

## 2008 USAID Summer Seminar Series

### August 5: Perspectives on the Crisis in Food Security

**Moderator:** Bill Hammink, Deputy Assistant Administrator, USAID, Bureau of Economic Growth, Agriculture and Trade

**Panelists:** Siwa Msangi, Research Fellow, Environment and Production Technology Division, The International Food Policy Research Institute (IFPRI); Jeff Hill, Division Chief, USAID, Africa Bureau, Economic Growth, Environment and Agriculture, Office of Sustainable Development; Josette Lewis, Senior Biotechnology Adviser, USAID, Bureau for Economic Growth, Agriculture and Trade, Office of Environment and Science Policy

**Materials:** Presentations (3) appended

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## Seminar Summary

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### Siwa Msangi's presentation

It is important to note the drivers of change behind rising food prices. Rising energy costs play a primary role; the cost of crude oil has been a major factor in influencing the rising real cost of food. It is not unusual to see some fluctuations in food prices with energy costs, but we are not witnessing any trend back toward the historic norm of decreasing real costs for food. The relationship between the spot and futures prices of food during the current crisis reveal that food prices are expected to remain high, rather than correcting over time as they have in the past. If real prices do not fall as they have in the past, there will be some significant effects on human development. Malnourishment, for instance, is extremely sensitive to fluctuations in the cost of staples. As long as prices remain at a higher level, this will continue to be a concern, regardless of whether we are able to achieve increases in productivity.

It is important to identify the root causes and drivers of elevated food costs. Socio-economic changes, such as population and income growth, lead to alterations in lifestyle and changes in the demand for cereal grains. As household incomes rise, the demand for meat increases, thereby putting further strain on grain and feed supply. Economic development does not always take food security into account, leading to problems such as water scarcity and under-investment in agricultural technology and infrastructure. Other slow-moving drivers include stagnating yield growth, as well as global climate change. Fast-moving drivers, like short-term environmental shocks and the increasing demand for transportation, can have especially violent effects on the system. The combination of fast- and slow-moving drivers give rise to "tight" market conditions: even in an era of surplus, there is less ability and certainly less interest in maintaining cereal stocks and increasing levels of private capital in grain markets.

One troubling driver is the slowing of agriculture productivity growth. As illustrated by the World Development Report, it is urgent that we revisit and reinvest in the agricultural sector. Much of the productivity growth that occurred in the past was due to the increase of land area under cultivation, and not due to any technological change or any real productive increase of the land itself. Looking ahead, the problem of feeding the world in 2050 highlights the need to invest in yield improvements; eventually, the amount of land under cultivation will plateau, and demand for food will only continue to grow.

A controversial aspect of the recent crisis was the alleged role that biofuels play in the current shortage. To isolate the effects of the biofuel industry, it is helpful to consider a counter-factual question: if biofuel demand was not present, what effects in food supply would we be seeing today? Msangi's analysis shows that in the absence of biofuels, the demand for cereal grains over the period 2006-07 would be about 30% lower than was actually experienced; similar numbers were produced in other studies by the FAO and the OECD. Of all crops considered under this "freeze" scenario, maize was the most affected (in terms of demand) by biofuels, and Sub-Saharan Africa was shown to bear the greatest burden in terms of calorie availability.

The welfare impacts of rising food and energy prices are not difficult to trace. Effects on the individual household depend on its income in relation to the poverty line. Naturally, a higher savings rate translates into a more effective buffer against price shocks. Trade-offs in household spending are already evident, however, as individuals are beginning to divert more income to the purchase of basic foodstuffs. The diversion of resources to staples and away from non-basic foods will have negative consequences, primarily in rising rates of malnutrition.

There are courses open to us, however, to mitigate the current crisis and to prevent similar situations from occurring in the future. It is important that we must address the trade restrictions that are distorting the market for staples. Establishing a truly 'free' trade regime in ethanol, through the elimination of subsidies, would discourage the production of biofuels and alleviate some of the pressure on the supply of staples. The international community needs to address food security as an important issue in its own right. We must develop well-targeted, well-designed interventions to protect those who are food-insecure. Most importantly, we must reinvest in the agricultural sector in order to increase productivity.

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### **Jeff Hill's presentation**

Africa has been seeing some positive trends recently in economic growth, agricultural production and sectoral growth, and governance indicators. Regional cooperation is on the rise, as illustrated by the recent formation of the Comprehensive African Agricultural Development Program (CAADP), under the auspices of the New Partnership for Africa's Development (NEPAD). This framework represents the crucial step of considering food security as a regional and continental issue. However, significant challenges persist. Currently, 40% of Africans live under the poverty line, malnutrition is rampant, and there were major obstacles to achieving the Millennium Development Goals even prior to the current crisis.

The recent rise in food prices has manifested itself with particular vehemence in Africa. Spending on staple foods is taking over household income – now typically comprising 50-70% of families' budgets – leading to reduced food intake and lower spending on health and education, which in turn may ultimately lead to civil unrest and political instability. While this crisis and its effects are global, the roots of Africa's particular crisis lay in the continent's perennial food deficit, which is significant and growing. This imbalance is the direct result of the region's persistent failure to meet the current demand of the moment, let alone be able to create and maintain a stockpile of cereal grains.

Correcting this imbalance of supply and demand will require a doubling of agricultural production in Africa. This is well within the region's capabilities: as most of the land is currently operating at such low levels of output in terms of inputs, an increased production rate would not be overly difficult to achieve through concerted action. Investments must be made to bolster the staple foods sector on the continent, which would have spillover effects of reducing regional poverty, boosting countries' GDP, and allowing for a measure of regional food security. Improving trade corridors and market access, as well as fostering inter-continental trade, would create lower yet stable prices, benefiting both consumers and producers. Most importantly, steps must be taken to reinvest in the neglected agricultural sector and modernize and improve production techniques.

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### **Josette Lewis's presentation**

The role of technology in agriculture is becoming increasingly important. Looking ahead to 2050 and anticipating the exploding demand for cereal grains due to diversification of diets, greater consumption of meat, and even climate change illustrates the necessity of increasing production and improving cultivation techniques. While biotechnology is still a controversial field, it has major productive potential that we cannot afford to ignore. Indeed, the typical improvement in yield in a conventional variety, achieved through selection and the breeding of successive generations, is around 5-8%; a new GM variety often boasts an increased yield of as much as 50%.

The global trends of genetically modified (GM) crops attest to the growing acceptance of this technology. At present, the United States is still the leader in the sheer amount of acreage devoted to GM crops, but other countries are increasingly adopting these varieties. Annually, over 100 million hectares are planted with GM crops globally, and that number is rising.

It is important to note that not all GM cultivators are agro-businesses or large corporations. There exists a burgeoning contingent of small-holder farmers as well, who are attracted to GM varieties on their superiority, in many cases, to conventional crops. For instance, a GM yield often translates into increased income for farmers; indeed, a study done by the World Bank showed that widespread adoption of GM cotton varieties in Sub-Saharan Africa would benefit the region more than full liberalization of cotton under the WTO. Environmental spillovers are also minimal, as compared to conventional crops: fewer pesticides are required (if any are required at all) on GM fields, and the reduced necessity of machinery on farms leads to reduced greenhouse gas emissions. Many GM crops can be engineered to be drought resistant, and fertilizer, which has doubled in price since 2007, is generally unnecessary.

USAID has taken on a supportive role in the adoption of GM crops. It provides countries with complete information on issues surrounding GM varieties, from environmental and small-holder effects to implications for trade with GM crops. USAID also consults with governments to ensure that policies are put in place to ensure safety and the proper regulation and oversight of biotechnology. Perhaps the Agency's most important role is as the catalyst for public-private partnerships in biotechnology. Governments have rarely funded, developed, and released their own version of GM or bio-engineered crops, and the private sector does not always have market-driven incentives to invest in research with the potential for major gains to human well-being. USAID has consistently pushed for the application of existing biotechnology to crops neglected by the private sector; USAID also advocates for research and investment in technologies that would benefit small-holder farmers.

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## Question and Answer

**Question for Jeff Hill. I was struck by your comments about doubling the yield in Africa, and I was struck by that. But I was wondering, to what degree is water a rate-limiting step, and is that an insurmountable obstacle?**

**Hill:** Right now, there is little irrigation in Africa, so I think that there is a lot of potential for doubling production. Water is not the primary limiting factor. I think that as you begin to see the area in a number of the innovations that are certainly available to the world, including conservation, agriculture, use of better land, use management, better catchments systems, the improved seeds, the improved fertilizer, the different kinds of alternatives that exist right now on the shelf; the options for being able to directly increase production are significant in both crops and livestock.

In many cases, there are a variety of options for improving food availability. For example, storage and handling can cause significant losses – perhaps up to 30 – 40% of stocks, for example. Some milling techniques result in a waste of up to 25% of total production. So handling a number of the different actions does offer the opportunity for affecting large parts of the imbalance that exists, as is just sort of a fundamental issue that's there. We're not only just looking at the issue of production as such, per se, because I think that in the way we look at it; it's not only what you do, but how you do it.

Clearly, the issue of doubling production by itself is not going to really come to a long-term solution of the issues. The real need in the systems we're talking about – staple food systems, which is the core of agriculture in Africa – have failed to be modernized. And a critical issue is: are we actually seeing the kind of service systems that will make them actually an important and vibrant part of the economies of those countries? And so it's how you're doing it, is also extremely important, in modernizing those systems, so that the adjustments, that can be achieved are sustainable.

**I think that many people in the development community have really looked at agriculture in Africa and agriculture through the prism of small-holder farmers, and just accept that most farmers in that part of the world and elsewhere are just going to be poor. But it's a function of agricultural policy. And I was wondering if USAID is thinking about changing agricultural policy frameworks so that more people can kind of get into commercial agriculture? It doesn't have to be an all or nothing, it doesn't have to be the huge versus the tiny, but are there ways of really kind of helping kind of plot out the stepping stones to commercial agriculture for being able to scale that up?**

**Hill:** There are two major angles that we're looking at here, and it can turn into a win-win situation. Number one is that this imbalance is real and causing significant negative impacts on the entire economy, and that needs to be addressed. The other issue is, is that in order for the investments to have the pay-off that they need, and to society, we need to actually improve competitiveness, we need to be able to see that the costs of doing that business – of, of fixing this imbalance – is going to be sustainable, which means engaging the private sector, improving competitiveness, making sure that the investments are really coming from people that are making money from, from being able to do these actions. So this modernization of your finance, your service sector, the transport systems that will make agriculture a more vibrant ag-business enterprise is critical to make it sustainable, and to deliver on the expectation that it will create the wealth to enable Africa and its rural majority to grow out of this poverty and build their resilience. The critical issue that we face here is that Africa right now has the largest number of destitute people in the world – 50% of the destitute are in Africa. This is a fundamental development issue that must actually be addressed.. How are we getting broad-based growth, creating the opportunities for the destitute, how are we actually looking at modernizing agriculture, especially the staple foods, how are we actually addressing the staple foods supplies that are affecting this imbalance in the broader processes? And so we come back to it – it's a simple statement of doubling the production; well, in fact, it has all of these win-win-win possibilities in Africa. And so it's how you're doing it that we're talking about.

**Hammink:** May I ask our IFPRI colleague to discuss the ag-policies question?

**Msangi:** When I mentioned who wins and who loses, I wasn't specific, but maybe in the context of your question I can be a little bit more specific in terms of how exactly higher food prices benefit African farmers. Let's contrast it to what has been the usual story, from the 1960s/70s, where you had Africa of course as a major source of valuable mineral exports. So you get bauxite, you get copper, you get diamonds, gold, all these other things - mineral exports which tend to increase the real exchange rates, and the terms of trade always turn against the agriculture. That's always been the story. You get this Dutch Disease type of thing, where agriculture actually stagnates. You do have some growth, but it's not broad-based enough to really have the economy-wide effect that you would need, and that's where the arguments of why focusing on staples, of why the graph that Jeff shows has such a dramatic effect, because when you do finally get those investments going and perhaps a higher price, more favorable market conditions, and not just, due to prices, but good policies as well, that encourages producers in terms of making sure that they get the full transmission of world prices, might actually provide one of the better environments for concentrated agricultural investments than has existed in the past.

When people talk about being able to turn this high food price situation into an opportunity for investments, for the returns to investment can actually be much higher, if it's accompanied by good policy that frees up the other constraints that have been there in the past. So making sure that the storage, distribution, marketing, infrastructure is there - and I always make the argument in terms of: does biofuels make sense for Africa? Well, it won't make sense for Africa if agriculture is not successful - biofuel won't

be successful. There are already countries in Africa that have declared biofuels programs: in Mozambique, in Senegal; and other places are looking at it. But the same constraints that would keep successful biofuels programs from taking off – for whatever reason, if they be for energy security or just avoiding costly fossil fuel imports, which is a legitimate cause - whatever those causes may be, any barriers that would prevent agriculture from becoming successful will also get in the way of any other types of investment in agriculturally-related industries.

**I would just like to follow up on the question of commercial agriculture in Africa. Jeff emphasizes the importance of staple food crop production, and I would posit that for Africa, in a continent where 50% of the population is destitute, it is important to allow investments to go where returns are the highest, be it staple crops or non-staple crops. I think your whole strategy is correct, but I do take issue with the exclusive focus on staple crops, where they may or may not have the highest return to investment and resources. [Directed to S. Msangi] I would like to encourage you to do the study you suggested on demonstrating the impacts of trade liberalization of certain ethanol – either ethanol products or feedstocks – to economies like the United States. And then I have one question for you about your analysis of the impact of ethanol on the price of corn. When you abstracted the possibility that the corn would be used for ethanol, how were you able to also abstract the impact of the subsidies on encouraging maize production?**

**Msangi:** In that scenario, just to deal with your second question first, we didn't. We held the trade policies essentially constant. So essentially what we did was to affect the amount of feedstock tonnage going into production of ethanol. In essence, the mechanism by which you reduce, we didn't make explicit the mechanism by which the feedstock usage of, let's say, maize, in ethanol production is reduced, but it could come about through removal of subsidies for domestic production.

**[Directed to S. Msangi]: When you did the simulation, you could not abstract the impact that actually took place, for producers knew that the legislation would provide that subsidy, because that wouldn't show up in your price so much, as it is another sort of non-market incentive that was sort of hanging over producers' decision-making?**

**Msangi:** In this case, it was a constructive counter-factual, so the alternative scenario was different from what actually happens. So we're saying, by whatever mechanism – be it through the removal of subsidies, perhaps, through the removal of tariffs against imported ethanol – you reduce the usage of feedstock - of maize - in the production of ethanol domestically; let's see then what would happen. How would the prices have evolved differently than they actually did? In fact, one of the other global models at IFPRI, the Mirage Model, will actually be looking more specifically at the liberalization and trade policy issues around ethanol.

**Hill:** Let me just talk about this issue of a staples focus, because this is an issue that many people will want to talk about, and to dig in, and it's an important issue that you raise on this. And the economies, the agricultural economies, the broader economies, will not be built just on staple foods. That is absolutely true. I think it's an important fact that needs to be recognized. But what we do know is that without actually significant improvements in staples, economies, almost every economy in the face of the earth, has not been able to actually lead to the next steps of the modernization that is really required in the economy.

Staple foods, getting those to actually work, making staple foods more affordable, allowing the resources to flow into other kinds of enterprises, is a fundamental step for supporting the transformation process, and is one step that has actually not gotten far enough, actually, in Africa. What we do know is that part of the agenda that we're talking about here is focusing on trade, transport, supply chain, barriers, the finance systems - and those will have significant repercussions across all enterprises, all systems that exist. And so that it will have much broader impacts for the entire economy and so that those will set the stage for improving competitiveness and opportunities. Focusing on staple foods does have the prospect of actually creating more possibilities for both diversification, but also significant opportunities for job growth. Where you're moving to more agro-industrial kinds of enterprises because you have the supplies that can support a more agro-business base in a whole range of different kinds of products that will be - that will be really interested in. And so it's a major source of jobs that will be off-farm and affecting the entire economy, and that hopefully, especially affecting as has happened in the rest of the world, of actually creating jobs, especially for the destitute. Creating the opportunity for them to look for off-farm kinds of jobs and pathways out of their current poverty. So, a staples-first approach is actually what is being talked about here, not a staples-only approach that is actually being discussed.

**Hamink:** Let me just give you one example from Ethiopia, where I recently spent three years.. The government of Ethiopia put major emphasis on improving the policy environment for investment in horticulture, especially cut flowers. That is, huge increase in the number of producers of cut flowers; it significantly increased their exports, and that continues to investment in agriculture. I mean, it's all positive, but unfortunately, it's only impacting on 20-50,000 people, and we know in Ethiopia that there are something like 7-8 million people that are chronically food-insecure, amongst the millions and millions of households, especially small farmers. You need that, but you also need something that you can significantly impact on the millions and millions of chronically food-insecure. And one of them, as Jeff said, is staple foods.

**How do we impact the millions you're talking about – how do we leverage some of our existing programs here at USAID – the PEPFAR, tuberculosis, those that have seen evidence-based data which have shown, for example, animal protein sources are very important for anti-retrovirals, very important to TB meds as well, but we don't see those programs engaging the farmers, the rural people that we deal with every day. And farming is not rural anymore, it's peri-urban and urban. And I think one of the things that came out from the World Animal Health Organization meeting of the chief**

**veterinary health officers in May in Paris of this year is that 96% of livestock farming are small farmers - that we don't engage. When we look at the commercial sector, and what I'm dealing with at the moment, especially poultry – poultry has become very very inefficient. It's a \$3 billion USD industry in Egypt, but they're some of the most inefficient farms in the world. \$1,200 USD per metric ton of poultry – I mean, it's just pathetic. Sudan, which has a \$400 million industry, is producing that same metric ton for about \$800 USD. So when do we start focusing on the commercial sector, which again is growing bigger and bigger and bigger over the years, but has become very inefficient in the resources that they're using, and then how do we then engage those small – farmers or populations with existing programs that we have here at USAID?**

**Lewis:** I think one of the things in the discussions that the Task Force has had so far is, thinking about a longer-term strategy for food security. There are a couple things that I would flag as some of the newer ideas that are emerging. One is this question of how to tackle the chronically vulnerable, or the chronically food-insecure. And this is kind of a new topic to me, but what I was really struck is how much we have and we see a gap between how we work with the chronically vulnerable and how we work in the realm of ag-development. And part of that is, frankly, institutional structure and the fact that we have two different bureaus who do these kinds of things, and to complicate it even more we have different flavors of money that go into these things. For instance, we have IDA, and Title II Food Aid that do the chronically vulnerable, and we have DA that does the mainstream ag-development. But I think there is the beginnings of a very serious discussion in the Agency about how we can close that gap and do it at a scale that starts to tackle the 7-8 million people – as opposed to the one country, and at the scale of the problem, rather than just to sort of help a few thousand, or tens of thousands, of households.

And I think it's both an intellectual discussion - better understanding what are the routes out of poverty: is it staples, where agriculture is not even the right tool for some of those people who are on land that is so marginalized or so small that they are never going to be economically viable? Small-scale farming is a broad category, and not everyone can enter the commercial stream as a small-scale farmer, and we need to better understand that and merge the thinking across the Agency in that area. And then part of it concerns implementation. Again, sort of closing the gap within our Agency, of working across our stovepipes, so that we see the problem the same way and we use our resources more effectively. And working with our partners outside the Agency who are implementing our programs, to again close those gaps in thinking and practice. And so this issue of the chronically vulnerable and how we can move our approaches towards more of an economic growth/ag-development strategy, where that makes sense – is, I think, a major topic for conversation in the Agency. And the other is how to better link the nutrition and health side with the ag-development and humanitarian. I think on the humanitarian there are fairly strong linkages between health and parts of our Agency. But on the agriculture side, how can we strengthen those? And that gets us into things like PEPFAR, malaria and TB, and the impacts of good and diverse diets, which agriculture has to contribute to. I personally believe that food should be the main tool that we have for improving health, otherwise we're going down the path that we've seen here in the Western World, where it's always a medical fix rather than people looking at their diet, and there're all sorts of implications down the road with that. So, I think that's another major area of increased discussion and opportunity for us to work outside of our bureaucracies.

**Hamminck:** Related to animal husbandry and livestock, that is an area, clearly, that impacts on, again, a lot of the chronically-food insecure. And depending on the country, different missions are developing approaches in different ways, and some are putting significant resources into the livestock area. I know it's part of what Jeff, the CAADP, and IEHA programs do, especially for pasture-less.

**Hill:** I do believe that livestock including cattle, goats, chickens, birds, are an important part of a discussion of staples. So it is livestock and crops, not just one or the other that is being discussed. And I think that there are significant opportunities for improvement. And then how do we deal with the commercial? Well, fundamentally, a concept, a construct, a principle that is being moved and advanced is taking a value-chain approach, where we're actually looking at how do you actually increase the competitiveness, the investments, in these areas, so that they can lead to sustainable private sector development around these major value-chains. And so all along the different connections and so that that would allow for players of different sizes and types and different kinds of arrangements for emerging, and so that they can play their role in the economy. So I think that it does recognize the commercial end of things is the critical issue and as a driver for the strategy that has to move forward, not just simply produce for sake of the production.

**Hamminck:** Just quickly on PEPFAR, and then we'll move to a few other questions. There has been increasing work between OGAC, PEPFAR, our own Office of HIV/AIDS and Global Health, Food for Peace Office related to nutrition issues and related to agriculture. Interestingly enough, over a year ago there was an effort between Food for Peace and OGAC on increasing programs where you can use food for people who are either on ART or other OVCs who are affected or infected by HIV/AIDS. Increasingly, missions in the field are using PEPFAR funding to actually do agriculture programs, and there's a great example in Kenya. And so those programs are increasing in a big way. Under now PEPFAR II, the reauthorization that the President just signed, obviously we need to expand it at both a kind of strategic level, but also of course at a programmatic level.

**If you look at the history of the U.S. in terms of the growth of agricultural productivity, a major part of the growth happened like in the mid-1900s, when a lot of people got off the land, we had massive industrialization, so on. And you saw large, consolidation of land-holdings, and large tracts of land that could use technology, that could become more**

**productive, that could reduce energy costs of agriculture. Are we not promoting something similar for Africa? Do we not have to see in terms of modernization, land consolidation, where these very small pieces of land are? It was interesting, in your presentation, Jeff, Zambia was the only country that showed a negative agricultural GDP. Zambia has the highest – the lowest average small land holding in agriculture. Are we not going to have to see a promotion of consolidation of land in order to modernize agriculture?**

**Hill:** The issue has come up several times about the policy environment and the changing policy environment. And it is absolutely true that getting factor markets to work - getting land, labor, and capital systems to work – you return to the basics, is really critical. And we do fully see processes beginning to emerge when you are seeing land markets begin to develop you will see different processes begin to emerge. And that is, it is true, but it is not also a simple and an easy development strategy to explicitly go into a country and have a dialogue with them, and say, “Well, we’re here to actually take land away from half of the people.” That is, if the way that it is conveyed, and the discussion around land has been such a volatile issue any place in the world, and I think that it’s so evolving that and creating the conditions for this to really happen, based upon really these structures and incentives is an important issue there. There’s no doubt that you are going to see the consolidation as it begins to develop. No doubt whatsoever. And that is the process of modernization that is actually going to have to be pursued.

**Msangi:** I'd just say definitely it's a changing of paradigms, and overcoming a traditional, sort of a dual existence of small-holders on one side, commercial, export-oriented farmers on the other, that has existed in many countries. And certainly if you can begin with countries like Ethiopia, and others in eastern and southern Africa, to overcome some of those types of barriers and free up quite a bit of labor through productivity improvements as well.

**We're hearing that this is back to the household food security side, that throughout Africa, as well as other places, as incomes rise a bit, and the consumption of meat then rises a bit also, that our estimates for supply and demand purposes globally of the amount of calories per capita. That if we go with the traditional way of calculating those, that we may be underestimating the actual, because so much of the staples are going for feed. And I just wonder if there's any comments, either about those calculations, or how that's being taken into account, or even if you think if it's worth recalculation or taking into account?**

**Hill:** I think that fundamentally the simple measure of per capita consumption, I don't think, is getting us very far. What we're actually interested in is something more sophisticated; a global hunger index that would actually allow for three or four major variables to be considered in terms of both nutritional status, of what people can actually get, and their absorption of this. That issue has been on the table, and the need for actually having a clear indication whether improvements are truly occurring in nutritional status of people, I think, has led to a better definition of indicators that are trying to become mainstream. And one that we would expect to be part and tracked as part of our actions here, and we've been moving very much in that line. And they are actually imbedded, partly with our assistance.

Within the entire Africa-wide CAADP is a series of primary measures of food security. It isn't a simple measure of nutrition state, it's a more complex set of measurements that we would want to see. And so, just as we would hope to actually see the kind of theory that suggest that if we are improving both economic growth and changes in productivity and incomes that we will see people's lives improving, poverty reducing, hunger reducing, and tracking all of these indicators so that we can see whether we are on track or not. And the indicators that we're seeing, when we begin to look at this cluster of indicators, is showing that yeah, there are these strong correlations but we need to have good quality indicators to do it.

**Msangi:** For Africa, the availability of low-priced protein could be greatly enhanced through improving small-scale fisheries, actually. That's one of the aims of the FAO study that we hope to accomplish. Because we know that, high-value fish, aquaculture capture, are going to increase for North America and for Asia, much of Asia. But the availability of proteins, animal proteins, could be greatly enhanced in Sub-Saharan Africa through improving fisheries. But right now there is no good accounting system within the FAO that takes account of how much random food is actually coming from fish. In fact, they're trying to even improve some of the inclusion of fish in their modeling frameworks, and those sorts of things. So I think that will also probably improve and give a better indication of where the sources of food and availability of food come from.

**Have we explored the idea of a large, basic education earmark and I'm not quite sure of the parameters of it - but the idea of having more of an agriculture or a nutrition-focused curriculum? Because Jeff, you talked about how people farm and produce, and Josette, you talked about a nutrition-oriented approach to promoting good health. Have we looked at the potential for using the school system to get information and skills and knowledge out to people, or is that considered an inefficient way versus more targeted approaches?**

**Hill:** Well, we've certainly looked at the different options for being able to do that, and it is really some very innovative things have been done. You know, it's interesting that when you actually have a long and detailed discussion with the different businesses and corporations about what is their single issue. One issue that they are concerned about, and everybody always wants to say, 'well, it's money'. The truth is, it isn't actually money, it's human capital. And it is do we actually have people with the basics skills that we can work with for reading and writing and understanding the fundamentals. And so that the issue of actually having linkages with schools has been a true innovative area of linking private sector and business groups around some of the business-development efforts and public-private partnerships that we've been looking at. And actually, in many of them, there is actually a part about skill-development that is working at the fundamental skill-development, and in almost all of the cases there is a connection with schools and education programs. The reality is that there have been relatively poor linkages internally within some of our different sectoral efforts on this, and I think that it comes back to a concern and a question that was raised about linkages

between HIV/AIDS and health and agriculture or nutrition and agriculture, or between the education and agriculture, and the truth is, is that there is the need to actually look at that. I don't think you would find any professional who says that there aren't linkages. But as we begin to look at the linkages, it hasn't always been easy programmatically, within AID, to cut across some of those territories, but I do think that it is an important issue. I don't know the great solutions to it, but there's got to be some.

**Lewis:** I do know in the area of linking education and nutrition there are efforts, the most basic being school-feeding programs, which is a very important part of dealing with food insecurity, particularly at an age where that has significant developmental impacts for the lifetime of people. But also beyond that, I do know there are programs linked to that, for example gardening programs to get kids to understand about diversified diets and to get more diversified diets into their food supply. I think there are some efforts, but probably the efforts could go further in that direction.

**Hammink:** As you know, under the African Education Initiative, and also under the President's new education initiative, there's a major focus now on not only quantity of education, the percentage of kids in school, but also quality. And in countries that have mainly rural populations, it's part of that having kind of an agriculture, nutrition type of curriculum, as part of the curriculum, because these kids in school, they come from households that mainly depend on agriculture for their livelihoods and income. That is increasing. There has to be more both at the Washington level, but especially within a mission in terms of programs that are focused on these vulnerable communities and vulnerable households, where the school obviously along with if there's a clinic there, is the major kind of gathering-place where these kinds of messages have to pass on.

**Msangi:** In terms of the public-private partnership, the Bill and Melinda Gates Foundation is one of the few that focuses on education and agriculture. And I don't know whether, in terms of the linkages, if USAID had been there, but they've also actually been trying to improve the collection of basic indicators, and their data and policy program is going to help a lot in being able to get better indicators. But maybe they could also help rid some of these concerns, because those are very much within their mandate.



INTERNATIONAL FOOD  
POLICY RESEARCH INSTITUTE  
*sustainable solutions for ending hunger and poverty*

# Food Prices and Human Well-being

---

## Underlying Factors and Needed Responses

Siwa Msangi

Environment and Production Technology Division, IFPRI

“USAID and the Changing Face of Development”

Summer Seminar Series

August 5<sup>th</sup> 2008, Washington, DC

A decorative graphic at the bottom of the slide consisting of a dark purple curved shape on the left, a light purple curved shape on the right, and a solid gold horizontal bar at the very bottom.

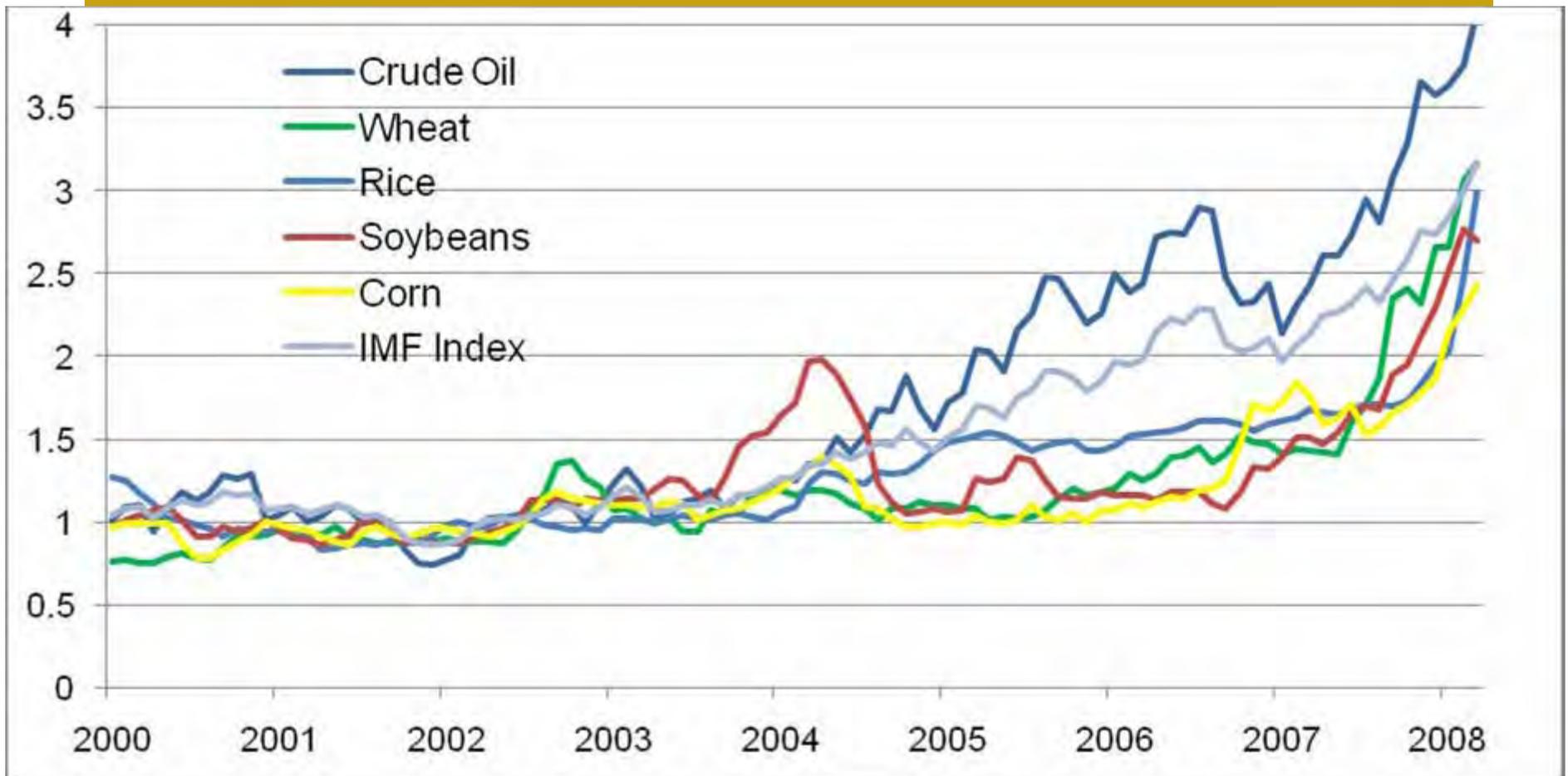
# Rising Food (and Energy) Prices

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**Upward pressures on key commodity prices is causing concern about threats to global welfare and food security for those who are vulnerable**

- **The ‘drivers of change’ are diverse – ranging from environmental to socio-economic changes**
- **Some drivers are fast-moving – while others are slow... affecting the short- vs. long-term differently**
- **While higher food prices is good news for producers, there are many poor net consumers whose well-being is threatened**
- **Higher energy prices hurt everyone – maybe help the environment (if helped by policies....)**

# Food and Commodity Prices, 2000-2008

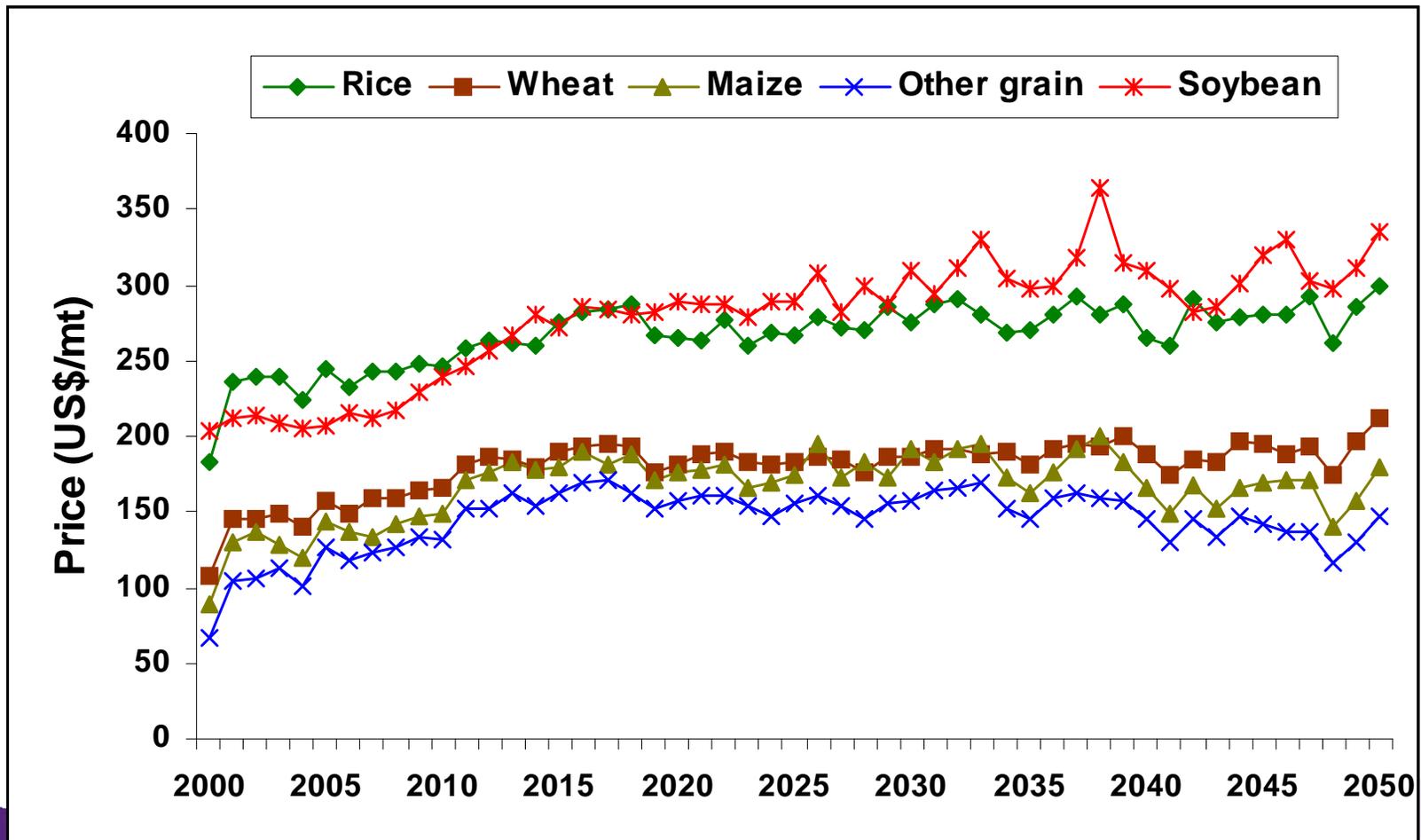


Food & commodity prices normalized to equal 1 (on avg.) for year 2002

Source: IMF financial statistics, tabulated by Tyner (2008)

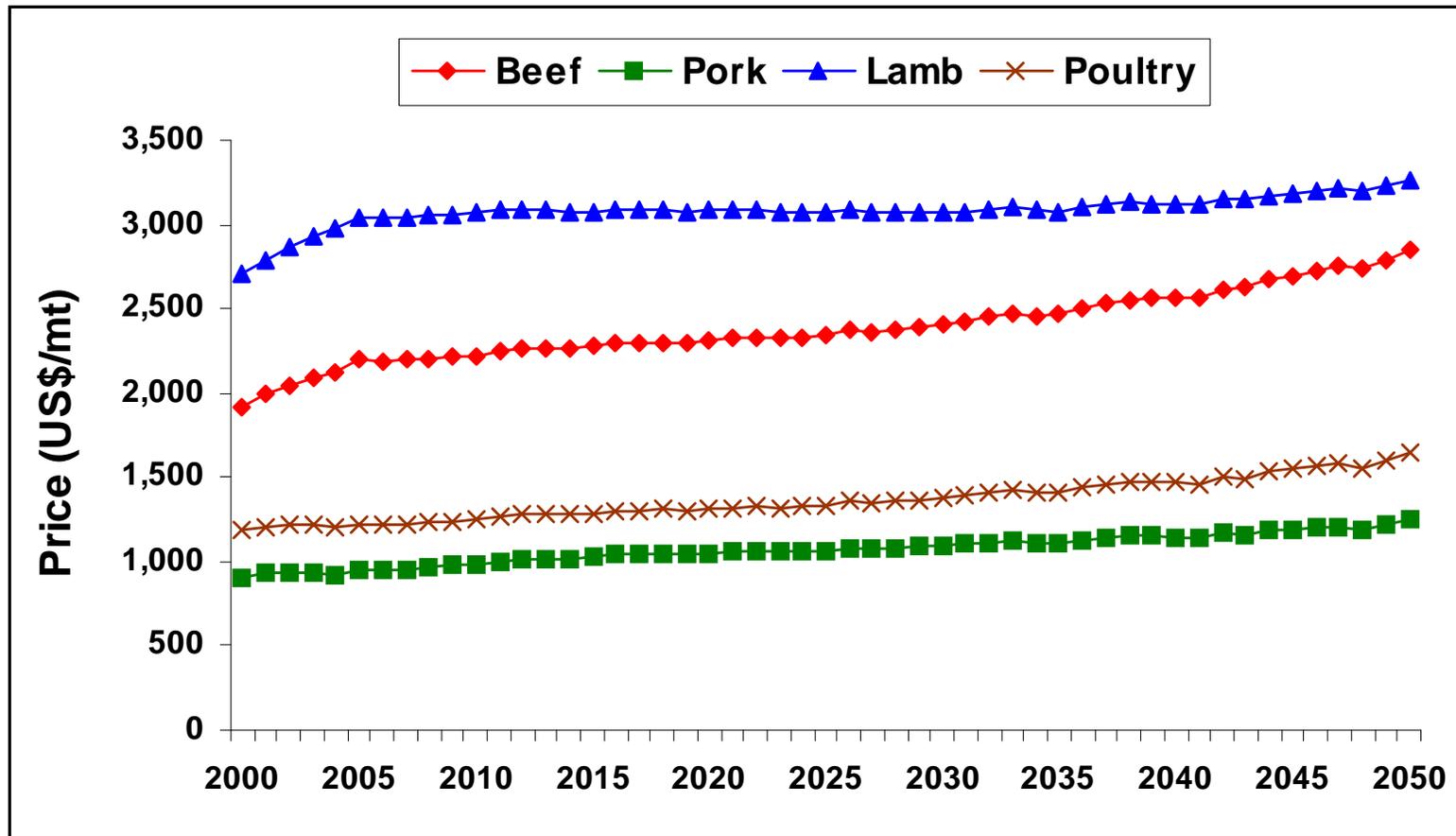
# Real world food prices projected to rise 30-50 percent beyond current high levels

## Cereals



# Real world meat prices projected to rise 20-30 percent beyond current high levels

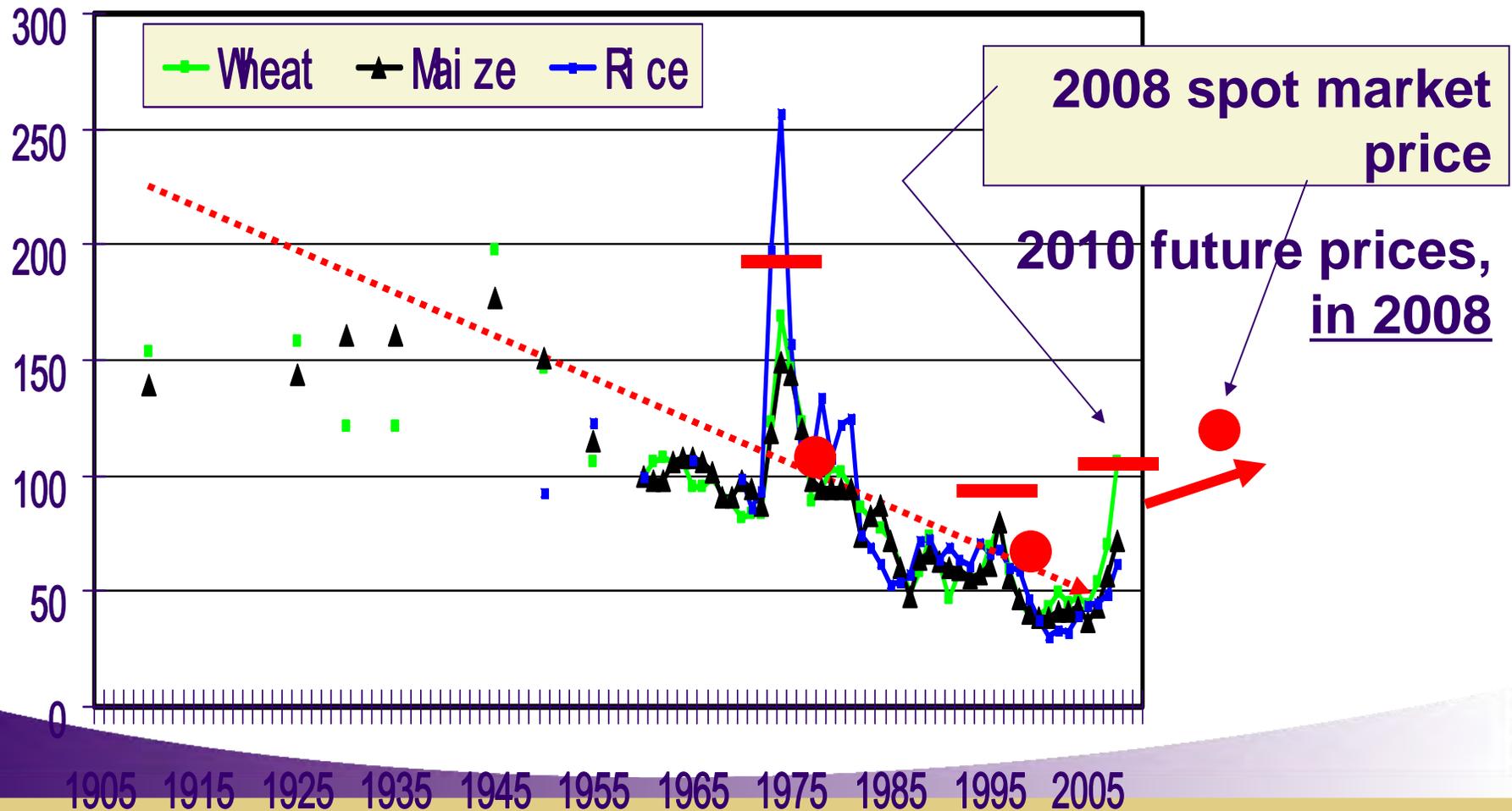
## Meat



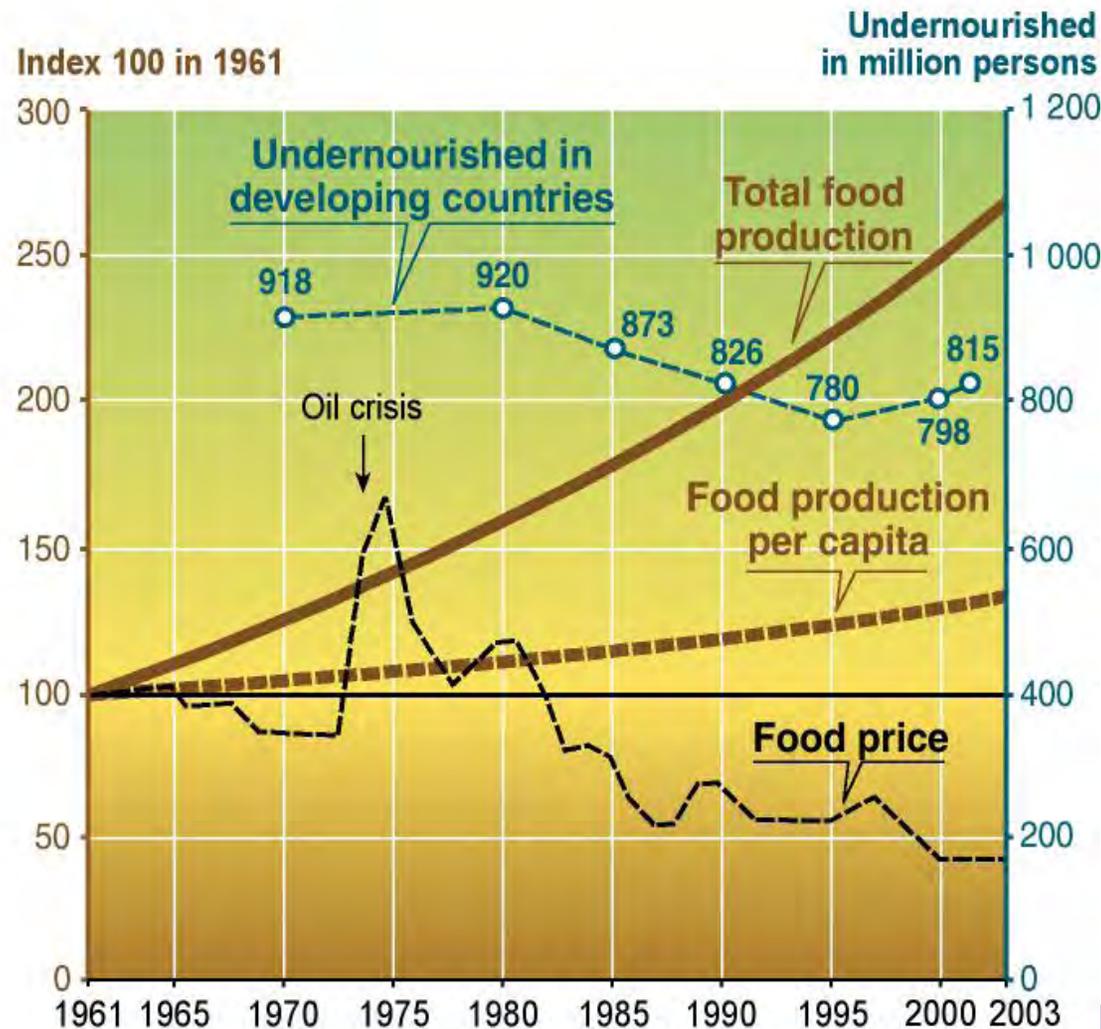
Source: IFPRI IMPACT projections, business as usual, IPCC SRESB2 climate scenario, September 2007.

# Relationship between spot and futures prices during CURRENT “world food crisis”

Real cereal price index  
(All prices = 100 in 1960)



# Food Production, Malnourishment & Price Trends



Moving towards a new regime? →

Will the improvements in human welfare also reverse themselves?

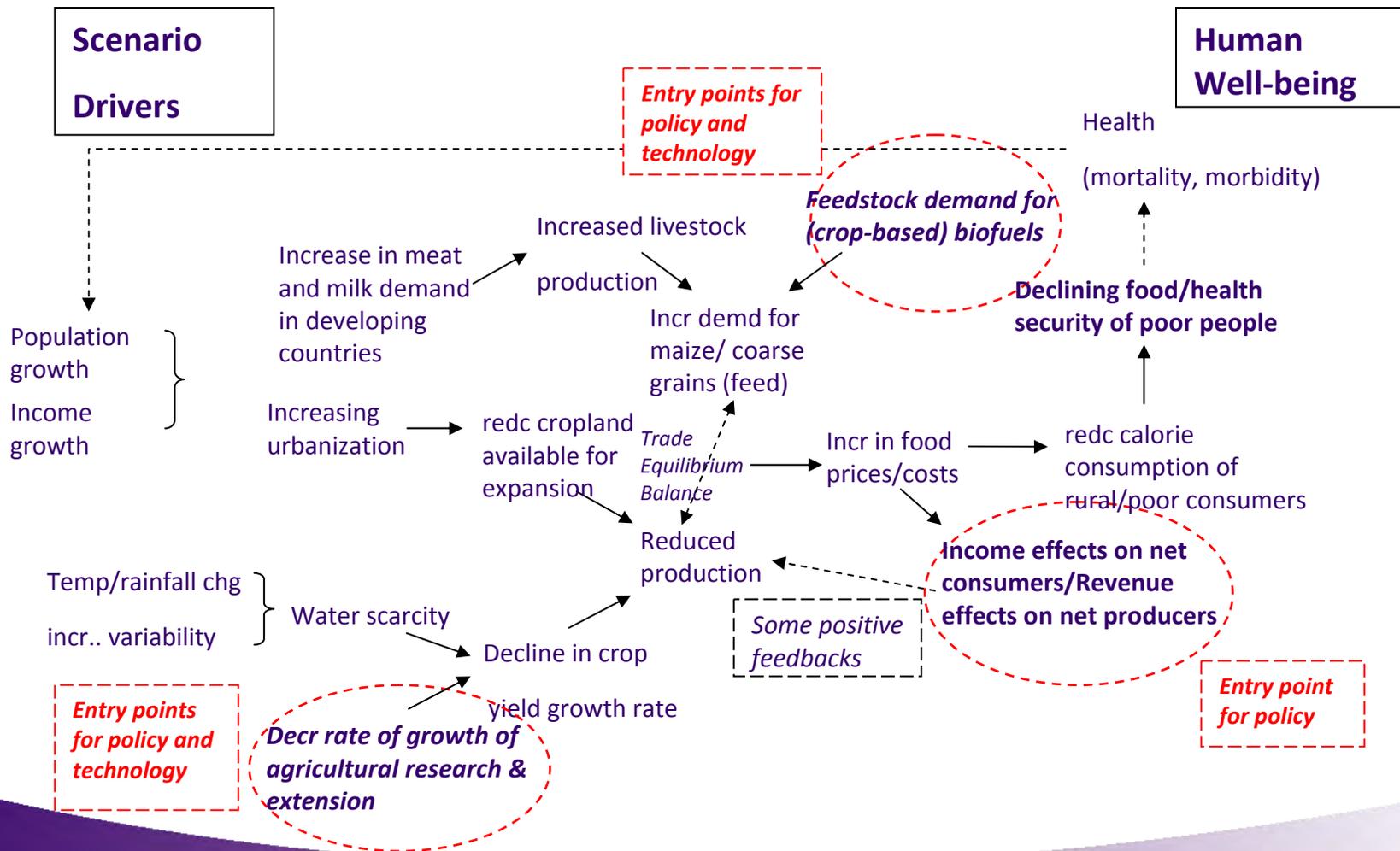
# Various “Drivers” underlie global trends in food prices

---

**A number of factors at work which determine changing conditions in global food markets – not a straightforward task to assign causality**

- **Socio-economic drivers – rising incomes and demands for meat (and the necessary feed grains to supply it)**
- **Environmental drivers – increasing variability in climate facing agriculture**
- **Policy drivers – renewable energy initiatives and blending targets for crop-based biofuels**

# Drivers of Change in Food Systems



# Some drivers are 'fast-moving', while others are slow.....

---

## Slower-moving drivers – which play into long-term

- **Socio-economic growth and demographic change (population and pc income didn't surge overnight in China and India – neither did their consumption)**
- **Longer-term shifts in climatic conditions**
- **Slowing yield growth (relative to demand growth)**

## Faster-moving drivers of change

- **Short-term environmental shocks which cause seasonal losses of harvest/yield (floods, droughts)**
- **Rapid increase in energy demand – and surge in crop-based biofuels production**

# Combined with other factors....

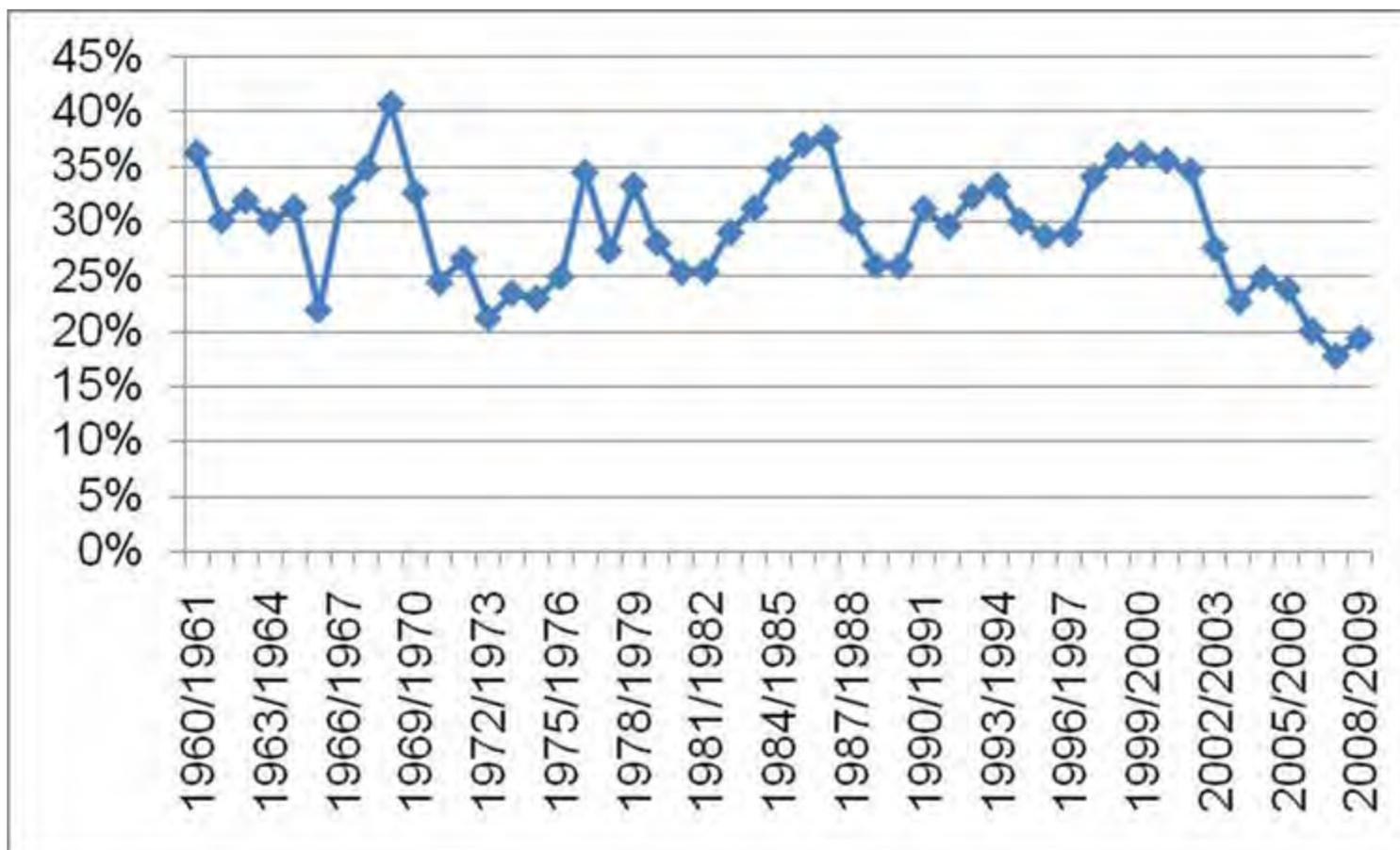
---

**These drivers of change, when combined with other factors that create a 'tight' market environment, can lead to the kind of effects that we have observed**

- **Steady decline in cereal stocks**
- **Increasing levels of private capital invested in grain markets**
- **Unfavorable macroeconomic environment (dollar devaluation) makes it harder for some consumers**
- **Unilateral trade actions by individual countries only help to exacerbate the impacts**

# Stocks-to-Use Ratios and Tight Markets

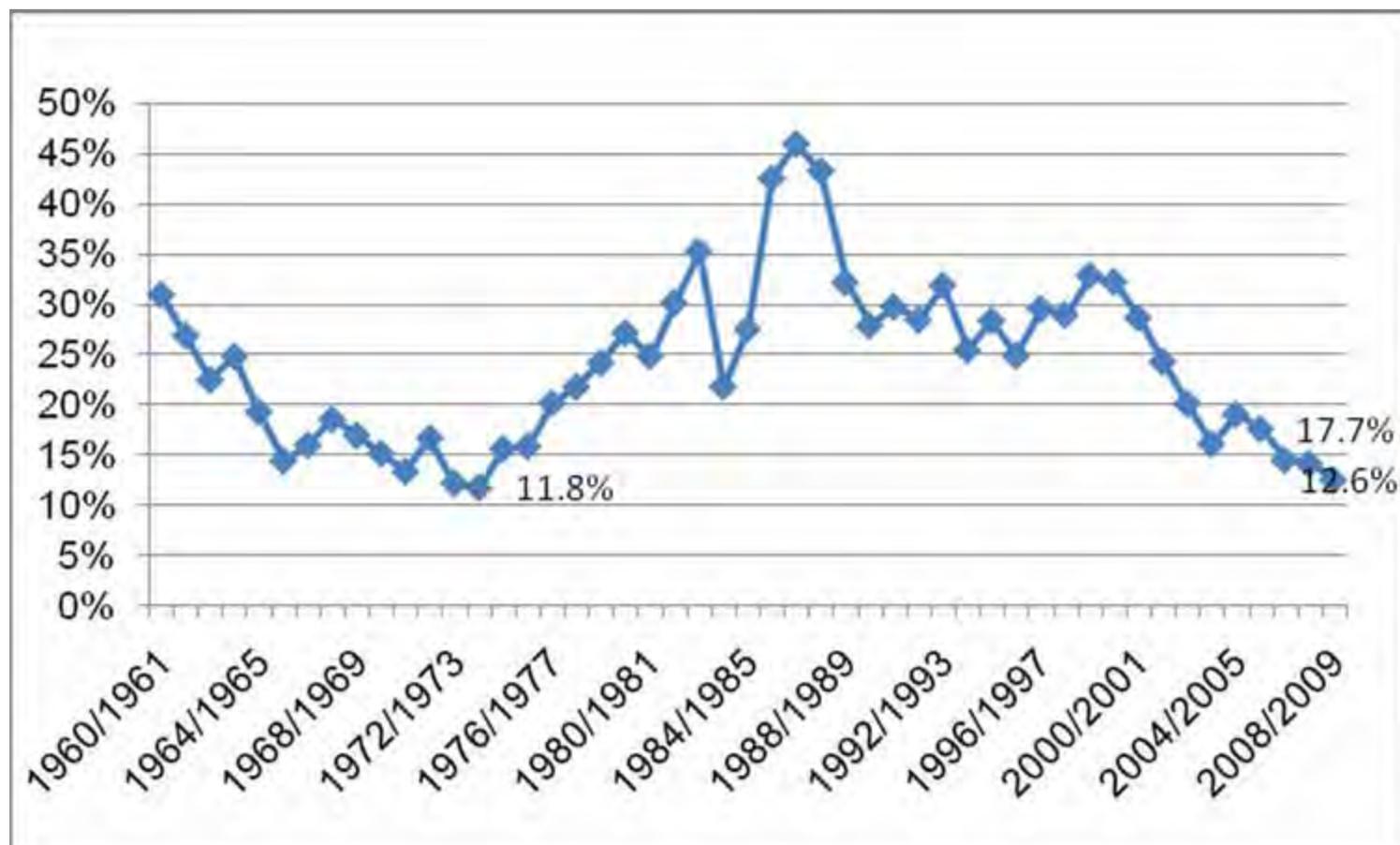
World wheat stocks-to-use ratio (1960-2008)



From Abbot *et al.* (2008)

# Stocks-to-Use Ratios and Tight Markets

World corn stocks-to-use ratio (1960-2008)



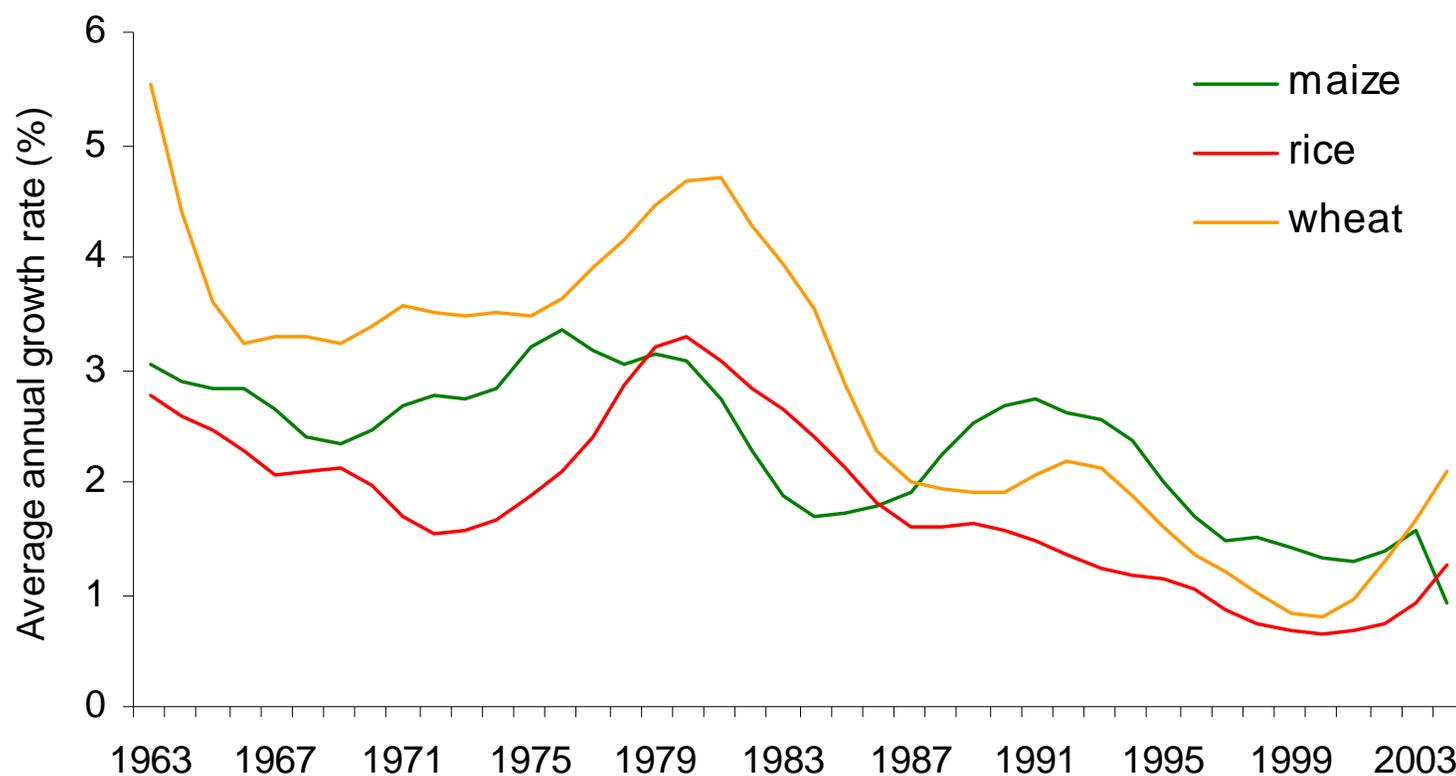
From Abbot *et al.* (2008)

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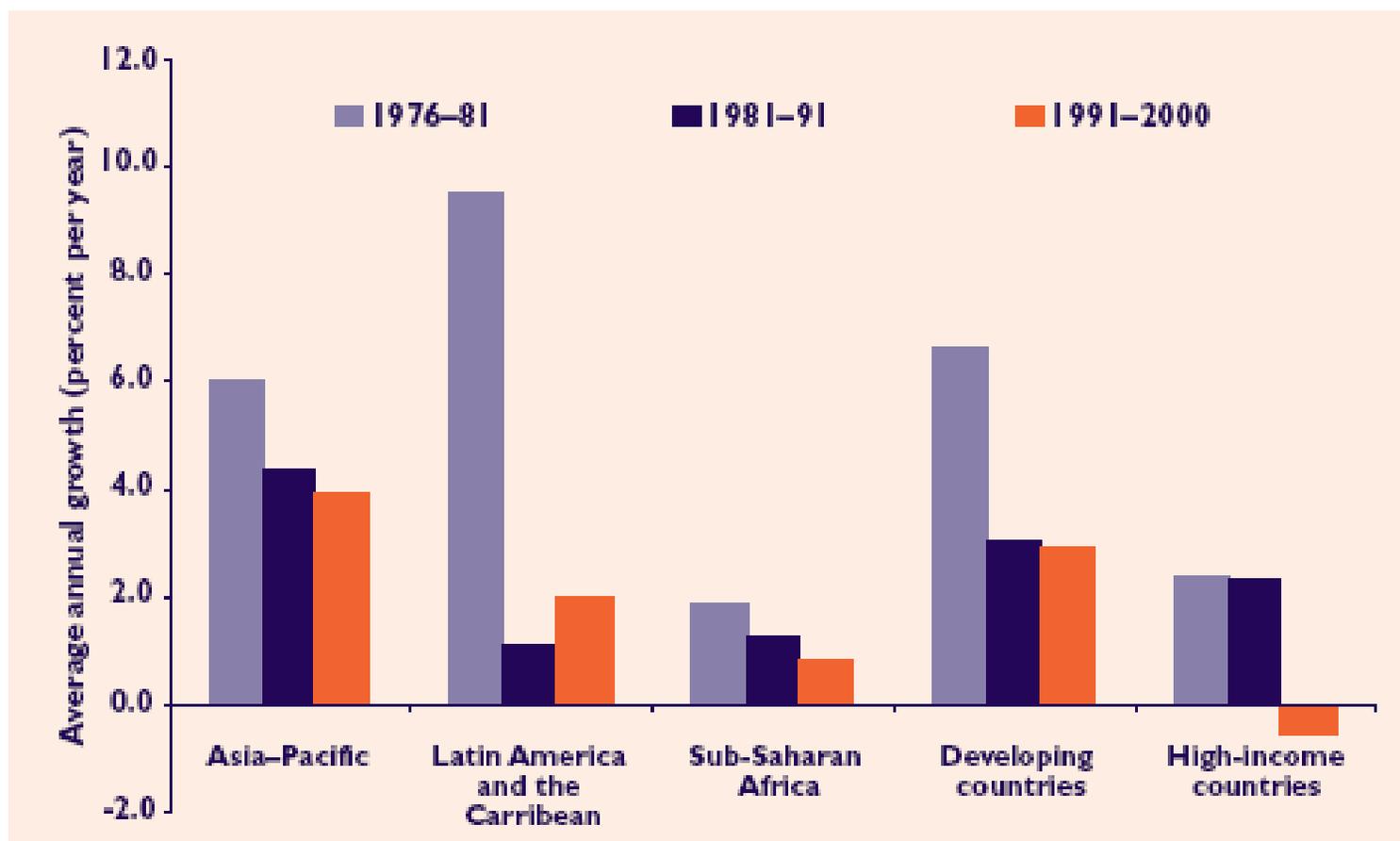
# Slowing Agricultural Productivity Growth

# Declining productivity growth

Growth rates of yields for major cereals in developing countries are slowing

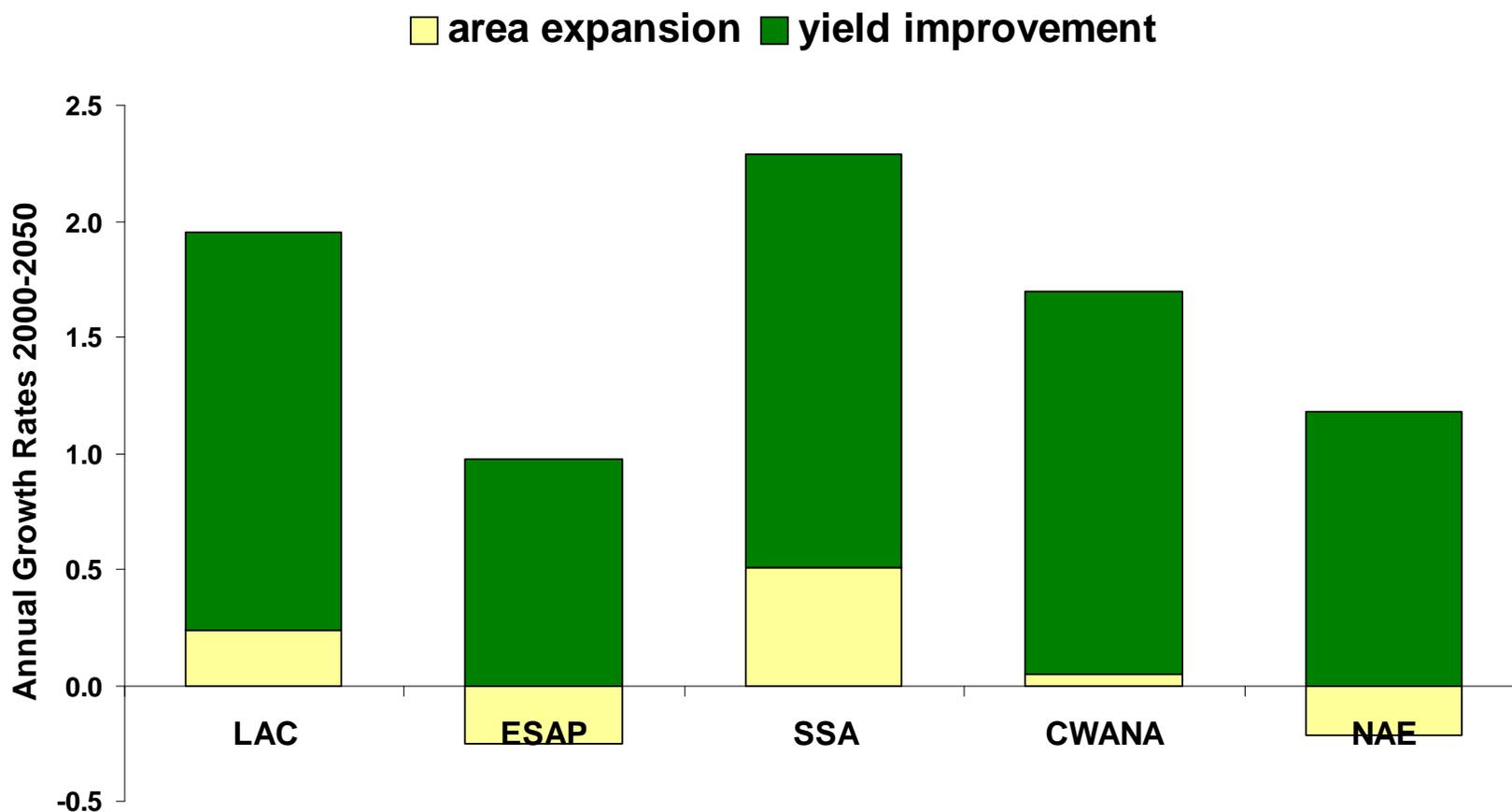


# Public agricultural R&D spending trends, 1976-81, 1981-91, 1991-2000



Source: Pardey et al. 2006.

# Projected sources of cereal production growth



Source: IFPRI IMPACT projections, September 2007

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# The Impact of Biofuels

# How do you isolate the effect of biofuels from these other drivers?

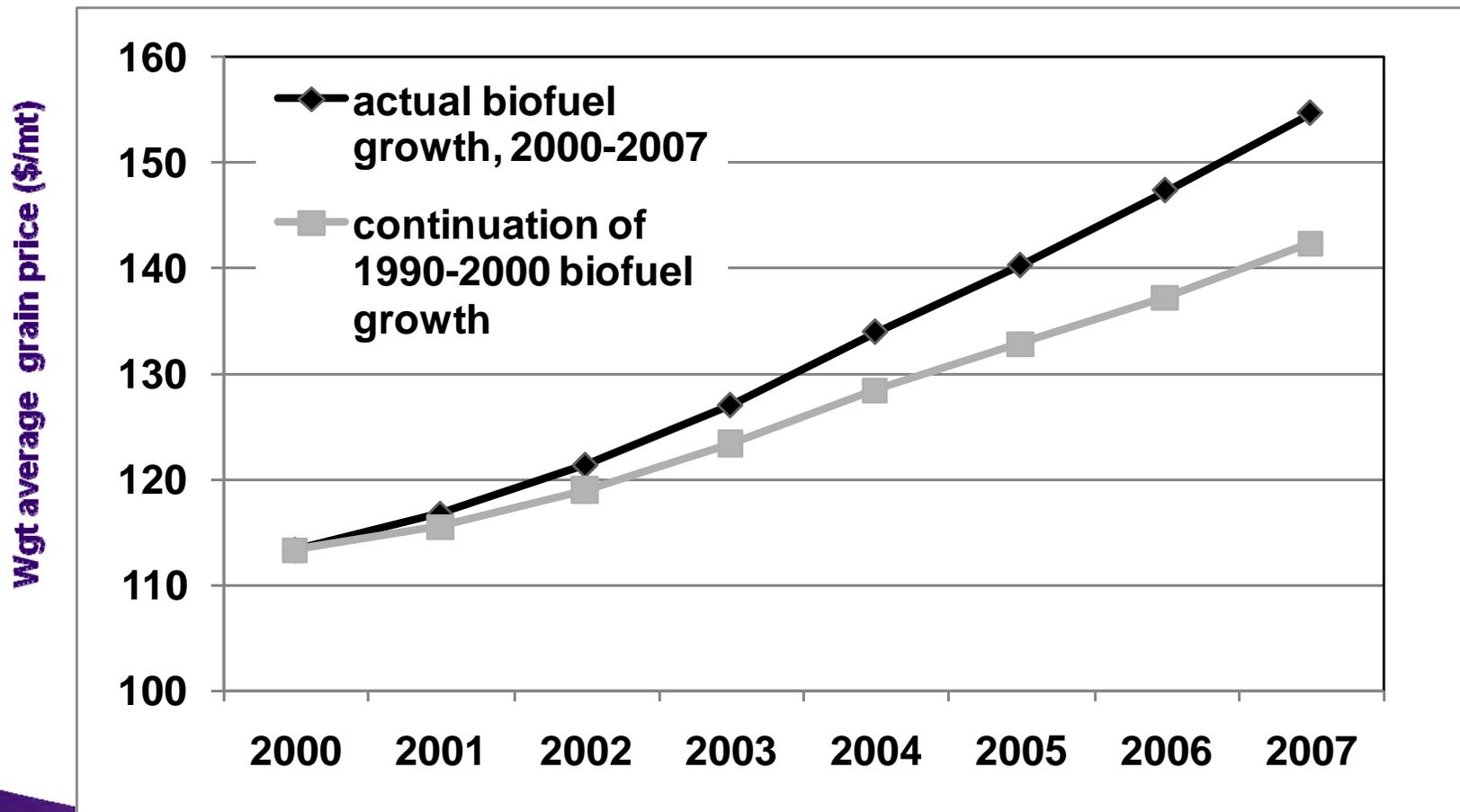
---

A fairly complex issue, as you can imagine. Most researchers wouldn't attempt to answer this question, but we went ahead and tried to, anyway.....

- Set up a counterfactual experiment, based on historical observed trends to which the baseline is set
- See how much we would deviate from that baseline model simulation if biofuels growth were reduced
- Also try and do forward-looking simulation experiments....

# Biofuels counterfactual simulation for grain prices

30% difference in 2000-07 change in avg grain price

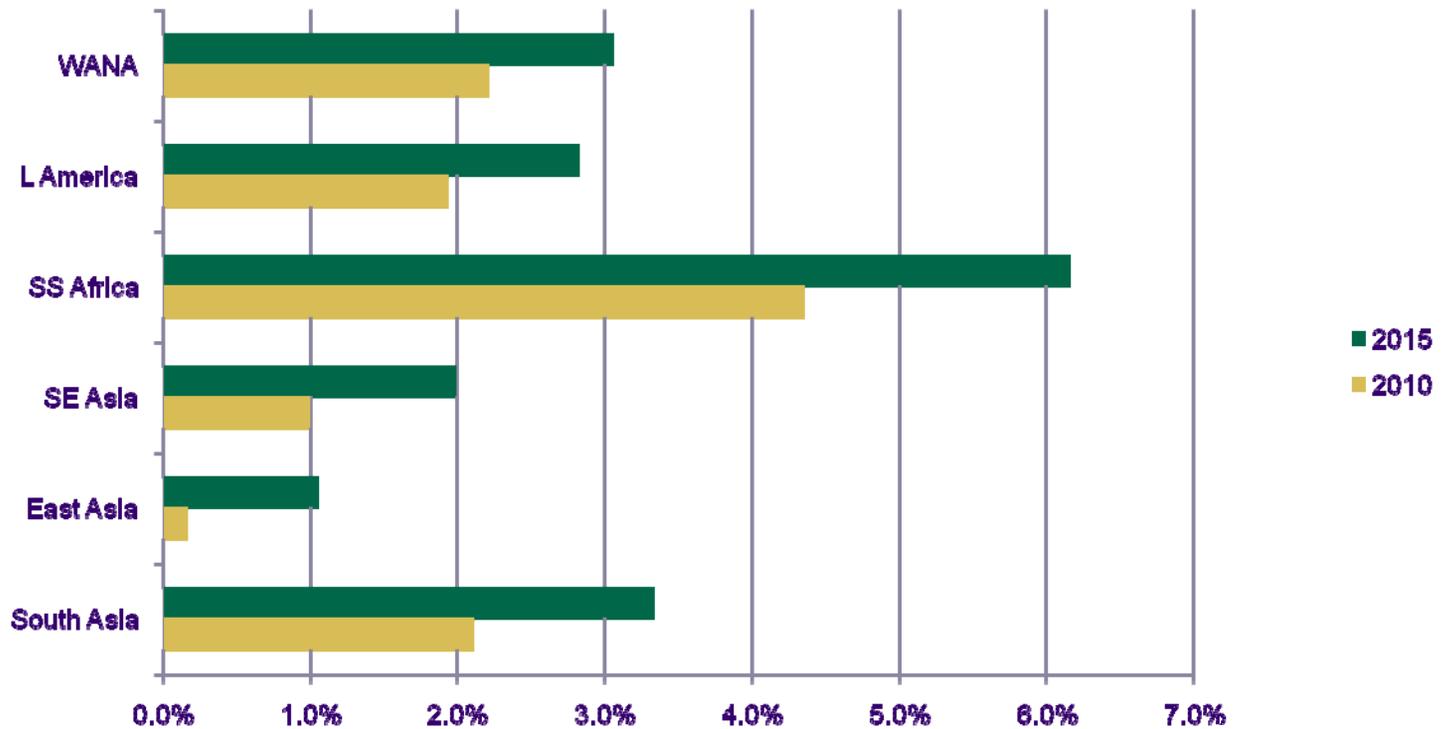


# Biofuels scenario projection for grain prices

Hold biofuels feedstock demand at 2007 levels – compared to baseline



# Changes in calorie availability under “freeze” scenario compared to the baseline levels (%)



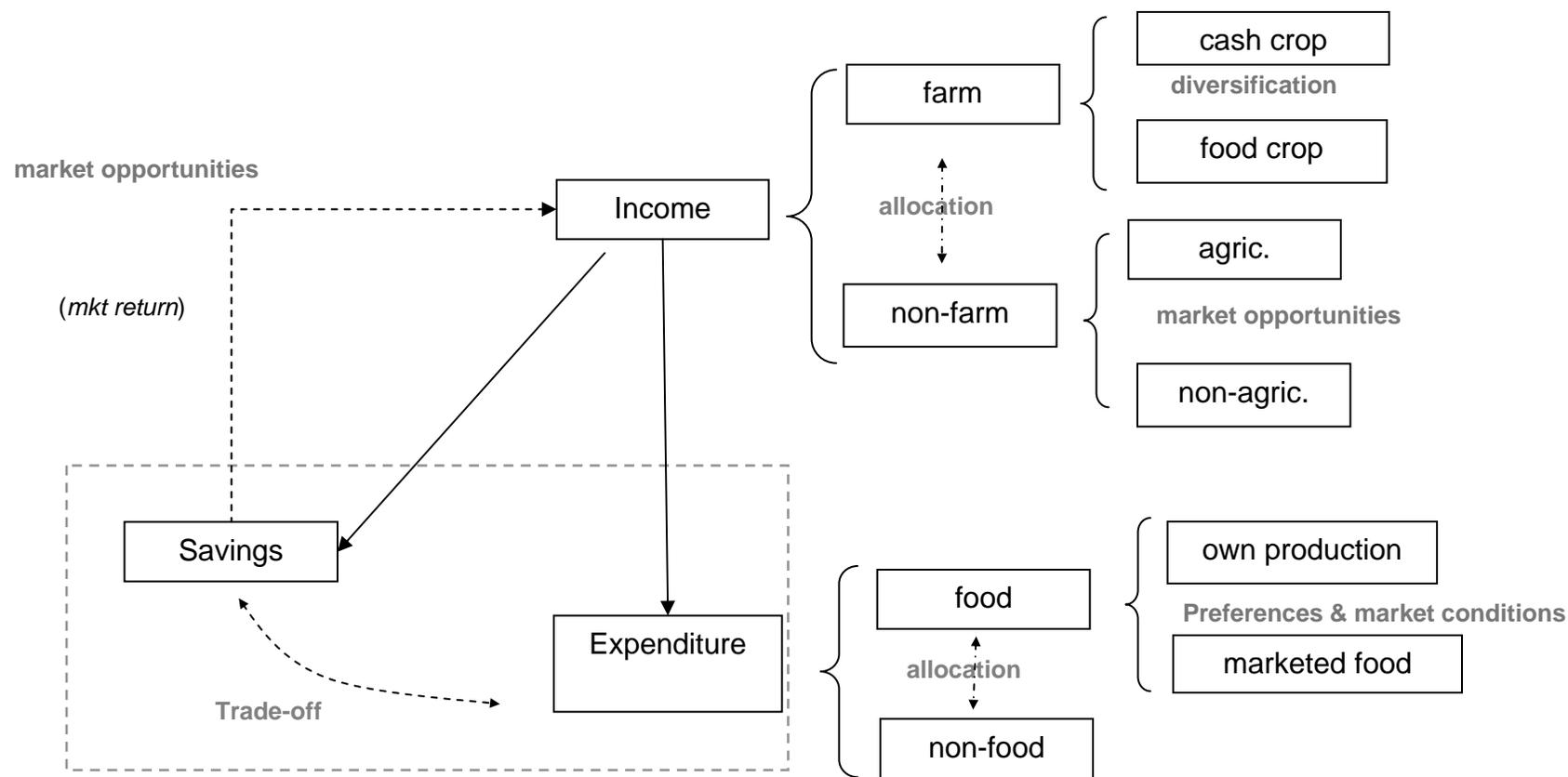
Source: IFPRI IMPACT projections

# Welfare Impacts of Food and Energy Prices

---

- Price changes in food and energy markets have impacts on households
  - Some impacts act directly through market prices
  - Others are indirect in terms of the cost of production or transportation for other marketed goods
  - Net sellers and net buyers are affected differently
- The gain that net sellers receive from price increases may not be enough to offset the negative impacts that net buyers undergo
- It also depends on the shares of household expenditure that go towards food or energy purchases – which varies by income level

# Key Trade-offs within the Household



# Trade Policy Matters....

---

- There are two dimensions of trade policy that matter, as far as biofuels are concerned
  - The trade in biofuels feedstock commodities (maize, sugar, soybeans, palm oil, seed oils, etc..)
  - The trade in the biofuels products themselves (ethanol and biodiesel) – this seems to be the most important dimension, as far as price impacts
- Allowing for freer trade in ethanol means that gasoline can be more easily replaced by renewable fuels when energy prices go up...
- The combination of tariffs, tax credits/subsidies and mandates can lead to perverse effects

---

# Policy Implications

# Summing up: Causes of Tightness and Volatility in the World Food Markets

---

1. Fast-growing demand (from Biofuels)
2. Other demand (food and feed)
3. Slowing productivity growth (under-investment in agricultural technology)
4. Environmentally-driven production shocks (increasing climate variability)
5. Trade policy, low stocks, speculation, \$ devaluation
6. High input and transport costs (energy price)
7. Population growth and socio-economic change

# Which policy response should not be chosen to deal with high prices?

---

Not:

- Export bans (starving your neighbor)
- Import subsidies
- Subsidies only for vocal middle class
- Restoration of production subsidies
- Policing and threatening traders
- Attempting to curb the specific food price inflation with general macro policies

# Policy actions to correct and mitigate the food price problem

---

## Global policies and international aid

1. Trade: Eliminate agricultural trade barriers, and export bans; establish international facility to finance food imports for most needy countries
2. Agricultural growth: Expand aid for rural infrastructure, services, agricultural research and technology
3. Protection of the vulnerable: Expand food and nutrition related development aid, including safety nets, child nutrition, employment programs

# A two-track approach needed in developing countries

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*A global and national food, health, and nutrition security initiative focused on the vulnerable*

*A global and national agricultural productivity initiative focused on small farmers*

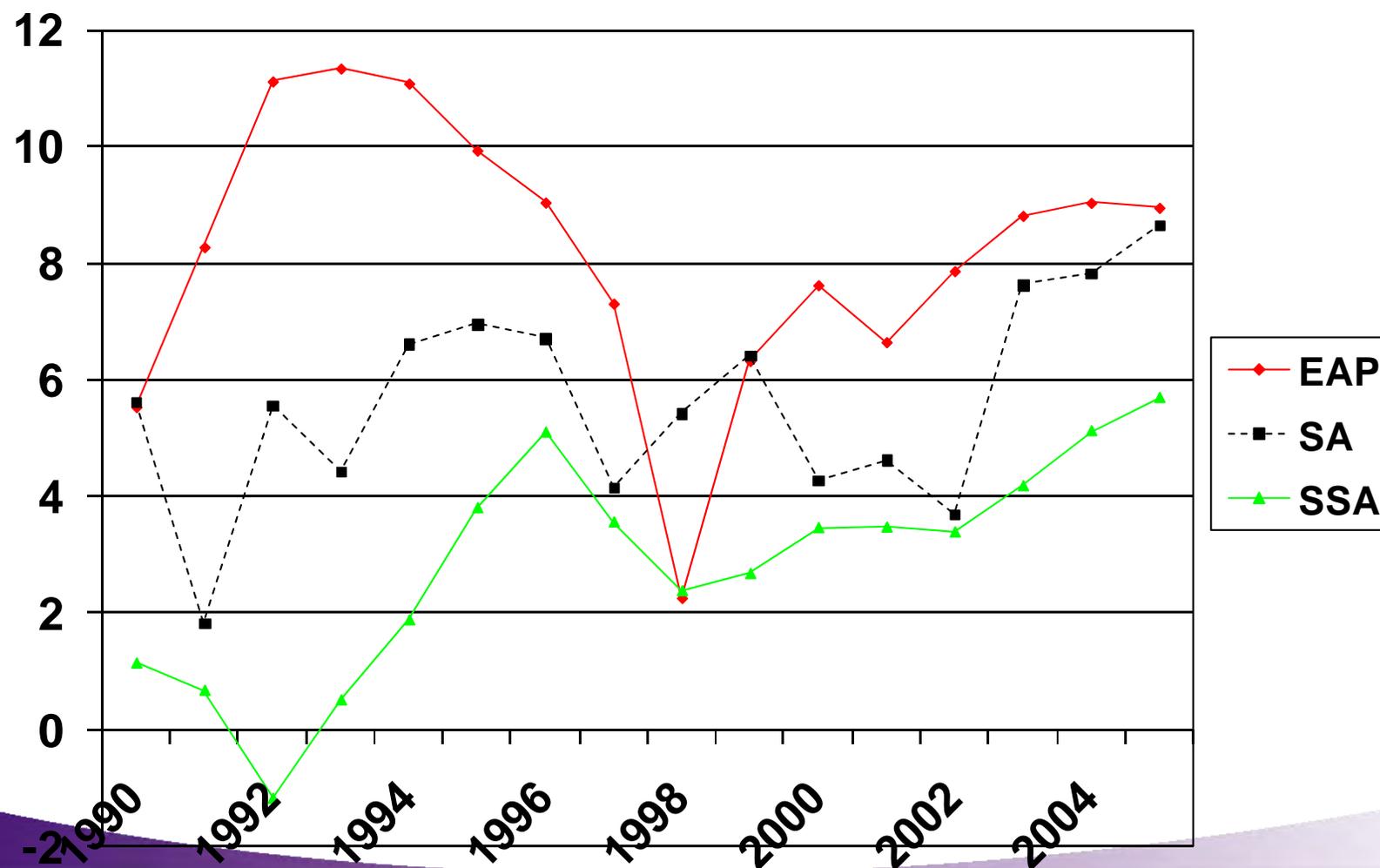
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**Thank You!**

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# Extra Slides

# Rapid growth in GDP (annual %), East Asia, South Asia, and Sub-Saharan Africa

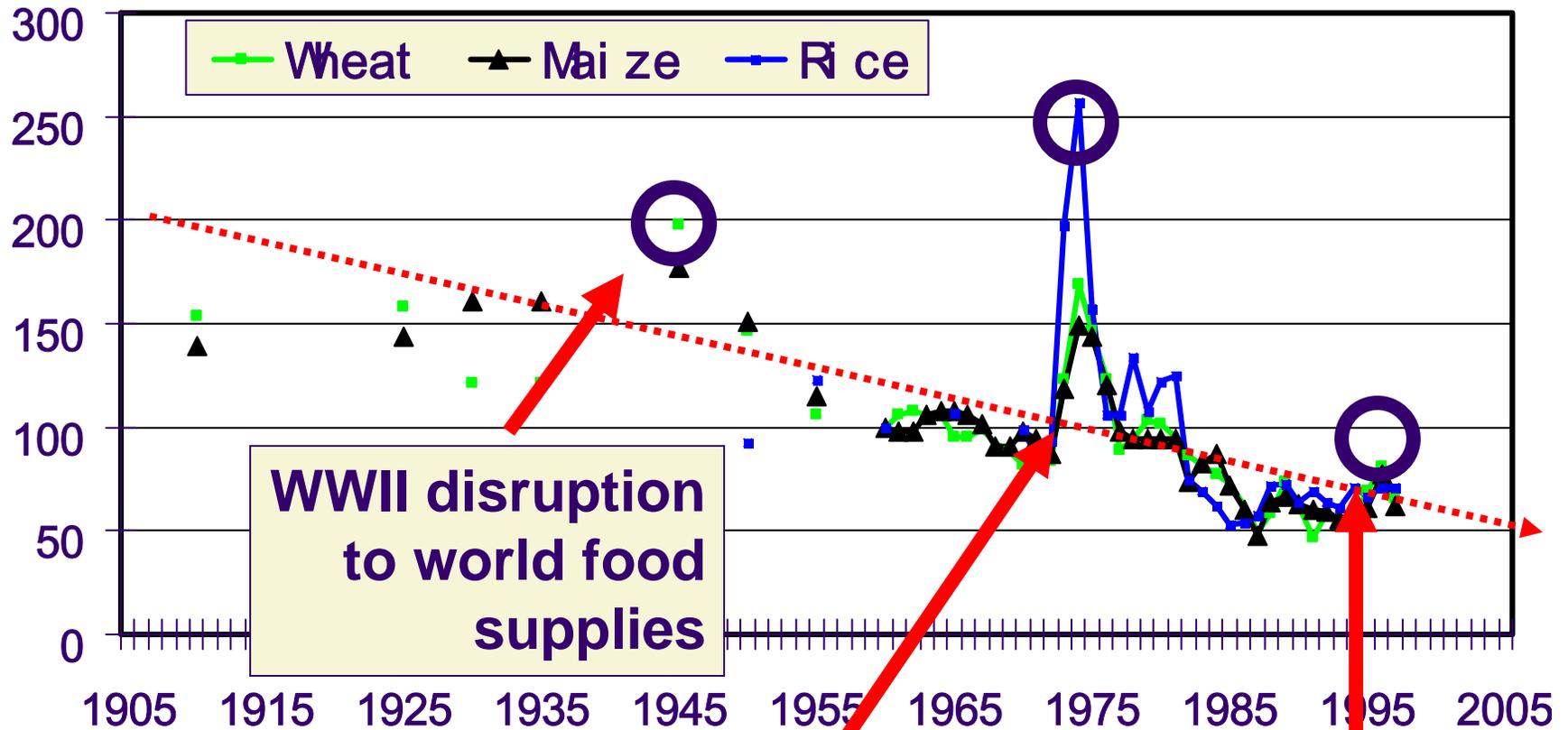


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# More to the Price Story....

# All Previous Spikes Proceeded by Major Global Supply Shock (in a major exporting country)

Real cereal price index  
(All prices = 100 in 1960)



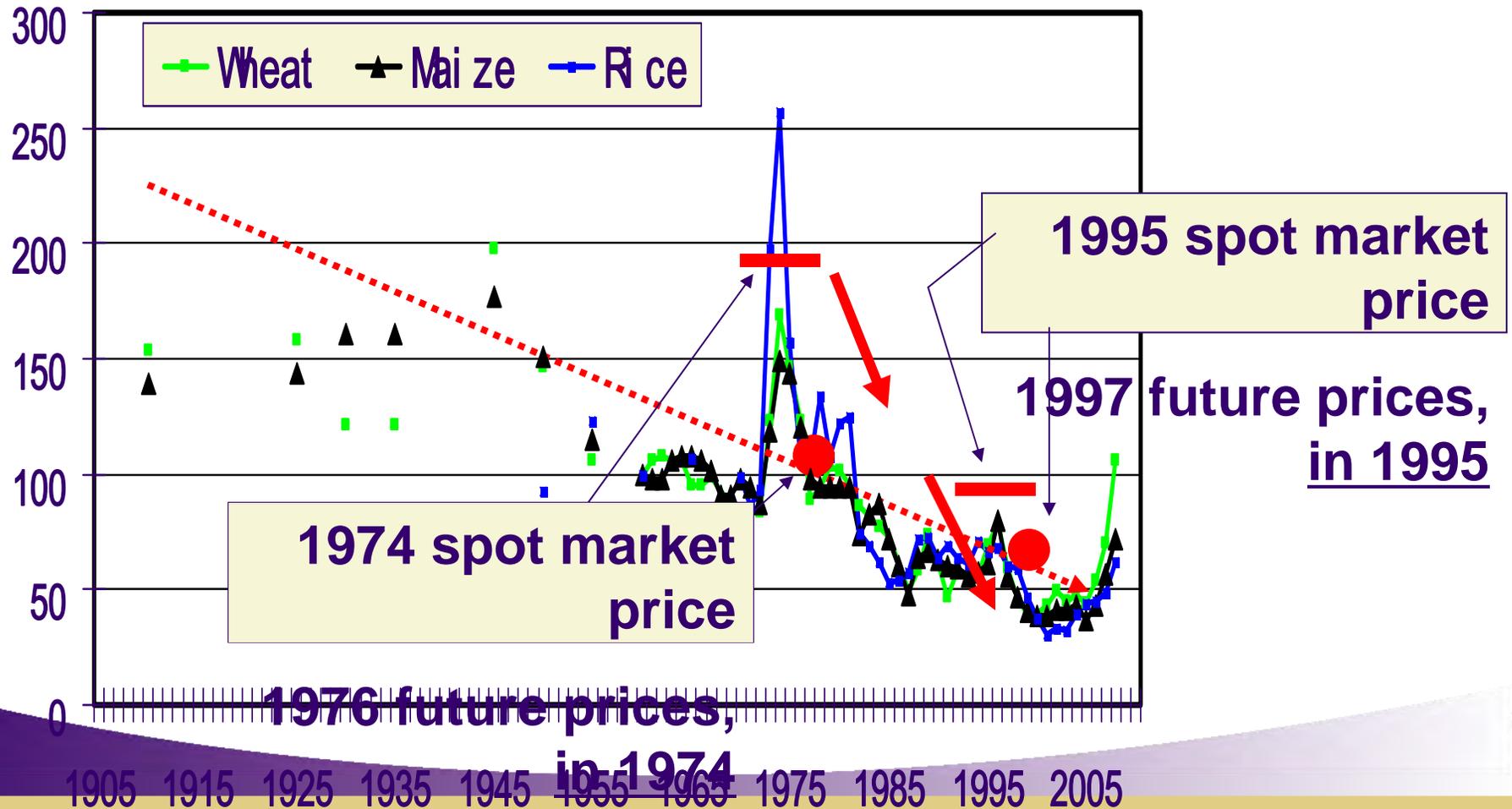
WWII disruption to world food supplies

Worst US Drought since the 1930s

Midwest/Canadian Drought + Failure of Brazil soybean crop

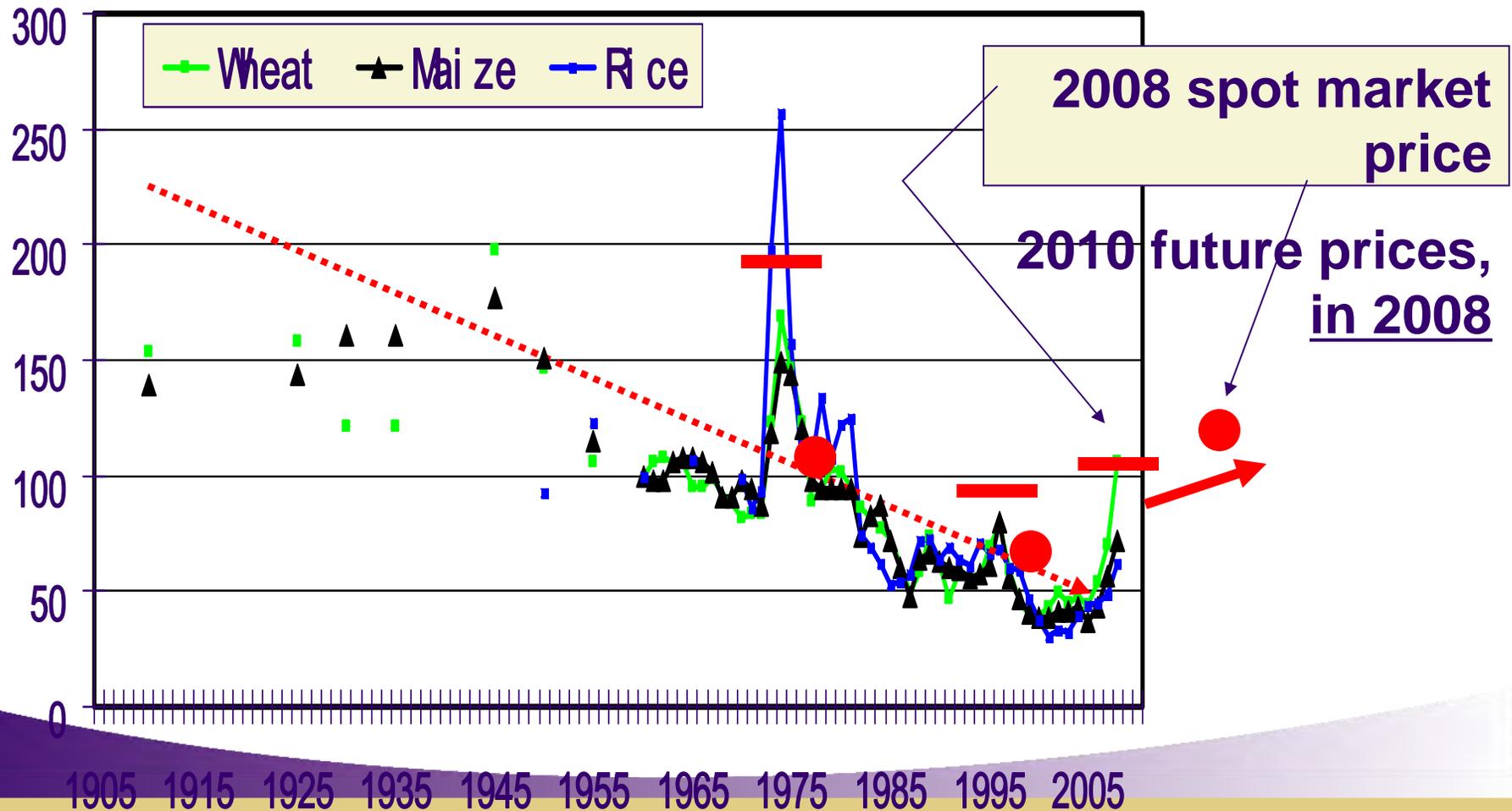
# Relationship between spot and futures prices during previous “world food crises”

Real cereal price index  
(All prices = 100 in 1960)

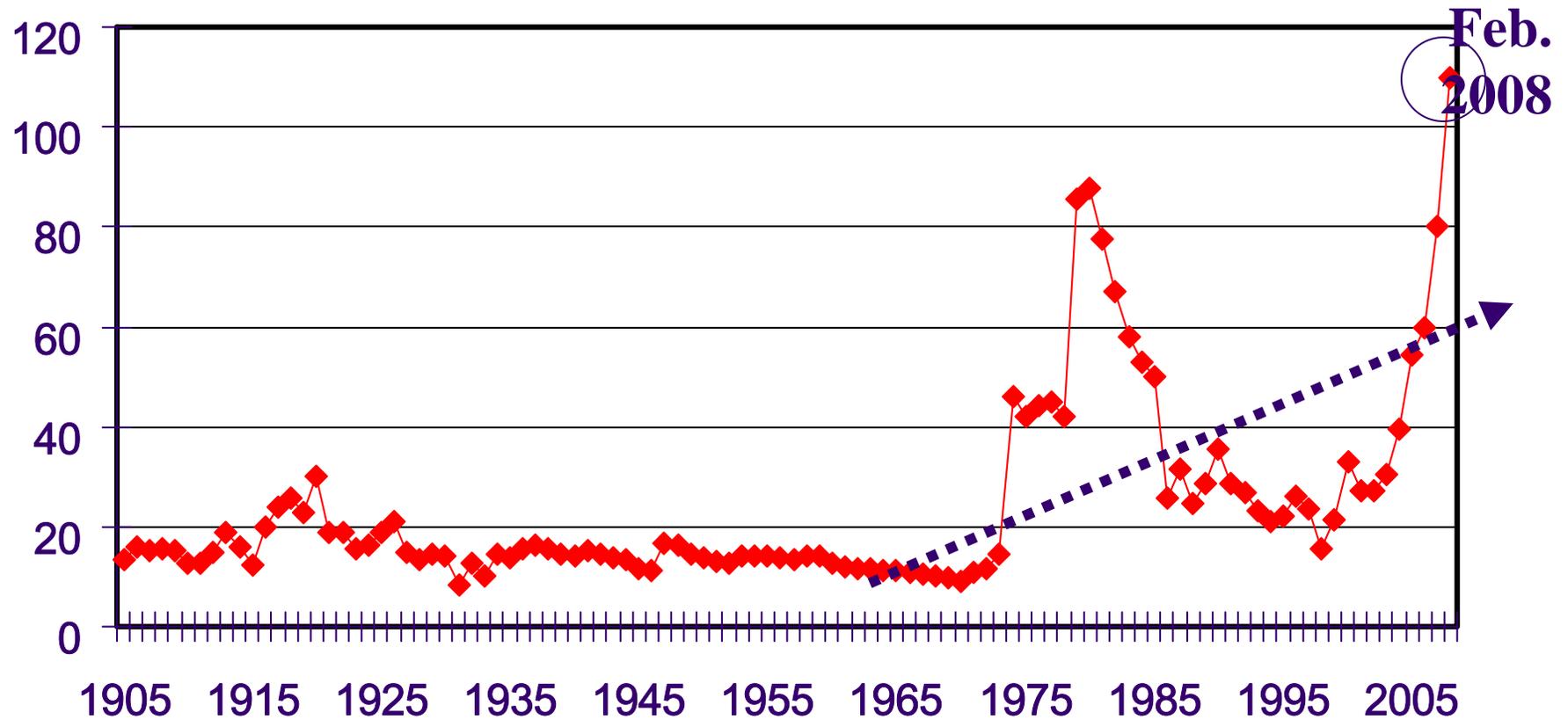


# Relationship between spot and futures prices during CURRENT “world food crisis”

Real cereal price index  
(All prices = 100 in 1960)



# Crude oil prices (US\$/barrel in real 2007 prices)



# US\$ and EURO prices and ... so what?

---

January 2000- January 2008 change

Wheat US\$/ton nominal +240 %

Wheat US\$/ton “real” +172 %

Wheat EURO/ton +134 %

**What matters for the poor is purchasing power**

---

# Policy Prescriptions

# Priorities for Social Protection, Health and Nutrition: Short term

---

- Rapid scale-up of interventions focusing on targeted cash transfers to the food insecure
- Additional focus on most vulnerable: pre-school and early childhood nutrition, school feeding programs
- Health services targeted for the poor

# Options for Social Security and Social Protection: Longer Term

---

- Build on existing institutions
- Strengthen tax base
- Improve information and incentives
- Move toward comprehensive health insurance coverage
- Draw on global lessons, including from high-income countries

# Agricultural Productivity Initiative

---

- Increasing crop productivity: agricultural research, water management, and rural investment
  - Emphasis on crop breeding (including biotechnology) targeting abiotic and biotic stresses
  - Water harvesting, minimum tillage, integrated soil fertility management
  - Rural infrastructure investment to improve access to markets, risk insurance, credit, inputs

# Integration of growth and environmental policies

---

- Need full integration of policies aimed at growth and environmental sustainability
- Dealing with scarce land and water resources and trade-offs with environment can only be met by bringing externalities into the growth equation
- Create markets and new value streams for agricultural ecosystem services

# Create and expand markets in natural resources

---

- Establish economic incentives for water use
- Expand markets for environmental services (watershed management, biodiversity)
- Develop markets for agricultural and forest carbon, generating new value streams in rural areas through carbon mitigation

# An international “Pact for Food Security”

---

Taking global action with international organizations, national governments, regional and sub-regional organizations, private sector now

1. Crash programs with subsidized seeds, fertilizer, and credit are not sustainable
2. Instead rely on the current high food prices to boost production, but immediately move to a big investment plan for agriculture: agricultural research, rural roads, irrigation infrastructure
3. Set up an agricultural production investment fund for developing countries that is additional to existing plans

# What will it cost?

Investments for rapid agriculture production growth to meet MDG 1 (which requires a boost of 50% in agricultural productivity growth):

## 2005 IFPRI estimate:

Incremental investments: \$16 billion per year, 2005-15 for agricultural research, rural roads, irrigation infrastructure.

Of this approximately \$8 billion for SSA and \$5 billion for South Asia, \$3 billion for others

## 2008 updated estimate would need to take account of:

- changed US\$ value
- changed economic and poverty circumstances
- might be up to twice the above quoted values



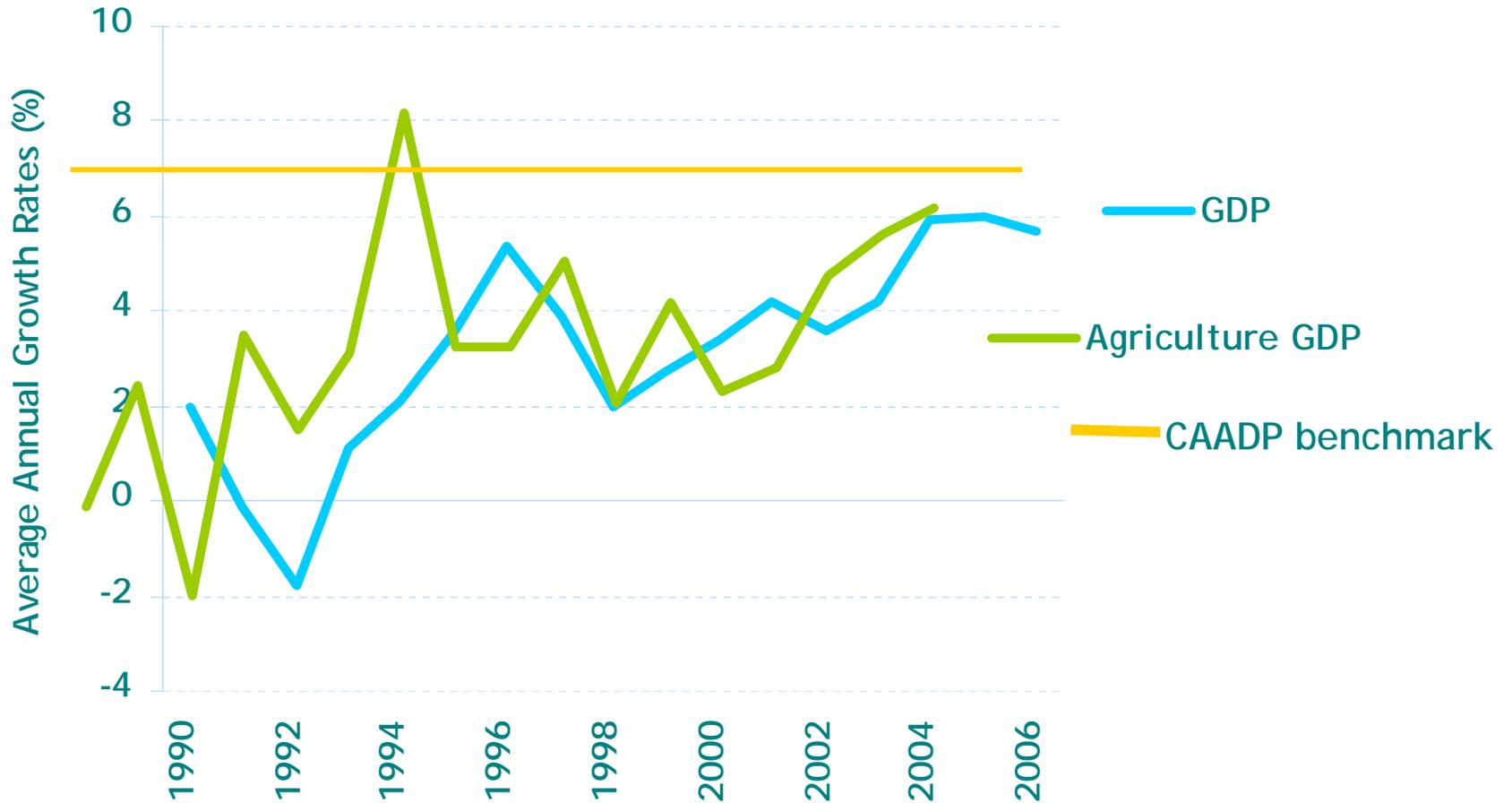
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# **Food Security in Africa: USAID Response**



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African continent-wide growth has been positive and stable in recent years

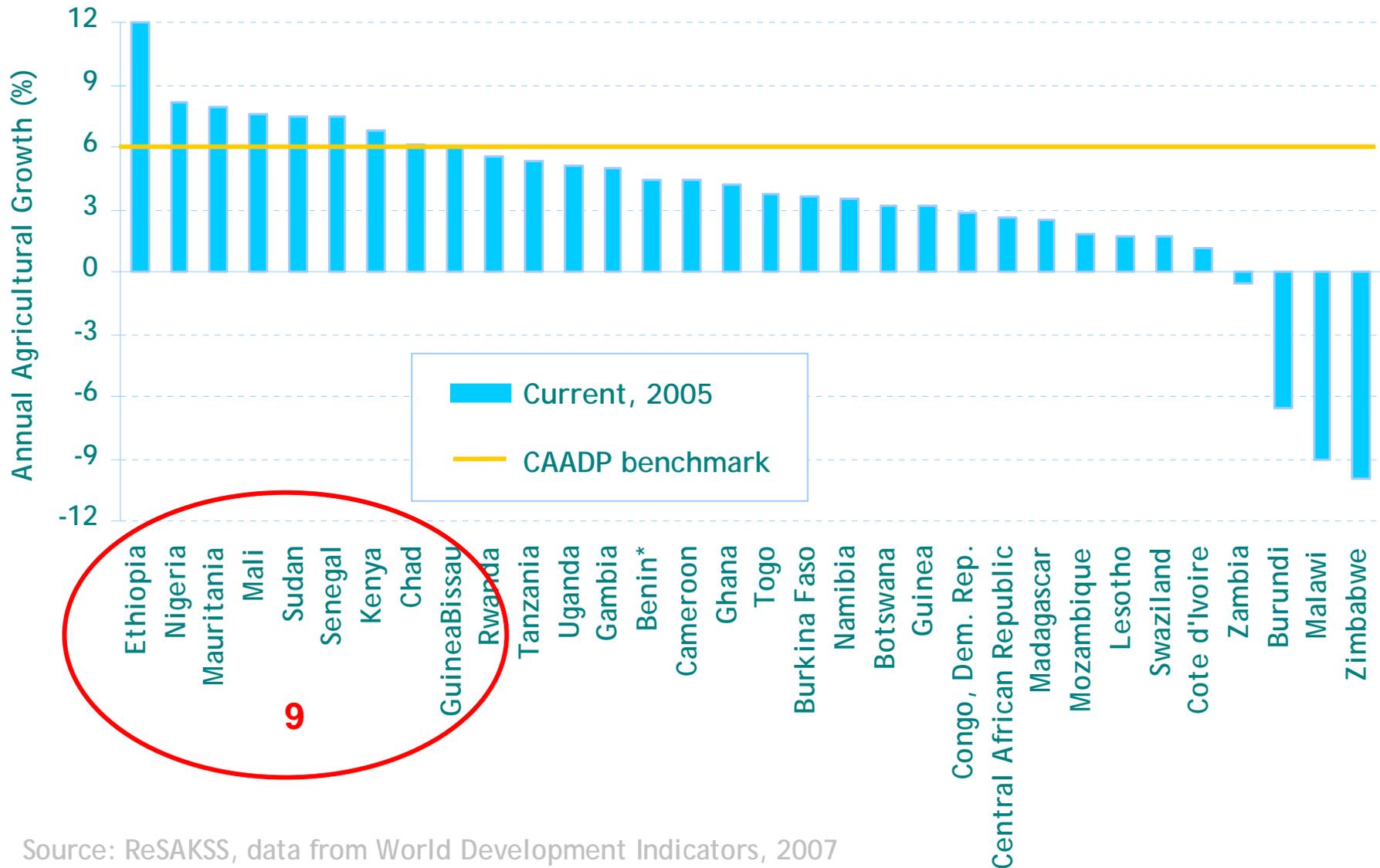


Source: ReSAKSS, data from World Development Indicators, 2007



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# Achieving 6% Agricultural Growth (Year 2005)

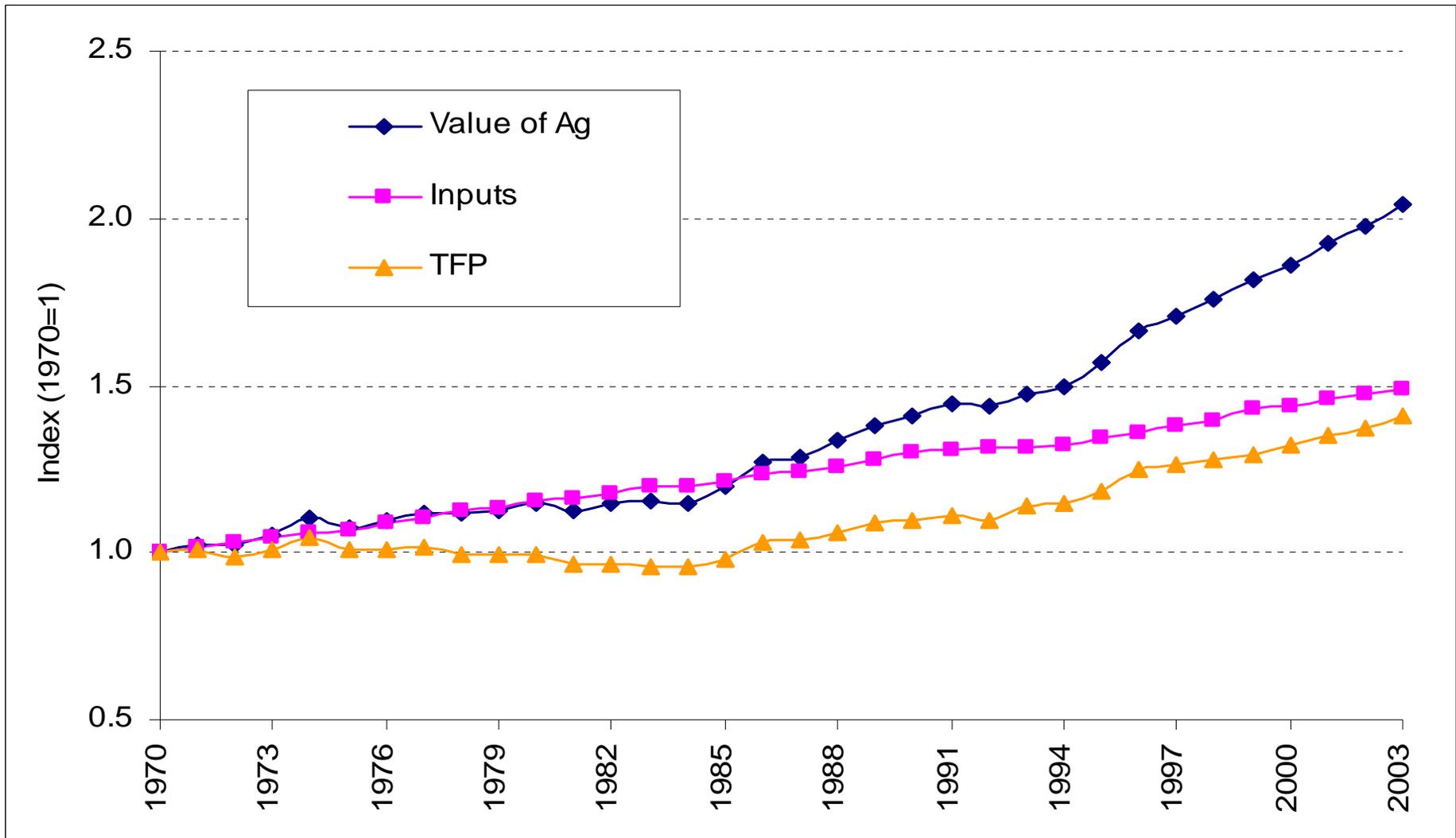


Source: ReSAKSS, data from World Development Indicators, 2007



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# Overall agricultural productivity has also been rising, but still too slowly

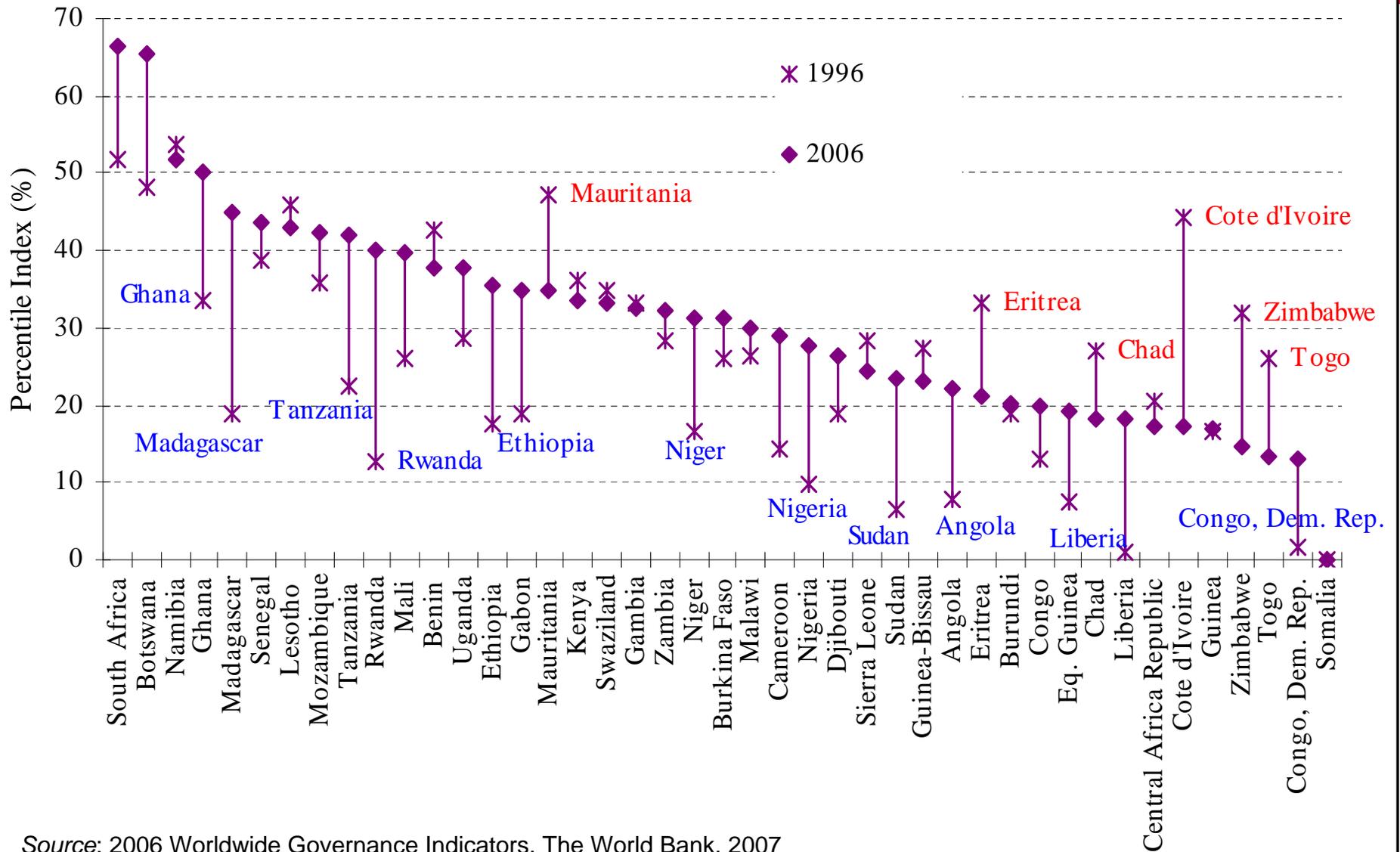


Source: Ni-Pratt, 2006, IFPRI



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# More countries are also witnessing gains in improved 'Government Effectiveness'



Source: 2006 Worldwide Governance Indicators, The World Bank, 2007



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# CAADP OBJECTIVES AND PROGRAMS

## MAIN FEATURES & PRINCIPLES

- **AGRICULTURE-LED GROWTH TO REACH MDG1**
- **TARGET GOAL OF 6% SECTOR GROWTH RATE**
- **INCREASED PUBLIC INVESTMENT (10% BUDGET SHARE)**
- **FOUR MAIN PILLARS TO GUIDE INVESTMENT**
- **POLICY EFFICIENCY, PEER REVIEW, ACCOUNTABILITY**
- **EXPLOITATION OF REGIONAL COMPLEMENTARITIES**
- **INCLUSIVENESS: FARMERS, AGRIBUSINESS, CIVIL SOCIETY**



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## PILLAR FRAMEWORKS

- STRATEGIC ISSUES
- SUCCESS FACTORS
- BEST PRACTICES
- POLICY ELEMENTS

*SHARED LT FRAMEWORK FOR ACTION*

## SECTOR COMPACTS

- LT INVEST. OPTIONS
- COMMITMENTS
  - SECTOR POLICIES
  - BUDGET POLICIES
  - DEV. ASSISTANCE
  - POLICY DIALOGUE

*DEVELOPMENT PARTNERSHIP AND ACCOUNTABILITY*

## KNOWLEDGE SYSTEMS

- BENCHMARKING
- PEER REVIEW
- MUTUAL LEARNING

*EVIDENCE/OUTCOME BASED PLANNING AND IMPLEMENTATION*

**BETTER POLICY, GROWTH, AND POVERTY OUTCOMES**



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## NATIONAL LEVEL

-  **AVOIDING PARALLEL PROCESS AND BUILDING ON ONGOING EFFORTS AT THE NATIONAL LEVEL**
-  **ALIGNING NATIONAL EFFORTS WITH THE CAADP GROWTH, BUDGETARY, FOOD AND NUTRITION SECURITY OBJECTIVES**
-  **ADDING VALUE TO NATIONAL EFFORTS WHERE NEEDED**  
 **COUNTRY CAADP COMPACT**

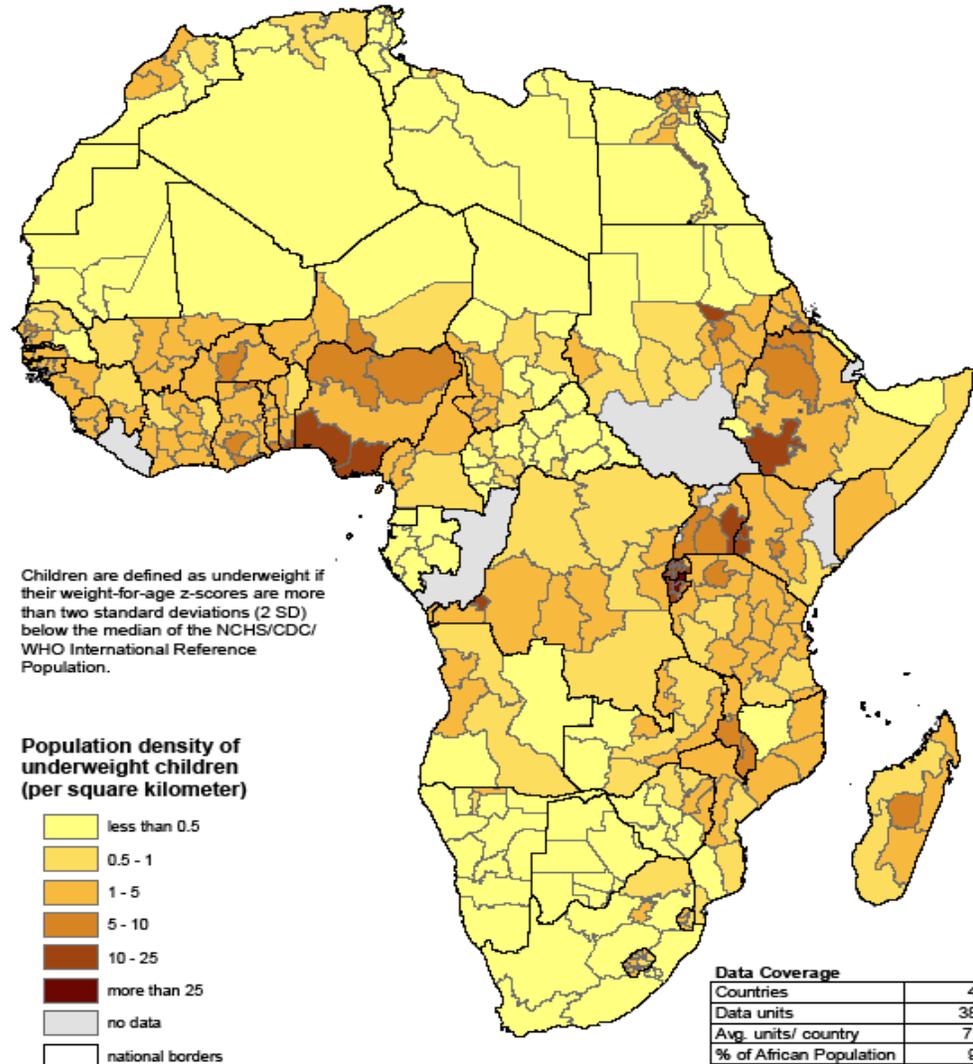


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## Poverty & Vulnerability in Sub-Saharan Africa

Poverty Rate (%), 2004	41.1*
Child Malnutrition Rate (%), 2005	29.6
Population (millions), 2005	743

### Population Density of Malnourished Children



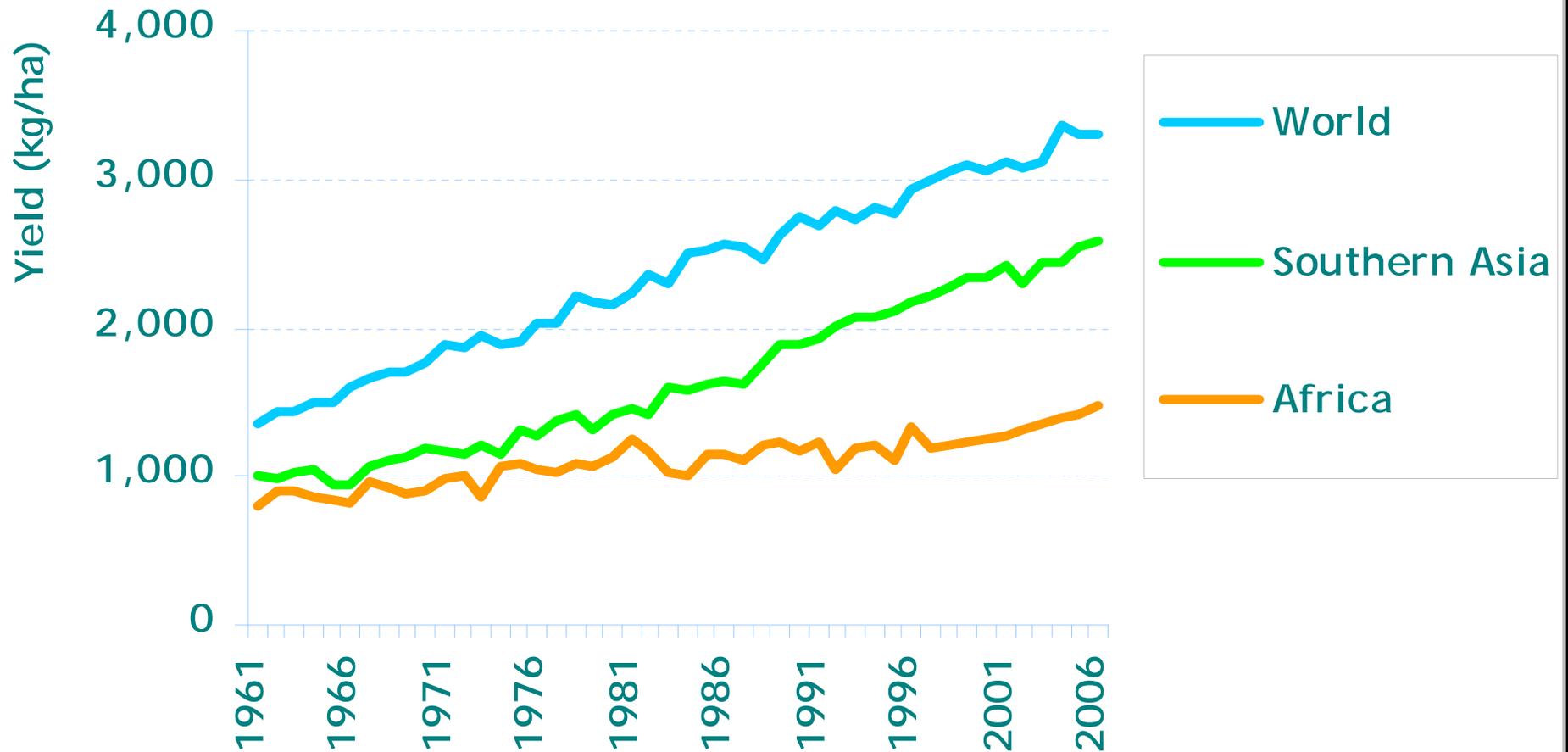
Sources: UNICEF, Demographic and Health Surveys (DHS), National Human Development Reports (nHDR), African Nutrition Database Initiative (ANDI), Gridded Population of the World (GPW) v. 3 alpha. Data for 96% of countries are from 1995 or later. All data are from 1992 or later.





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The biggest challenge is the persistence of low average cereal yields

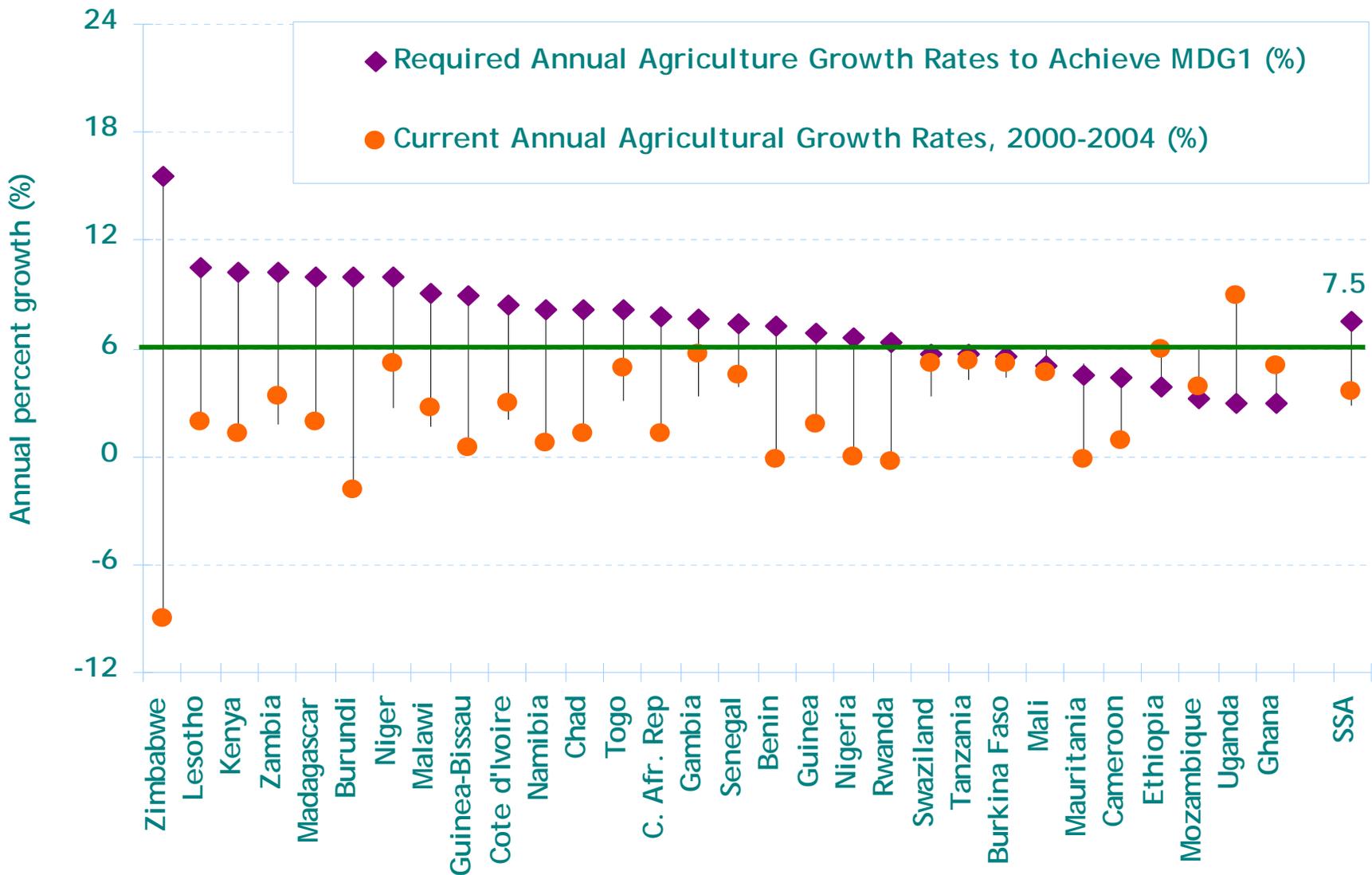


Source: FAOSTAT, 2006



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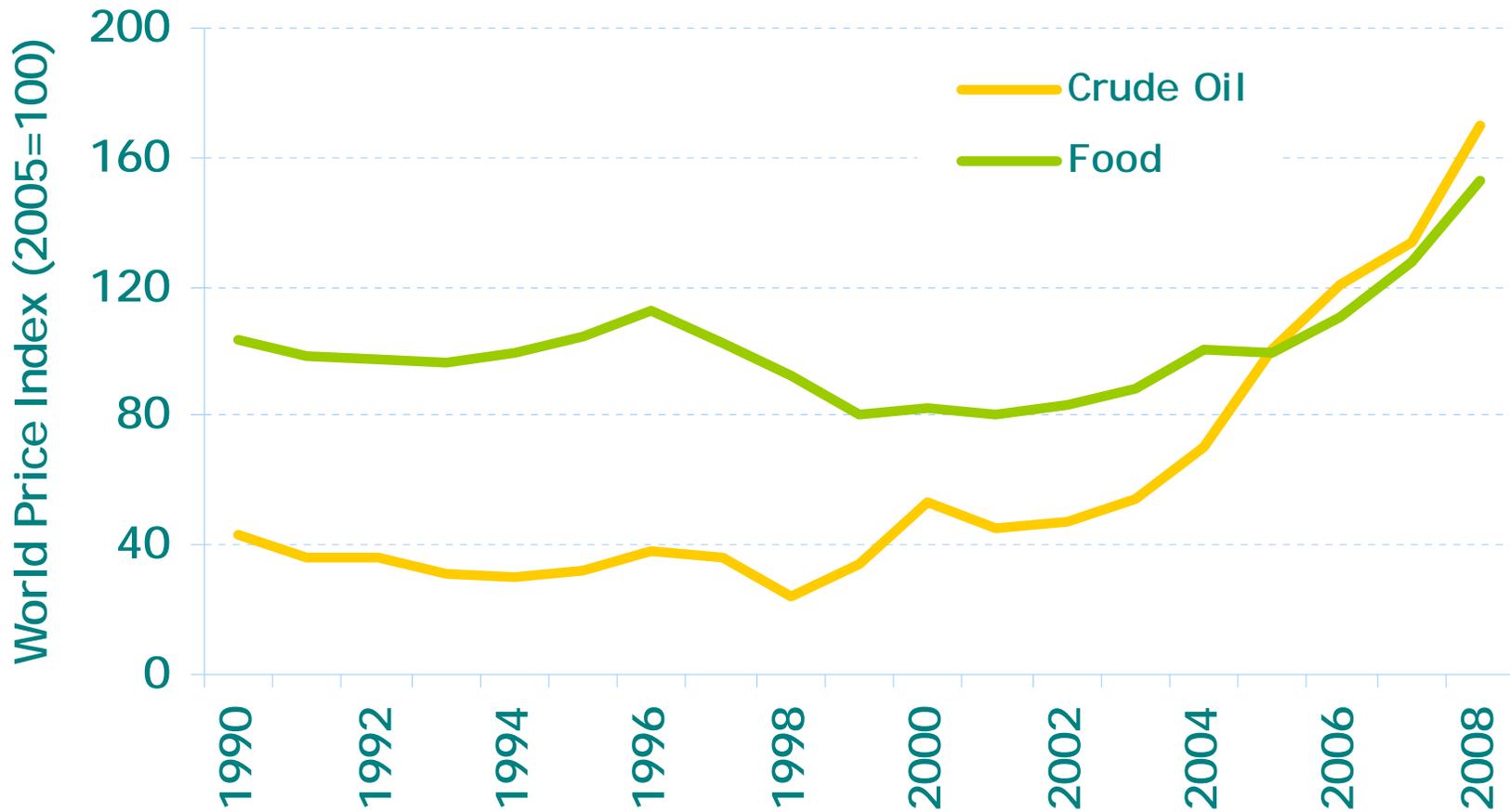
But, meeting the MDG goals of halving poverty & hunger by 2015 will require higher growth rates





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# Rapidly rising food and oil prices

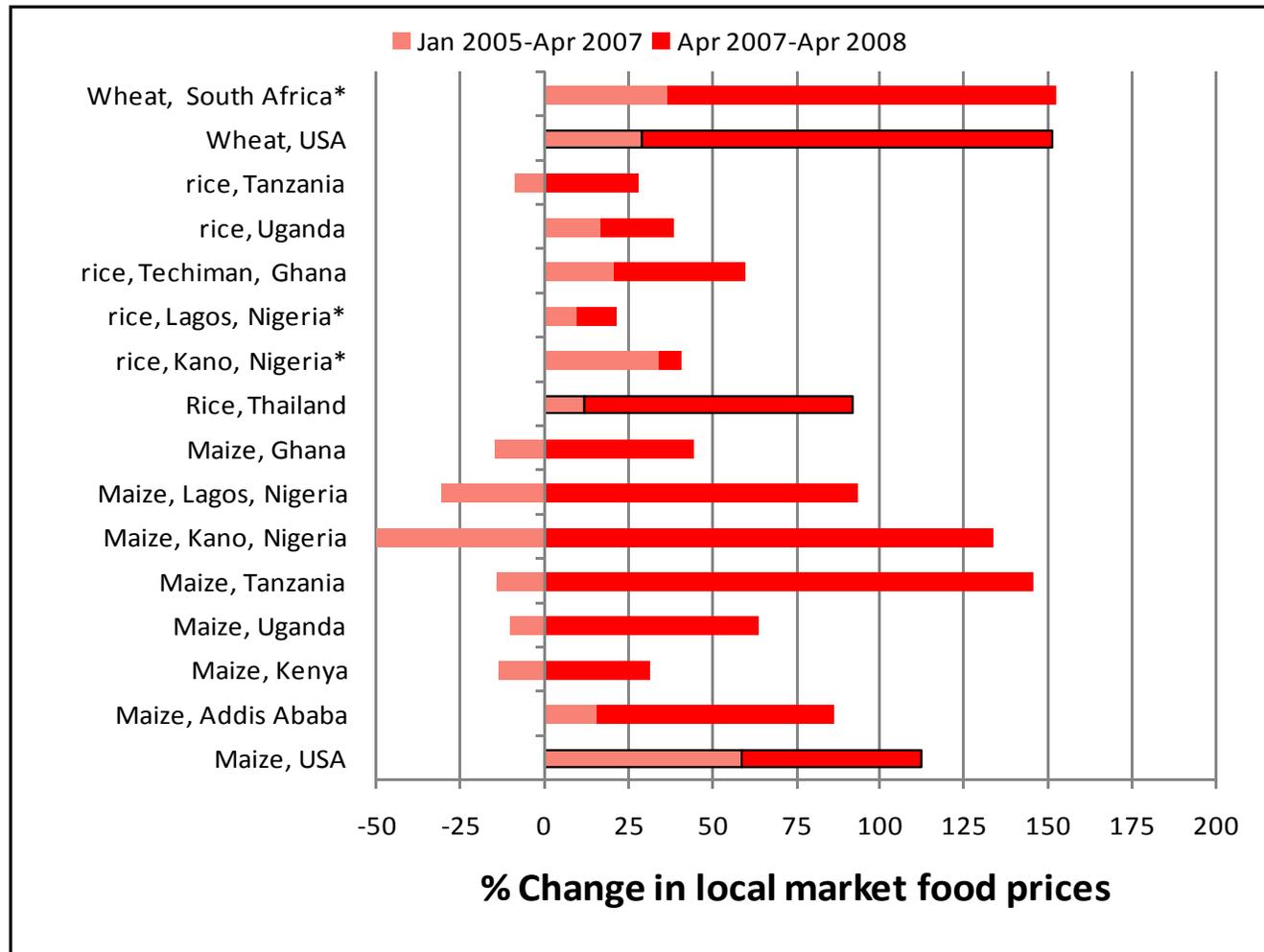


Source: ReSAKSS, data from IMF, 2008



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# Increasing Price of Food





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# The all important price of food

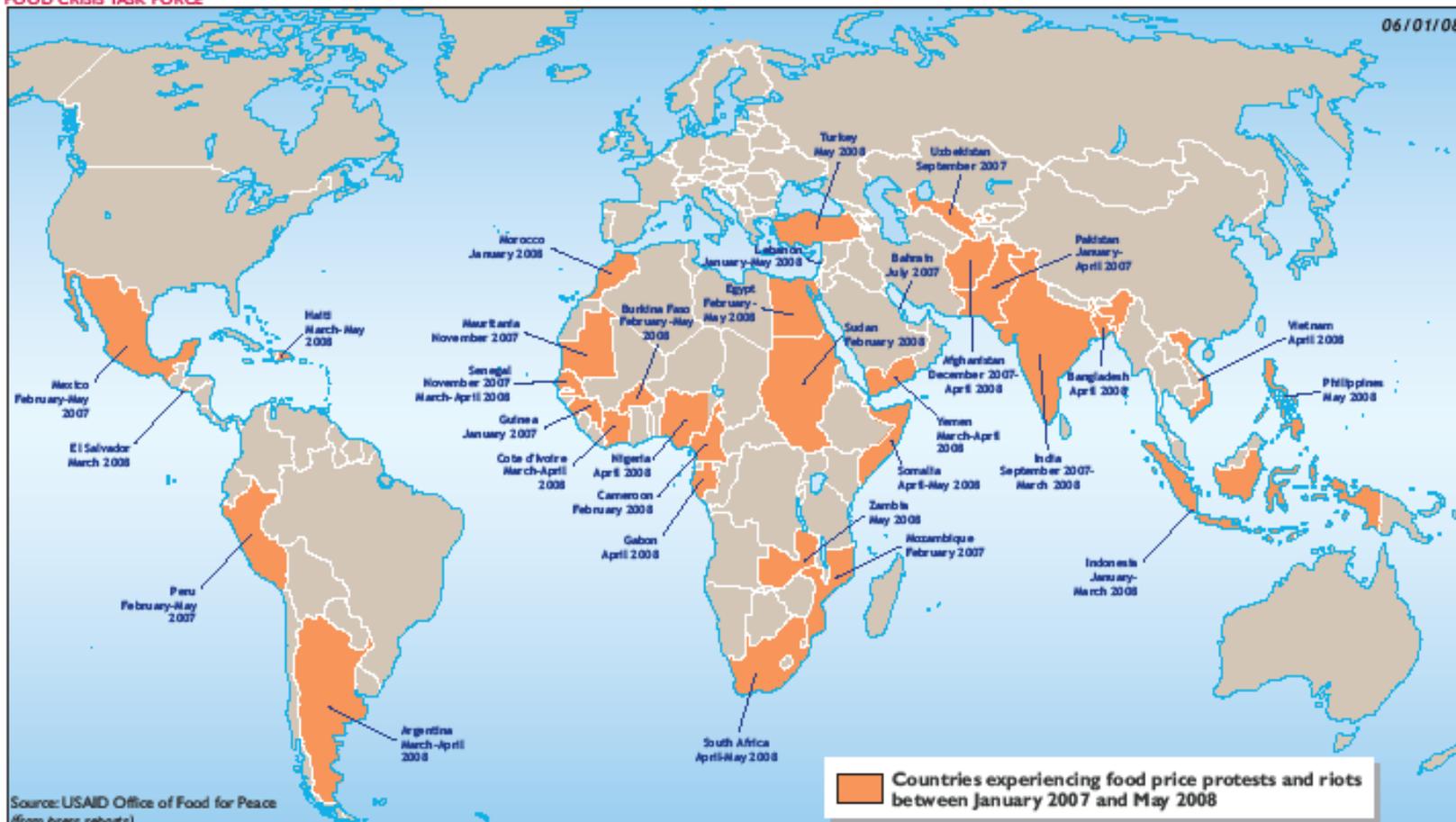
-  **In Africa a typical family spends 50 to 70 percent of its budget on staple foods.**
-  **Food inflation = reduced food intake and malnutrition, & lower expenditures on education and health.**
-  **The macroeconomic and political ramifications of rising food prices = increased overall, trade deficits, food riots and civil unrest.**



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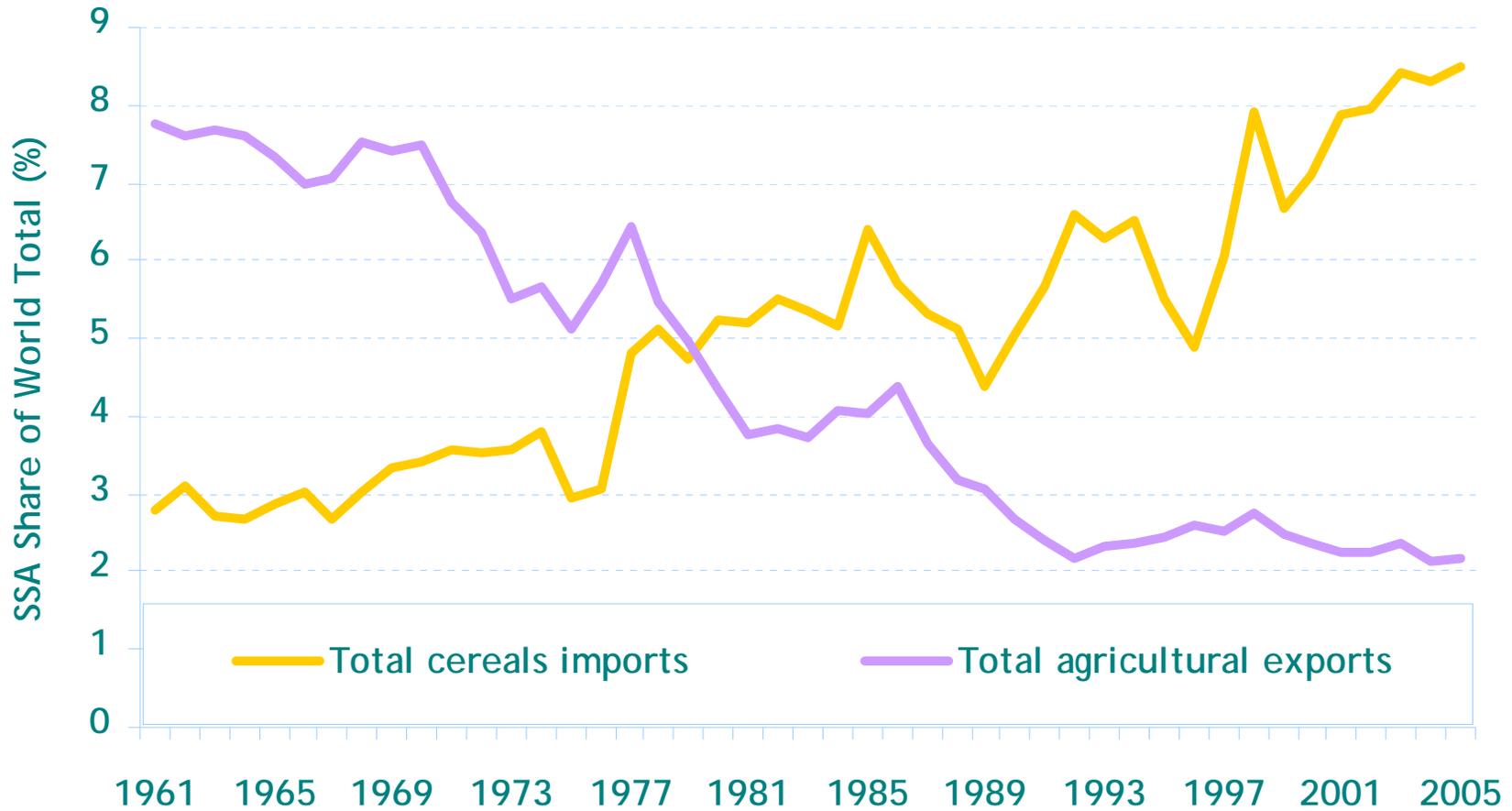
# Food Price Civil Unrest

FOOD CRISIS TASK FORCE





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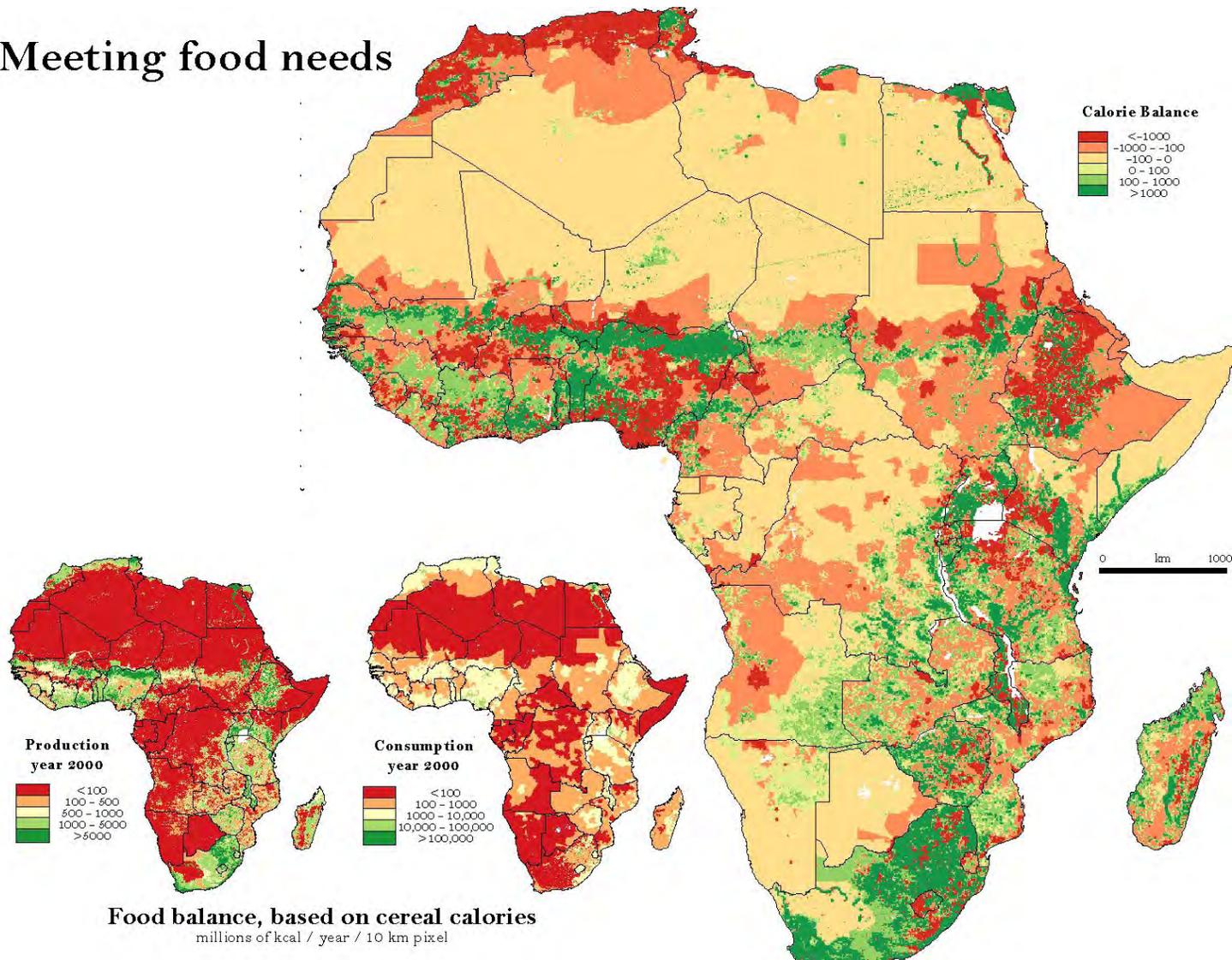
Source: ReSAKSS, calculated using data from FAOSTAT, 2007



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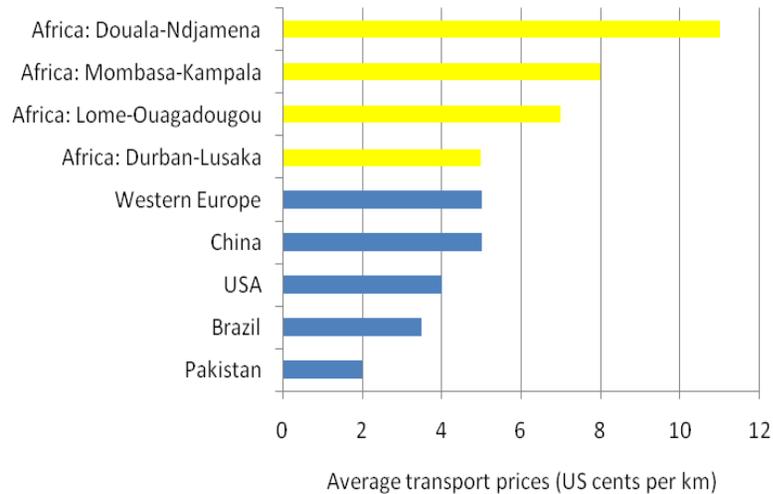
# Food Security Crisis and the U.S. Response

## Meeting food needs



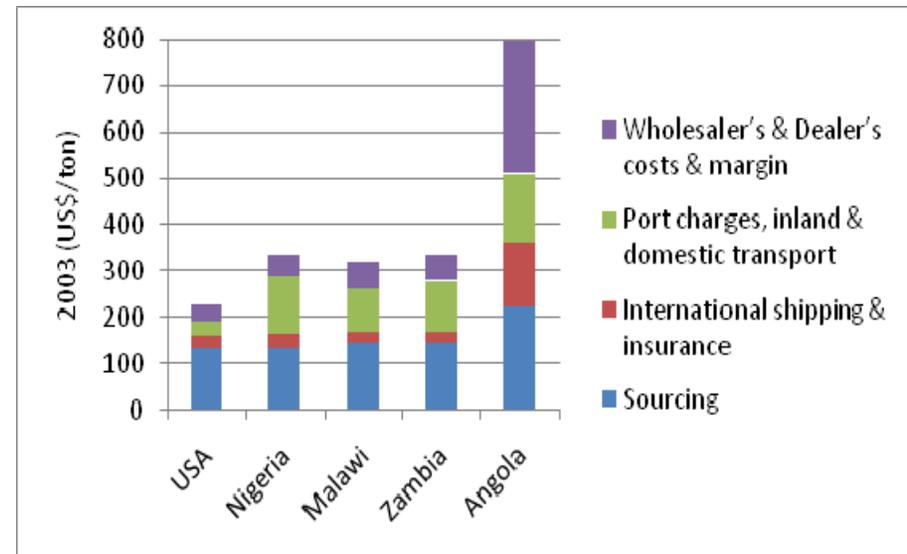


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They find that fertilizer transport costs are 3-5 times higher in Africa than in the US, and they made up about one-third of the farmgate price of urea fertilizer in African countries in 2005.

Several studies have demonstrated that transport costs are especially high in Africa, including major transport corridors.

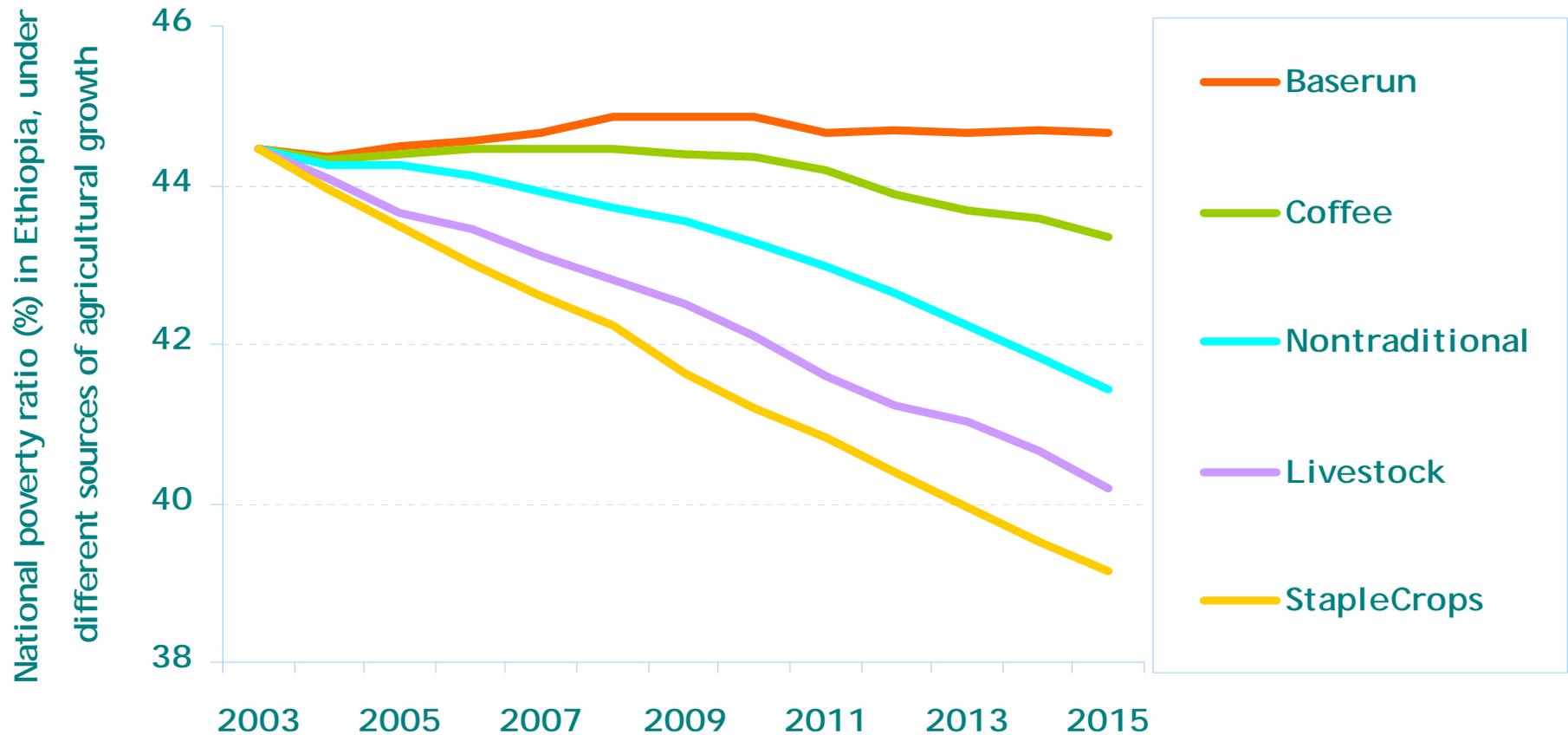


Source: Gregory and Bumb (2006).



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Agricultural growth can be significant if derived from growth in the staples and livestock sub-sectors.. while leading to a higher impact on poverty and hunger reduction

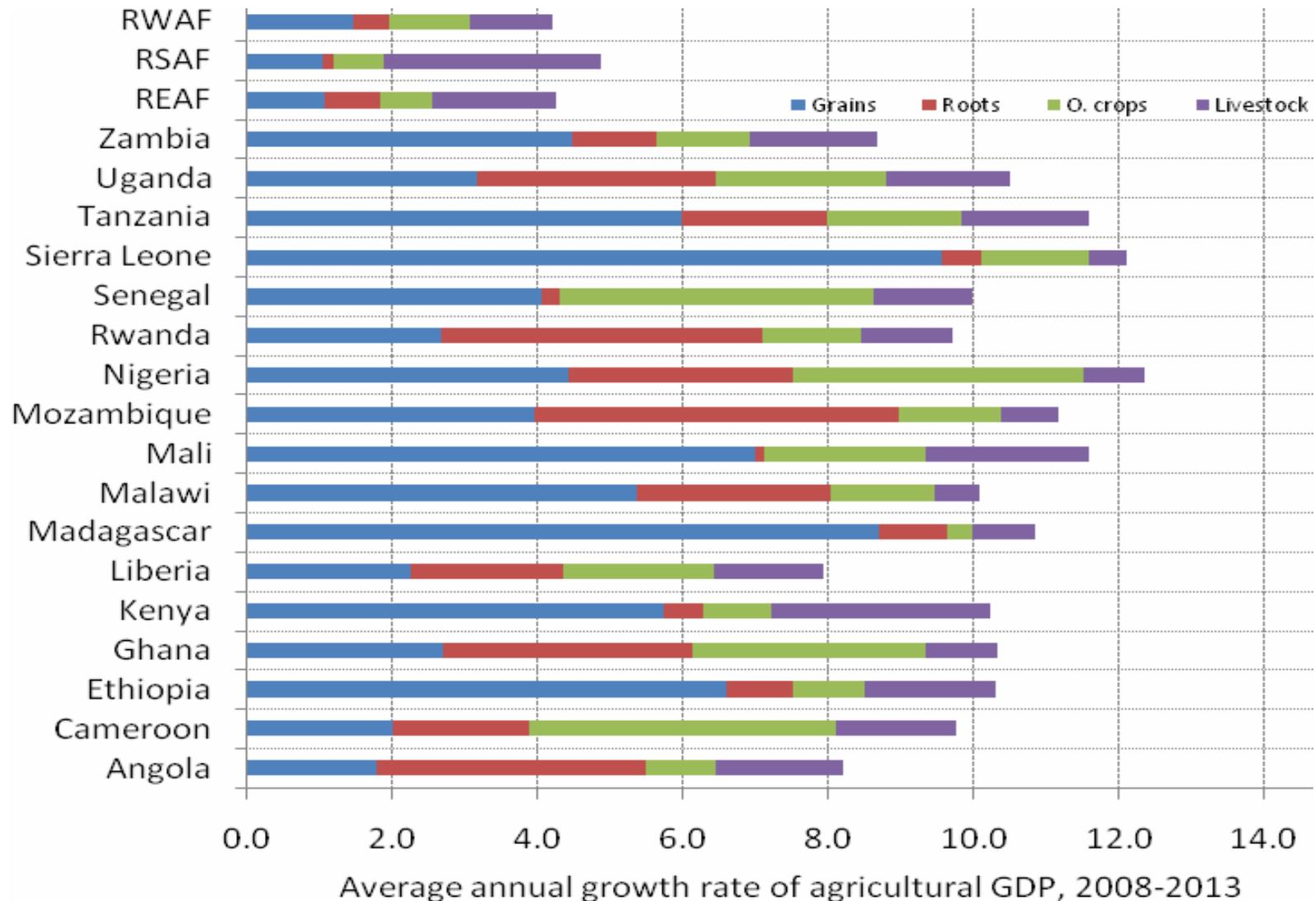


Source: ReSAKSS, from Diao et al. 2006, IFPRI



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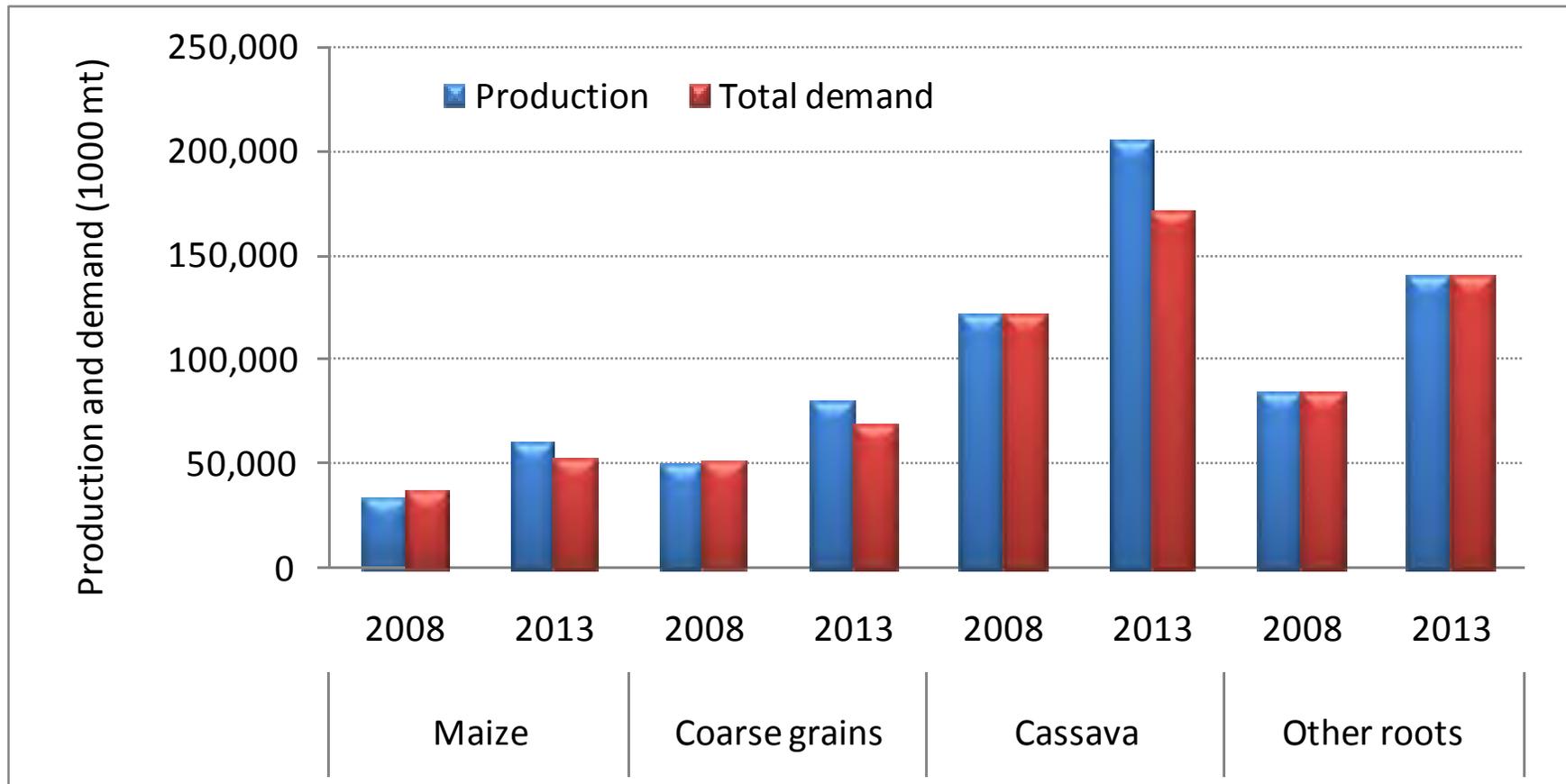
# Cereals' Share of GDP Growth





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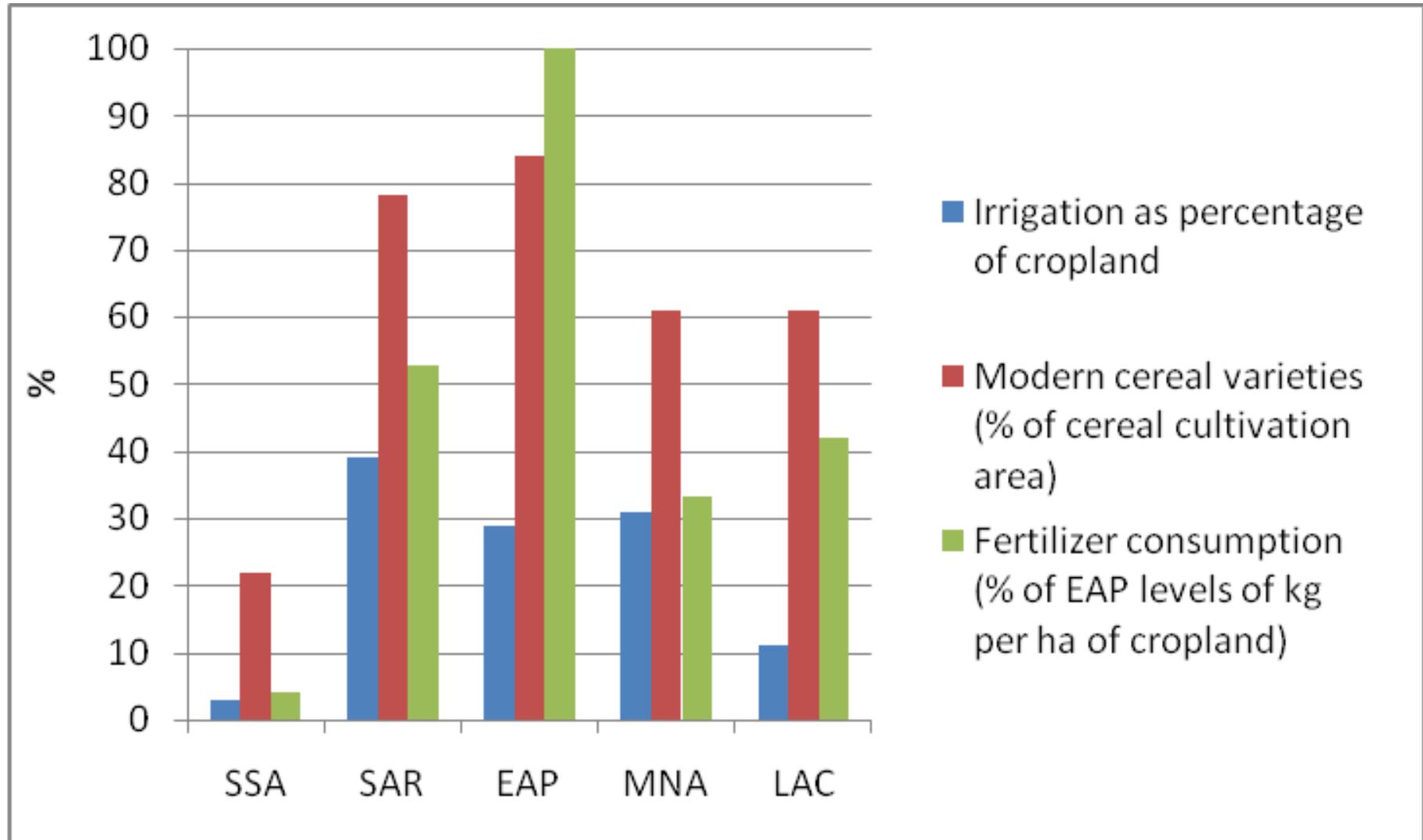
# Growth of Staples





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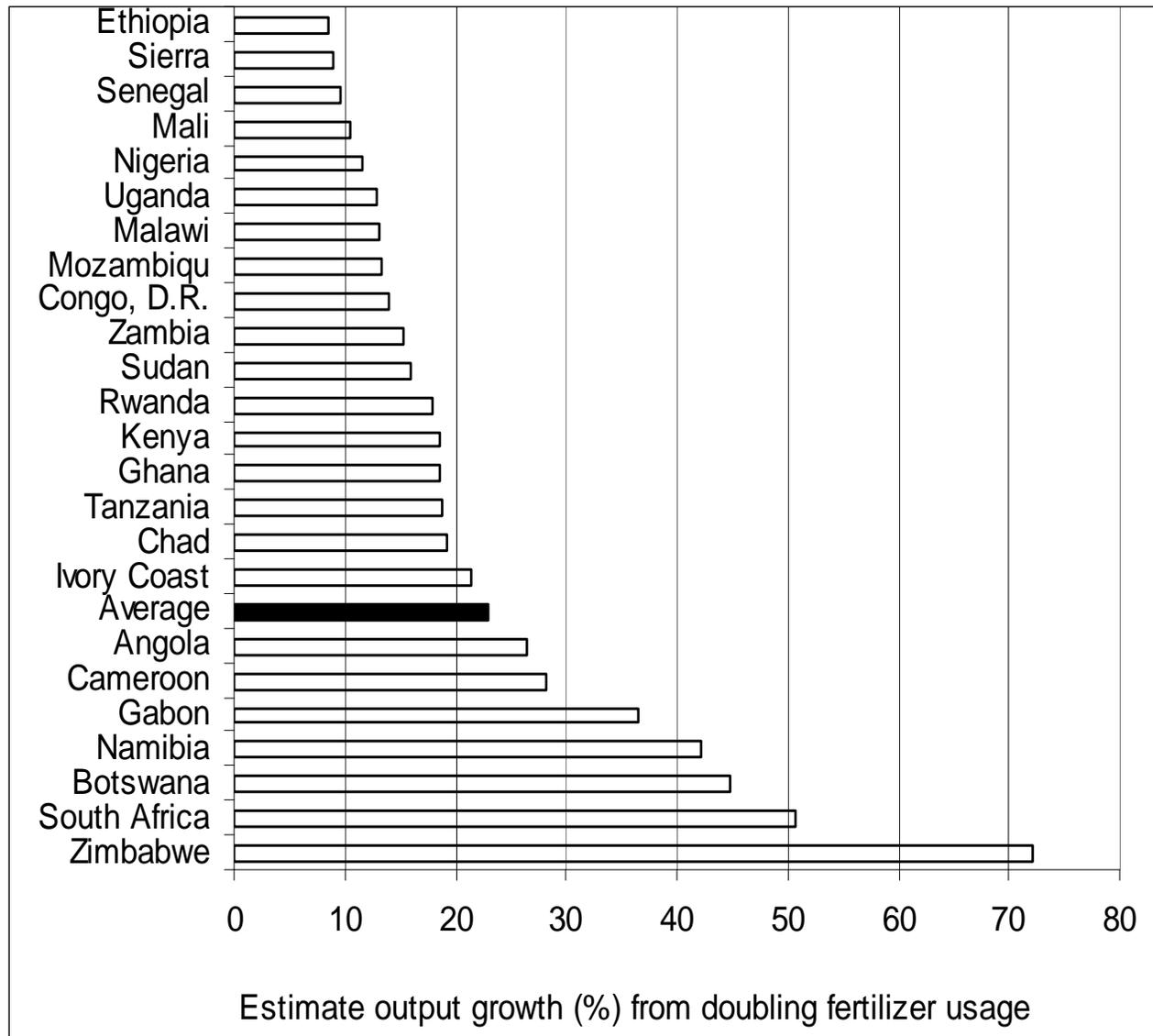
# Inputs





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# Many African countries would substantially benefit from doubling fertilizer usage

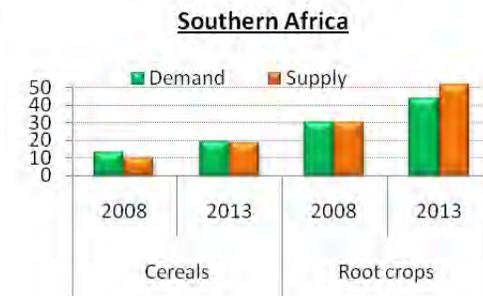
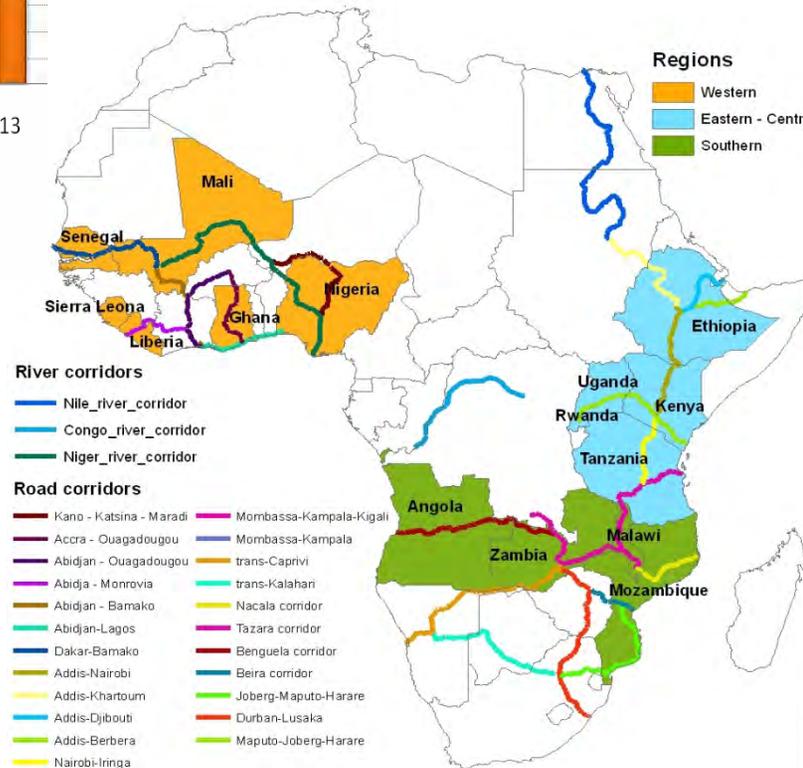
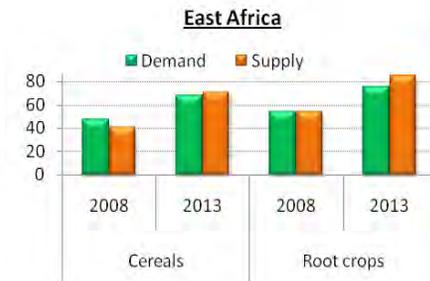
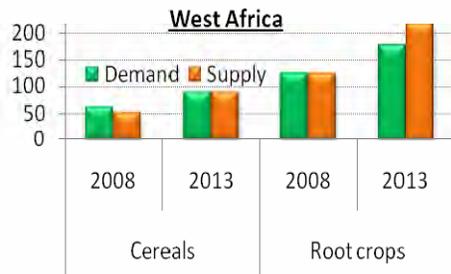


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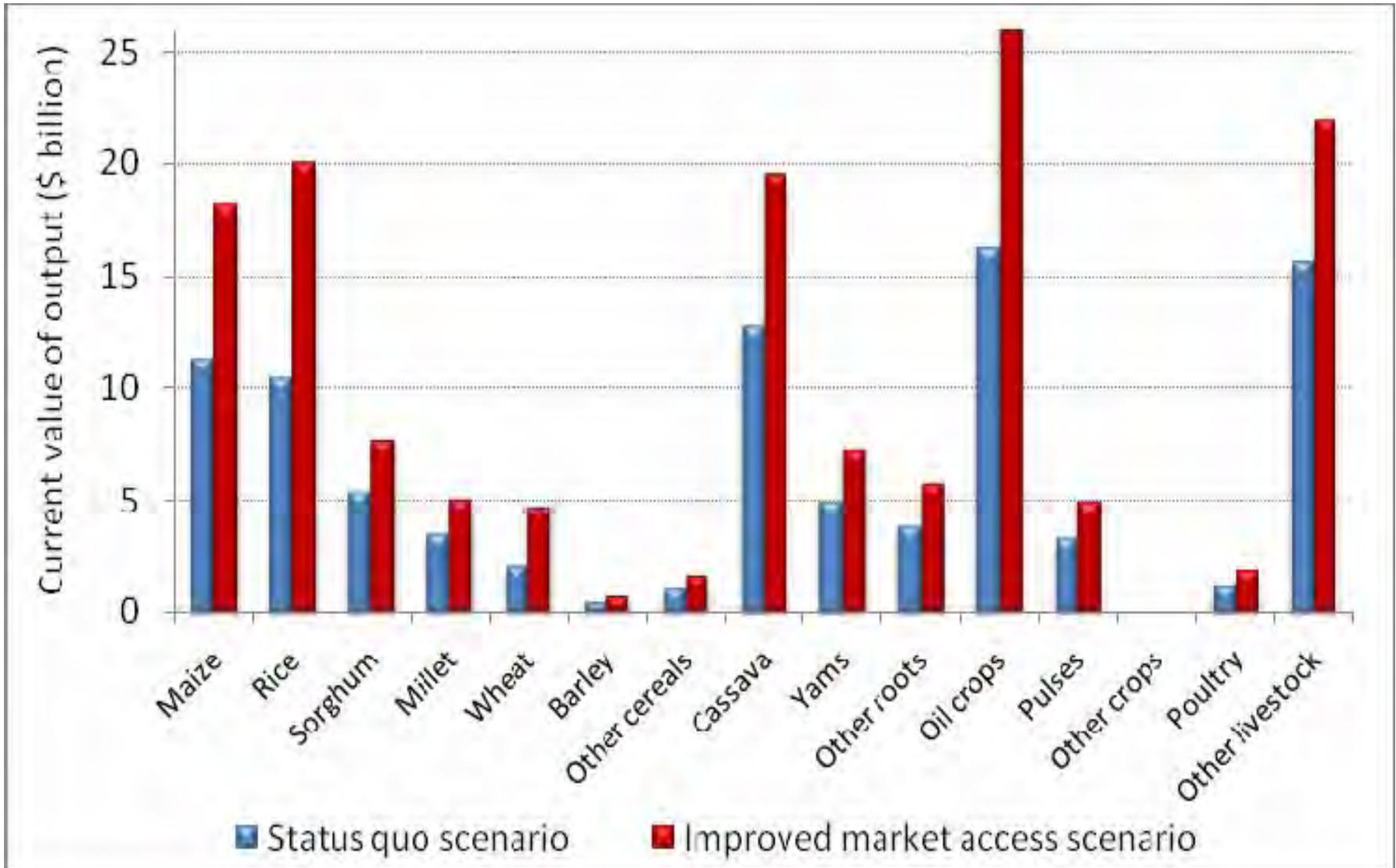
# Improved trade corridors can ensure adequate market absorption from rapid supply increases





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# Benefits of Market Access 1

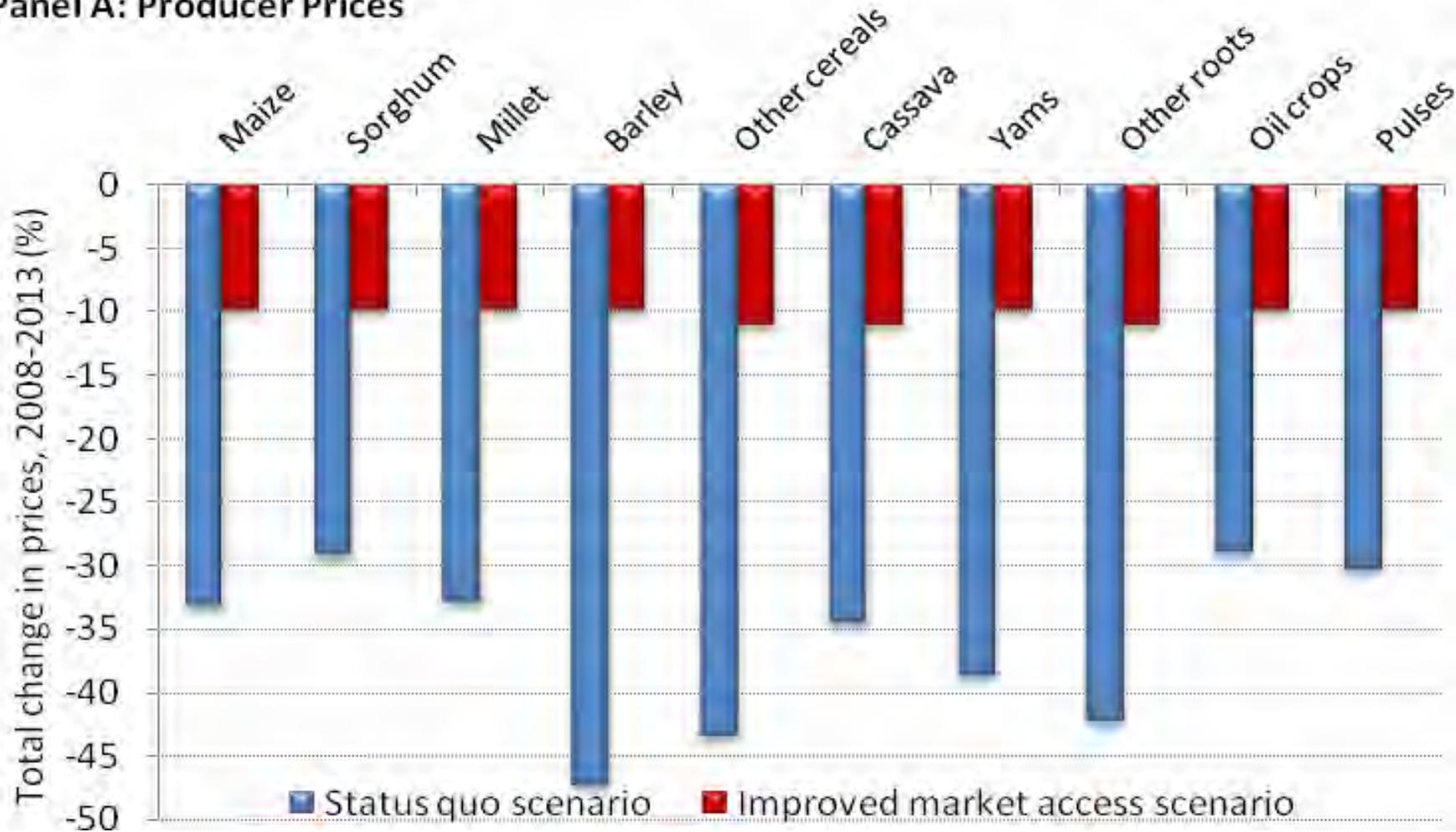




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# Benefits of Market Access 2

Panel A: Producer Prices

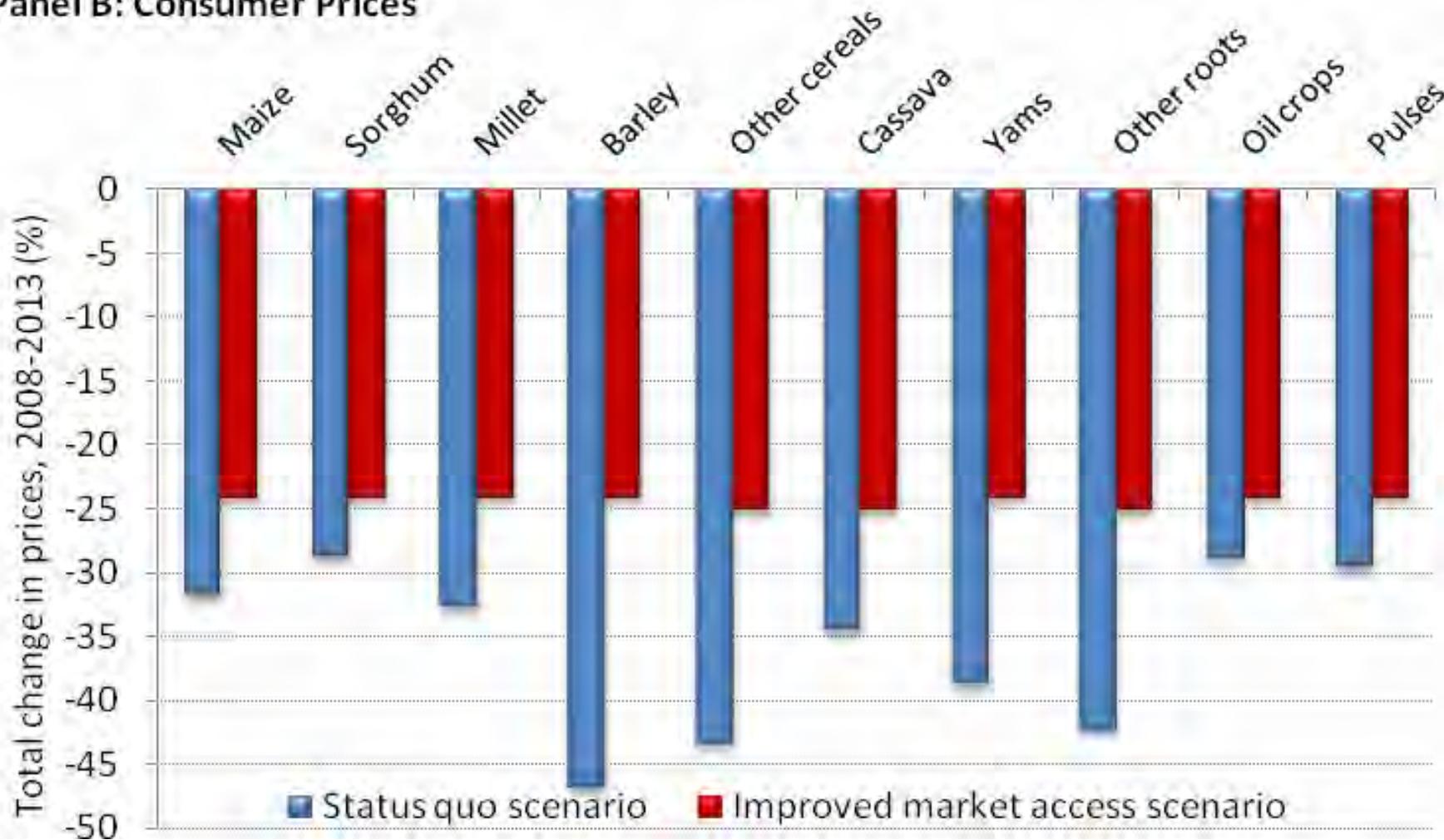




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# Benefits of Market Access 3

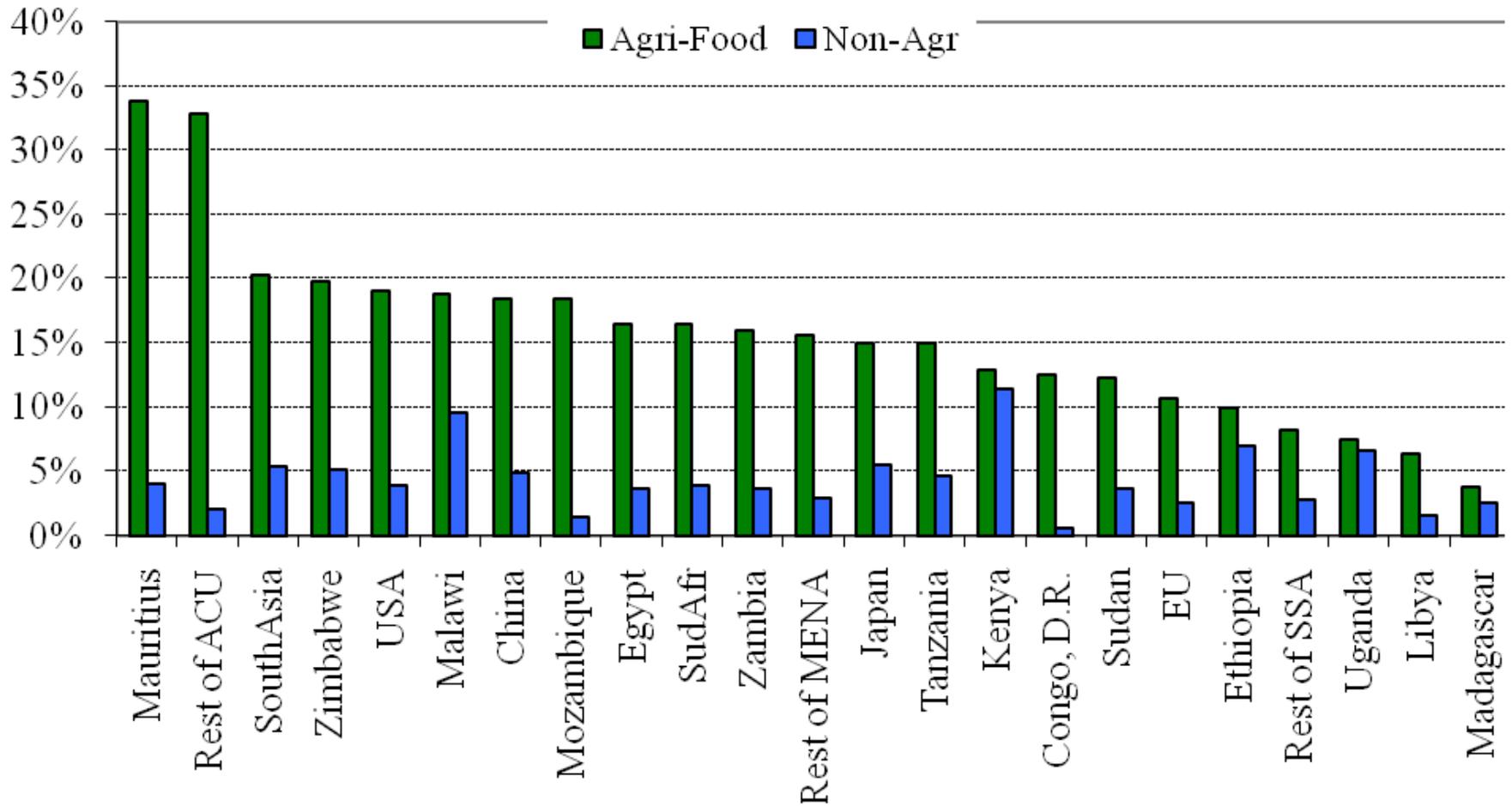
Panel B: Consumer Prices





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# Ag vs. Non-Ag Tariffs





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# USAID & African agriculture

- **IEHA: launched in 2002, a multi-year effort designed to help fulfill MDGs by cutting the number of hungry people in Africa in half by 2015.**
- **Focuses on promoting agricultural growth and building an African-led partnership to cut hunger and poverty by investing in agriculture oriented towards toward small-scale farmers.**
- **USAID is working with African Union's New Partnership for Africa's Development (AU/NEPAD) to directly support the AU/NEPAD Comprehensive African Agriculture Development Program (CAADP).**



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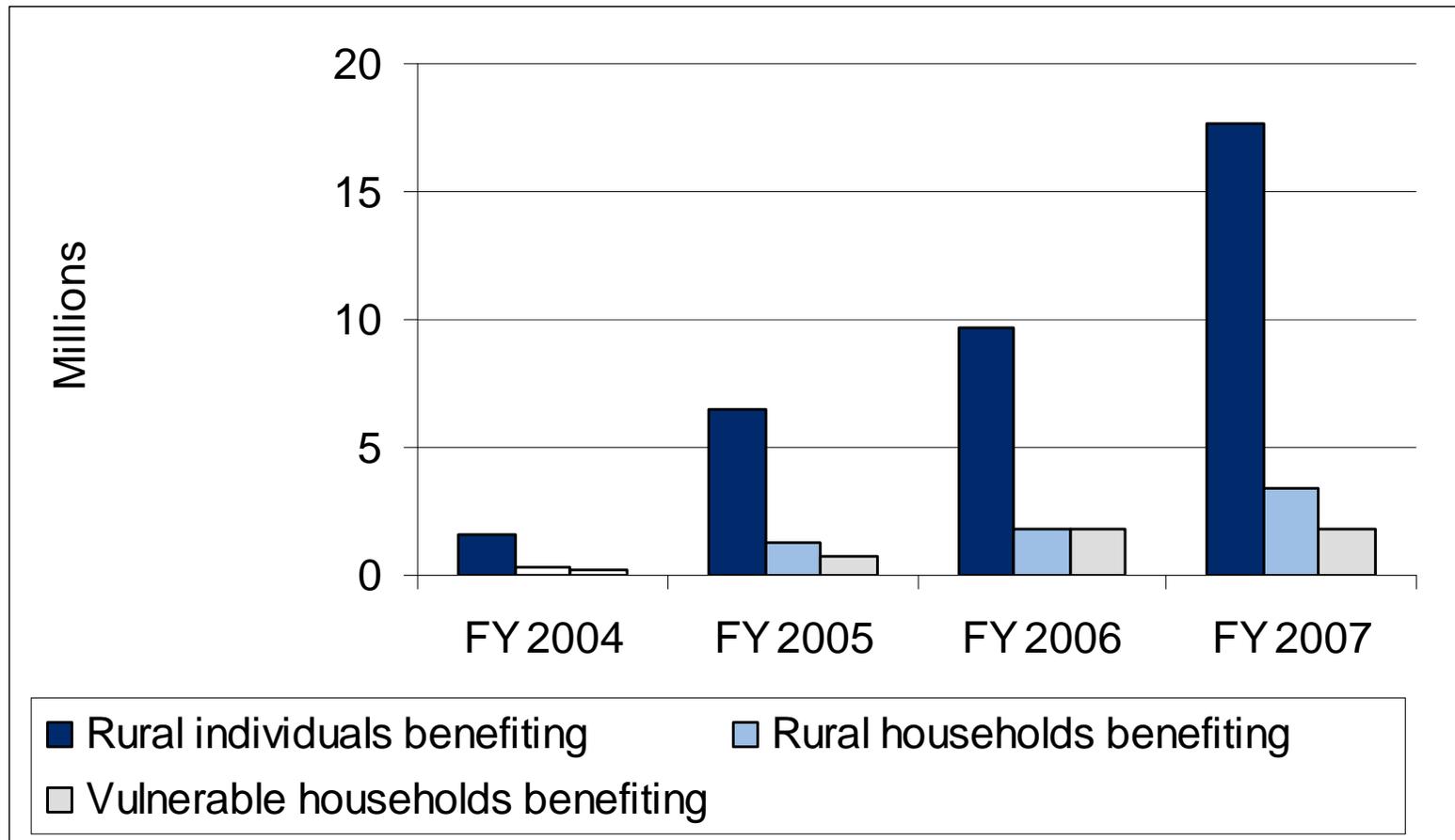
# IEHA = Transformational Development

- **Focused research → new technology**
- **Targeted projects → adoption**
- **New technologies and TA → smallholders increase physical productivity and quality**
- **Policy reforms & TA → improved markets, more farmer confidence in them**
- **Smallholder income, sales increase: transformation from vulnerable subsistence to efficient, market-oriented agriculture**
- **Poverty and hunger decline**



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## IEHA's Increasing Reach: People & Households Benefiting





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# IEHA Transforms

## IEHA's new technologies in 2007:

- ✘ **adopted by more than 900,000 farmers**
- ✘ **brought nearly 300,000 hectares under new technology--  
double the increase in 2006**

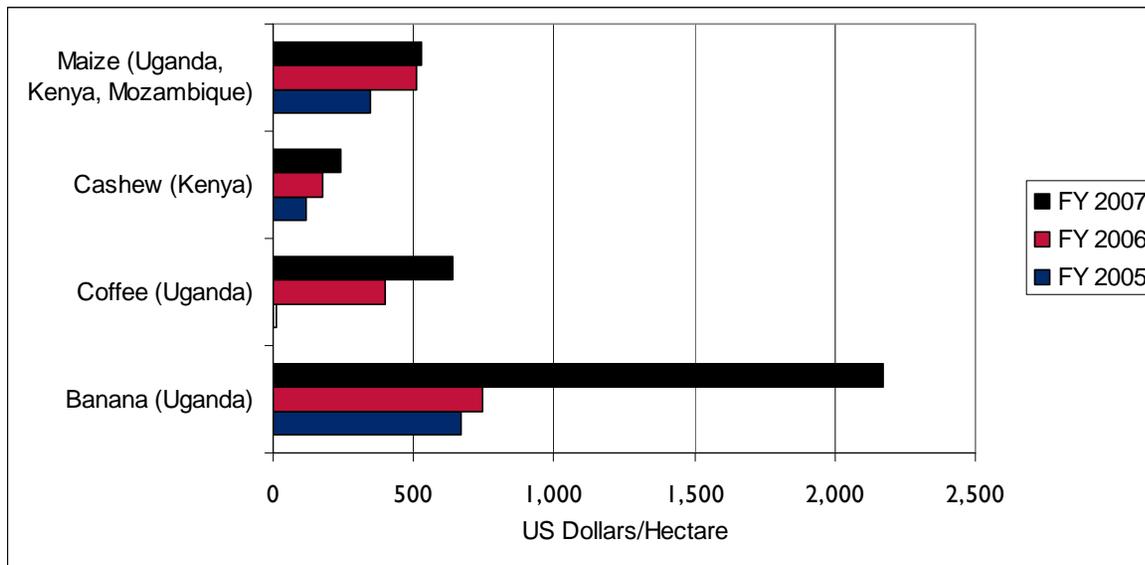
<b>Crop</b>	<b>Additional Area (Ha)</b>	<b>No. Farmers Adopting</b>
<b>Maize</b>	<b>86,555</b>	<b>283,661</b>
<b>Vegetables</b>	<b>41,495</b>	<b>42,894</b>
<b>Cocoa</b>	<b>32,940</b>	<b>5,779</b>
<b>Cassava</b>	<b>30,736</b>	<b>52,655</b>



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# IEHA Transforms Productivity

- IEHA measures productivity by gross profit per hectare, to include value of quality improvements
- Smallholder maize growers (Kenya, Mozambique, & Uganda) saw maize productivity increase 52% (2005-2007)



Small Kenyan cashew and Ugandan banana farmers also saw increases (107%, 226%)



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# IEHA Transforms: Productivity

Crop	Yield Increase (2005-2007)
<b>Maize</b>	<b>27%</b>
<b>Coffee</b>	<b>41%</b>
<b>Cashew</b>	<b>52%</b>
<b>Banana</b>	<b>90%</b>
<b>Milk (Male-headed)</b>	<b>17%</b>
<b>Milk (Female-headed)</b>	<b>25%</b>



# IEHA Transforms: Smallholder Sales

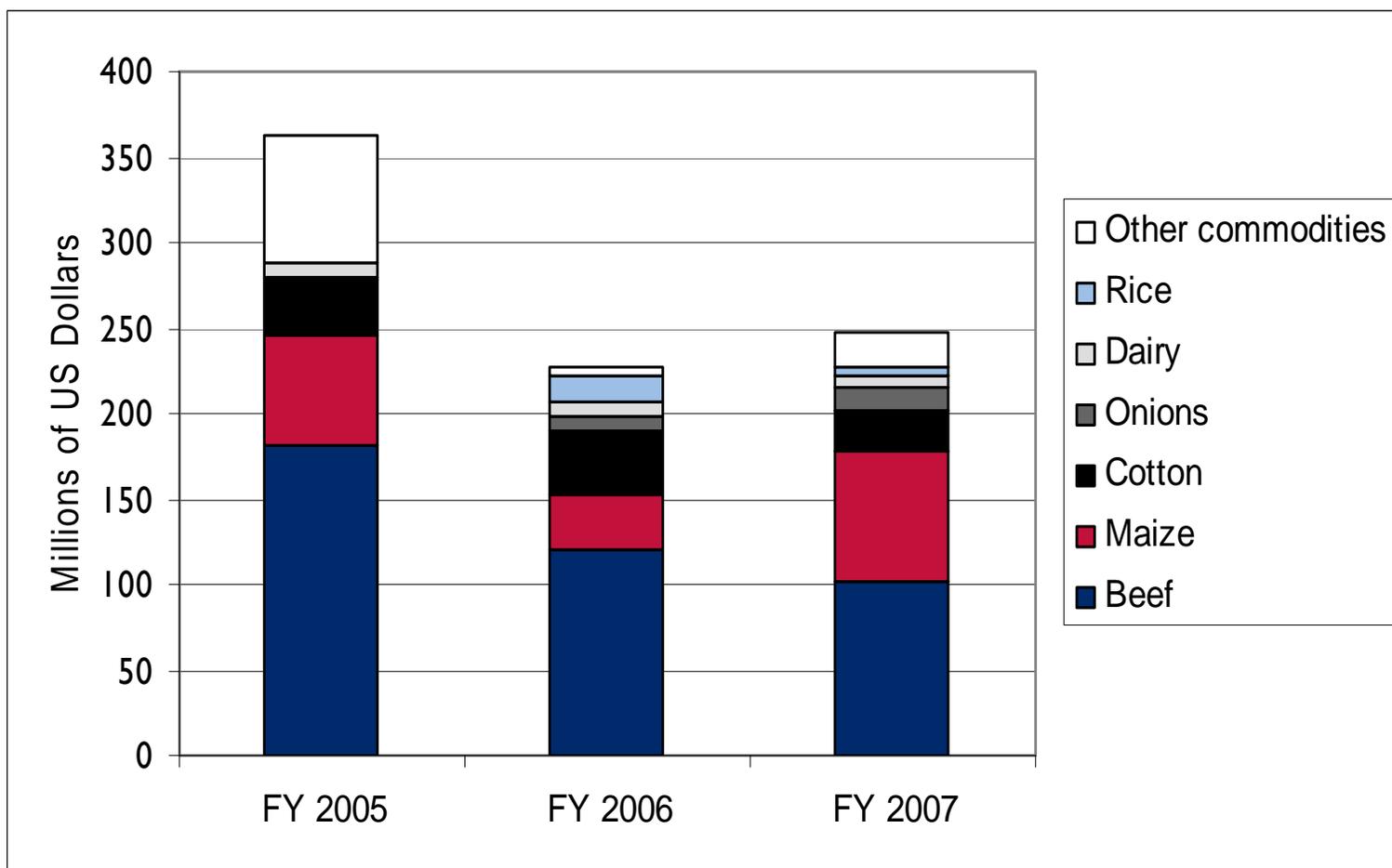
**Purchases from Smallholders of Targeted Agricultural Products,  
FY 2005 – 2007 (US Dollars)**

<b>Commodity</b>	<b>FY 2005</b>	<b>FY 2006</b>	<b>FY 2007</b>
Peanuts	8,360	10,675,471	111,036,968
Cotton	9,065,000	28,297,526	39,713,813
Rice	829,700	12,039,000	13,707,416
Maize	8,660,638	1,541,553	11,088,275
Cashew	284,709	3,803,232	10,833,512
Coffee	1,122,000	5,355,961	9,120,193
Bananas	3,250,000		8,961,900



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# IEHA Results: Intra-Regional Trade



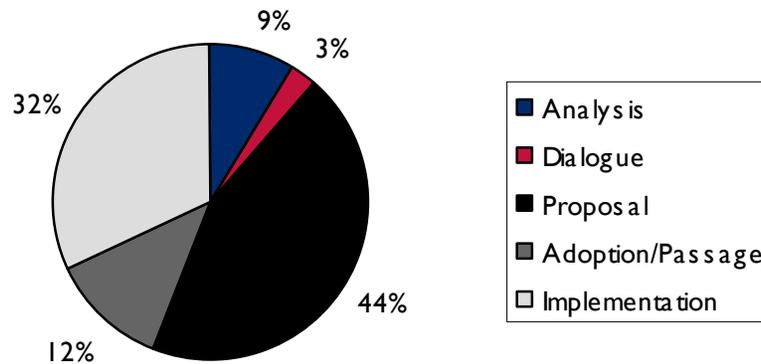


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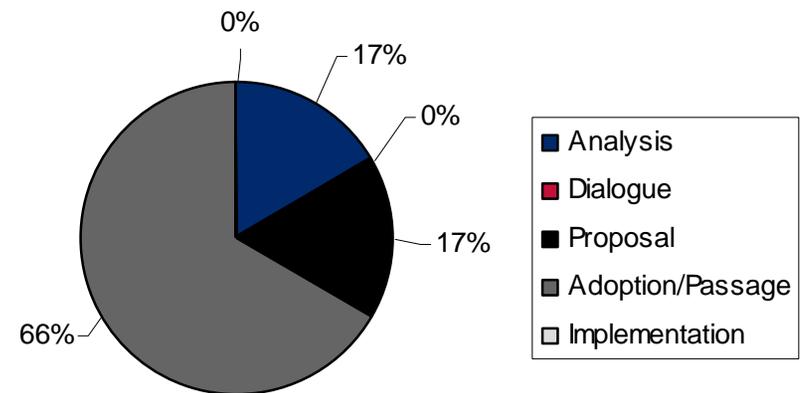
# IEHA & Policy: Persistence Pays

Milestones Achieved by End 2007 on Policy Actions Started...

...in 2005



... in 2006





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# Long-term Food Security: The Role of Biotechnology

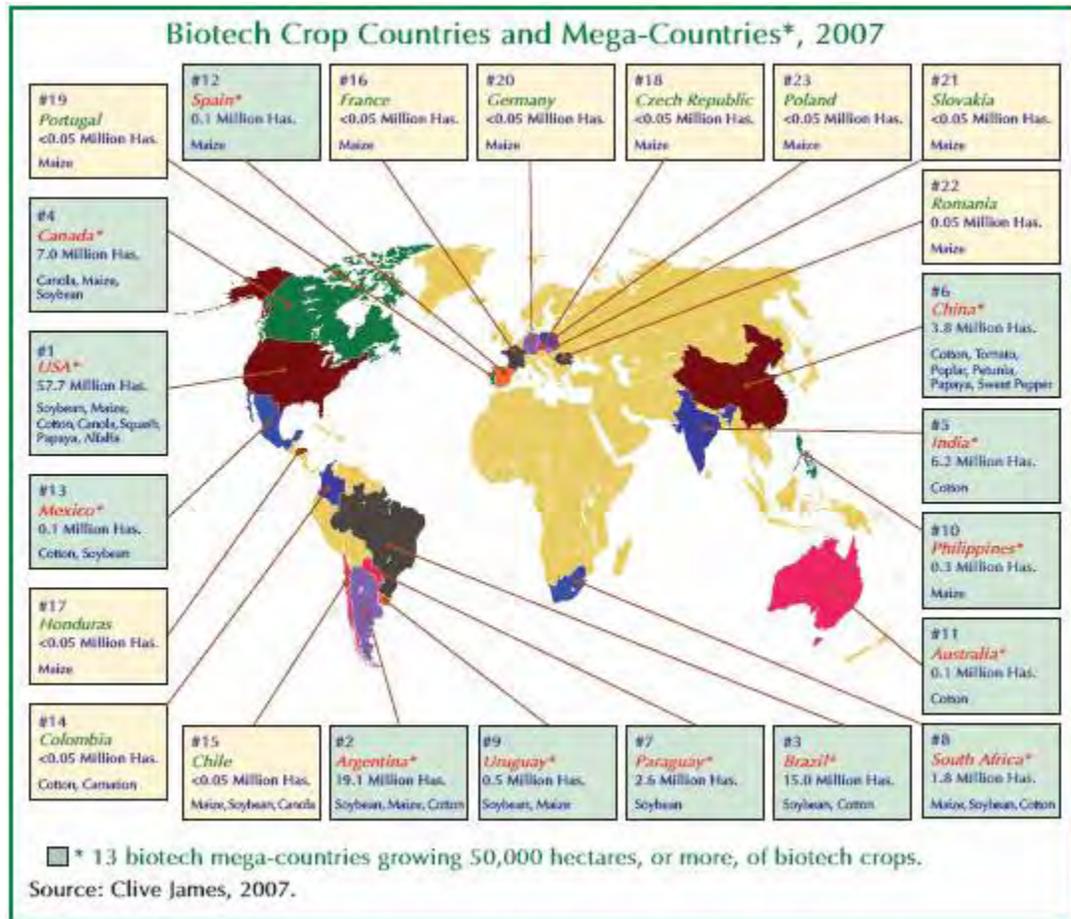
Josette Lewis, Ph.D.

Senior Biotechnology Advisor

EGAT Bureau



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## Global Status of GM Crop Production

- Over 100 million hectares planted globally
- 23 countries planting GM crops + 29 for food/feed
- 64% of global soy, 25% maize, 43% cotton
- 75-80% of processed food in U.S. contains GM
  
- 2/3 of white maize in South Africa
- 2/3 of cotton in India; doubled from 2006-2007
- 250,000 ha of GM maize in the Philippines



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## What Have Biotech Crops Delivered?

- **Increased income**
  - India cotton: net farm income up by \$200/ha
  - World Bank: GM cotton could boost SSA welfare more than full WTO liberalization
- **Reduced impact on environment**
  - environmental impact of pesticides down 15% in ten years
  - Reduced greenhouse gas emissions in 2006 equivalent to removing 6.5 million cars
- **Drought tolerance**
  - all major companies launch in U.S. by 2015



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## What Can Biotech Crops Deliver?

- **Nitrogen Use Efficiency**
  - Global price of fertilizer doubled in 2007
  - GM technology: same yield with ½ fertilizer or 30% yield gain
  - Carbon credits for farmers in China
- **Biotech v.s. breeding**
  - Good yield increase through breeding 5-10%
  - GM crops in developing countries: 10-50%



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## Our Role

- Helping developing countries make informed choices
- Give small farmers a choice: crops and technologies they need
- Requires public investment – U.S. largest donor
- Leverage U.S. scientific and commercial leadership



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## Our Impact

- **Policy**
  - First field trials in Uganda, Bangladesh
  - Commercial approval for cotton in Burkina Faso
  - Policy in place to allow trials in Ghana, Nigeria, Malawi
  - Streamlining and strengthening regulatory in India
- **Technology**
  - Eggplant in India: first food crop
  - 1<sup>st</sup> commercial approval by public sector in South Africa
  - First trials in Uganda, Bangladesh
  - Trials in Philippines: eggplant and papaya



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## Public-Private Partnerships

- Policy development and reform allows private sector to enter market.
- Eggplant in India – commercial hybrids + public varieties.
- Cowpea & Nitrogen Use Efficient Rice – licensing of property technology & technical support.
- Maize for Africa & rice for Asia – new models for expanding small farmer access to commercial technology.