determining the policy and operating environments also have a role to facilitate access to technologies and services. Banana genetic resources underpin production systems, and collecting, characterizing, and sharing of banana germplasm will require continuing efforts of the international agricultural research centres, NARS, advanced research institutes, and regional research organizations and networks.

Markets and trade

Again, effective linkages and participation in farmers' organizations are crucial to enhance farmers' abilities to understand and respond to markets at all levels. However, markets are rapidly changing, and responding effectively and appropriately will be a major challenge across the banana chain.

At the local and regional level, expanding urban markets and the flourishing supermarket sector will offer many opportunities for banana growers and traders. Improved transport and market infrastructure, provided by local and national governments, is critical to stimulating growth in this area. Processing into innovative and durable new products will become more important in order to access more distant regional markets and to even-out seasonal discrepancies in supply and demand. Agri-businesses and regional trade organizations can guide interventions, with support from governments. Market information will be critical, and sharing this information will bring in actors in the communications field, such as mobile phone network providers.

At the international level the dessert banana will continue to dominate trade, but changes in European trade tariffs will mean that production and freight systems in Africa will need to become far more competitive. There may be opportunities for well-organized farmer groups, for example in supplying 'fair trade' and similar certified bananas. The main actors will include international traders, airlines and shipping companies, supermarkets, standard-setting and certification organizations, governments, and regional and international trade organizations. Inland production areas are seriously disadvantaged with regard to transport costs and will require creative market opportunities, such as value-added processing.



Clean planting material of more productive, stress-resistant cultivars is a priority for banana production

Dry, subtropical conditions in South Africa reduce the need for fungicide sprays and facilitate organic production



Promoting innovation

A starting point for the discussion of innovations systems was that African banana farmers had been ill served by the classical linear model of agricultural research and development, where innovation is presumed to arise mainly among public sector researchers and is passed via extension services to farmers. A new point of departure for the present discussion was provided by an Agricultural Science, Technology and Innovation (ASTI) system analysis recently carried out in several African countries and reported at the conference.

Once again, effective linkages and empowered farmers were recognized as holding the key to innovation in the banana sector. Information and communication pathways are also fundamental. There is potential for innovation in all relationships across the banana chain, so all principal actors are implicated; but those who focus on supplying new technologies and promoting innovation are particularly important, specifically research organizations at all levels (national, regional and international). These actors should however note the considerations in the box *Innovation in African agriculture – some key considerations*. The private sector also has a crucial role in facilitating innovation, as a source of new technologies and also as a conduit for transferring technologies that may be familiar in a different context to a new set of banana producers or marketers.

Innovation in African agriculture– some key considerations

Participants highlighted some considerations for actors involved in promoting innovation in African agriculture:

- Africa is a social economy (rather than purely capitalist) and therefore a different kind of commerce is required that respects farmers' needs and capabilities
- Scientists may have answers but technologies will not be adopted unless there is greater focus on shared practical testing in farmer communities
- Two-way communication, feedback and trust needs to be increased between stakeholders including recognition of the potential of indigenous knowledge and practical experience
- Strengthening of institutional support frameworks (functional research institutes and extension services) in Africa is critical, but changes must recognize that institutions emerge from human interaction and agreement and thus these pathways cannot be designed, tested and replicated or scaled up as if they were technologies in the same way in each country; rather a flexible and dynamic approach is required
- Any introduced innovation must be demonstrated to provide tangible financial benefits, but this poses a problem when technologies to increase ecological sustainability are proposed that do not have an immediate benefit; thus different approaches need to be considered to ensure adoption.

Implementing the strategy

In the absence of an organization with a mandate to implement this multi-faceted strategy, the Forum for Agricultural Research in Africa (FARA) and its various elements will be pivotal to transforming Africa's banana sector. The overarching framework of FARA is the Comprehensive Africa Agriculture Development Programme (CAADP) which has four pillars. Pillar IV aims to enhance agricultural research, technology dissemination and adoption, and its implementation is governed by FAAP (Framework for African Agricultural Productivity). Key goals are to integrate natural resource management, encourage adoption of appropriate germplasm, development of sustainable market chains and stimulation of policies for sustainable agriculture. The banana strategy addresses these goals for the specific case of the banana sector, and thus fits squarely into the mandate of FARA.

Participants at **banana2008** envisaged that implementation of the strategy will begin by building an informed knowledge base organized around innovation platforms that both engage stakeholders and engender ownership. Implementation of the strategy can happen under existing institutional arrangements, as follows: For research issues, national agricultural research systems feed into the sub-regional organizations West and Central African Council for Agricultural Research and Development (WECARD), the

Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) and the Southern African Development Community (SADC); while for trade issues the key bodies are the Economic Community of West African States (ECOWAS) and the Common Market for Eastern and Southern Africa (COMESA). All of these, in turn, feed into FARA. Technical backstopping and technology validation at the regional level will be facilitated by the research centres of the Consultative Group for International Agricultural Research (CGIAR) and their numerous and diverse research partners, both within Africa and outside the continent, with additional support in specific areas from the Technical Centre for Agricultural and Rural Cooperation (CTA) and the African Agricultural Technology Foundation (AATF).

Banana researchers in Africa have been accustomed to collaborating within regional networks: *Réseau Musa pour l'Afrique Centrale et Occidentale* (MUSACO) for West and Central Africa and the Banana Research Network for Eastern and Southern Africa (BARNESA) for Eastern and Southern Africa, under the auspices of WECARD and ASARECA respectively, and these networks have recently been broadened to include NGO and private sector participants. Links to banana researchers in other regions, for the exchange of information and technologies and for collaborative problem-solving research, are promoted through the global ProMusa network, which also constitutes the Banana and Plantain Section of the International Society for Horticultural Sciences.

Still broader innovation platforms are now envisaged that will unite researchers, extension agents, farmers and farmer organizations, agribusiness staff, traders, policy-makers and development partners. Research priorities (see box) and technology dissemination strategies will need to be market-orientated, participatory, and use approaches such as farmer collective action, farmer-to-farmer learning, market-led technology adoption, and mutual learning in the market chain.

In conclusion, the strategy for transformation of the banana sector in Africa fits precisely the FARA model for agricultural innovation and economic development, and can be implemented under existing institutional arrangements. Participants at **banana2008** propose the adoption of this strategy as a 'test case' within the FARA framework. They believe this would facilitate increased visibility and the mobilization of the breadth of expertise and depth of resources needed for its successful implementation. Such an outcome could indeed help banana to realize its full potential as a major economic driver for sustainable and equitable development in Africa.

Research needs for bananas in Africa

Among the many needs identified by participants, some cross-cutting themes included:

- To sustain production in the face of significant biotic threats; research to improve diagnostics, strengthen pest- and disease-management practices and create more resistant varieties.
- To help smallholders better cope with production constraints, research on strategies for managing weeds and water (e.g. by mulching or irrigation), on best-bet nutrient practices, and to select more stress-tolerant varieties.
- To improve seed systems and meet the needs of producers of all kinds for larger quantities of clean planting material (especially to replace plantations affected by diseases and pests), research on tissue culture, improved traditional multiplication systems, distribution chains, and linked value chains.
- Market research and information dissemination systems to enable producers to make informed choices in relation to planting, harvest, and marketing options to maximize on-farm profits.
- Food science and technology research to develop innovative new processing options and higher-value banana-based products.
- Market research to identify opportunities for selling medium-to-high value banana-based products into regional and international markets.