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## Genetically Modified Organisms and Southern African Food Policy

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## Genetically Modified Organisms and Southern African Food Policy

### Abstract

This paper examines why it is that Zambia and Zimbabwe, two states with similar background conditions and initial positions, arrived at differing policy decisions with regards to genetically modified organisms (GMO). The two neighboring Southern African states are economically dependent on their agricultural sector, share a common colonial legacy, rely heavily on maize as a subsistence crop and have struggled with issues of food security. Their decisions were shaped by their post-colonial legacy and differing conceptions of modernity. In the years following independence, Zambia sought to subsidize their agricultural sector through inputs and credit. Zimbabwe instead focused on land reform and reappropriation, and in so doing hampered their agricultural sector enough to necessitate GMO acceptance. An understanding of the motivations for rejection of GMO in Southern Africa has implications for future food relief programs within Africa and elsewhere.

### Keywords

Zambia, Zimbabwe, GMO, transgenic crops, food policy, Social Sciences, Political Science, Rudra Sil, Sil, Rudra

### Disciplines

Comparative Politics | Political Science

**Genetically Modified Organisms (Gmos) And Southern African Food Policy:**

**A Paired Comparison Of Zambia And Zimbabwe**

By: Andrew Leahey

Dr. Rudra Sil, Advisor

A thesis submitted in partial fulfillment of the requirement  
for the Degree of Bachelor of Arts  
in Political Science with Distinction

University of Pennsylvania

Philadelphia, PA

April 1, 2013

## Abstract

This paper examines why it is that Zambia and Zimbabwe, two states with similar background conditions and initial positions, arrived at differing policy decisions with regards to genetically modified organisms (GMO). The two neighboring Southern African states are economically dependent on their agricultural sector, share a common colonial legacy, rely heavily on maize as a subsistence crop and have struggled with issues of food security. Their decisions were shaped by their post-colonial legacy and differing conceptions of modernity. In the years following independence, Zambia sought to subsidize their agricultural sector through inputs and credit. Zimbabwe instead focused on land reform and reappropriation, and in so doing hampered their agricultural sector enough to necessitate GMO acceptance. An understanding of the motivations for rejection of GMO in Southern Africa has implications for future food relief programs within Africa and elsewhere.

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*List of Abbreviations*

ESAP	Economic Structural Adjustment Programme
EU	European Union
FISP	Fertilizer Input Support Program
FSP	Fertilizer Support Program
GDP	Gross Domestic Product
GM	Genetically Modified
GMO	Genetically Modified Organism
MCB	Maize Control Boards
NGO	Non-governmental Organization
UDI	Unilateral Declaration of Independence
WFP	World Food Program
ZANU	Zimbabwe African National Union
ZAPU	Zimbabwe African People's Union
ZCF	Zambian Cooperative Federation

## **I. Introduction**

The aim of this paper is to examine why it is that Zambia and Zimbabwe, two states with similar background conditions and initial positions, arrived at differing policy decisions with regards to genetically modified organisms (GMO). The two neighboring Southern African states are economically dependent on their agricultural sector, share a common colonial legacy, rely heavily on maize as a subsistence crop and have struggled with issues of food security. An understanding of the motivations for rejection of GMO in Southern Africa has implications for future food relief programs within Africa and elsewhere.

In mid-2002, in the midst of a famine that struck all of Southern Africa, Zambia, Zimbabwe, Mozambique and Malawi refused acceptance of thousands of tons of donated grain, and Zambia returned more than 15,000 tons of donated maize already in the country back to the World Food Program (WFP). This seemingly unwise decision only makes sense in the context of the genetically modified organism debate, in which Southern Africa is currently embroiled. At the time, the four rejecting states cited concerns over the release of GMO crops in the environment and in the food supply. Opponents of GMO pointed to this as a clear case of the United States, through the WFP, attempting to take advantage of a food crisis to promote GMO crops in the region (Zerbe, 2004). While this may be the case, why the four states rejected the crops remains an open question.

The case was further muddied when Malawi, Mozambique and Zimbabwe shifted positions and permitted the importation of GMO grains and maize – as long as the material was milled outside of their borders. Ostensibly this condition was to ensure that any seeds in the material would be destroyed prior to the crops entering the country (Karimjee, 2011), thus preventing farmers receiving food aid from planting the seeds. This seems to indicate that the

chief concern of these three states was not in fact the safety of GMO crops in the food supply, but one involving the release of GMO strains in to the environment. In the midst of famine and widespread starvation, it would seem implausible that an environmentalist concern would carry so much sway as to actually lead to the rejection of much-needed food. This assertion is backed up by a body of literature that revolves around the idea that developing states, and in this case specifically the Southern African states, fear being viewed as “contaminated” by GMO strains. This mark of contamination might lead to their permanently losing markets where the future of GMO is uncertain, such as the European Union (Aerni & Bernauer, 2006; Paarlberg, 2003). This argument seems to explain why four states on the brink of disaster would risk further harm in order to insure no GMO seeds were sown in their soil, but simultaneously accept food stuffs made from these same GMO crops.

The interesting question arises when one introduces the anomalous case of the sole holdout, Zambia. Zambia had been the first state in the region to raise concerns regarding the safety of GMO crops, and had spurred its Southern African neighbors to insist on GMO-free food aid. The vast majority of the rejected grain had been grown in the United States, the world leader in total GMO crop hectares. Initial requests by the Southern African states that the grain be milled prior to exportation were rejected by the US, citing unreasonably high costs (Zerbe, 2004). When South Africa stepped in and offered to mill the grain prior to its importation in to the famine-stricken states, Mozambique, Malawi and Zanzibar accepted those terms. Zambia, however, continued to reject GMO grain, milled or unmilled. After sending a team of scientists to the United States and the European Union in order to study the potential effects of GMO food (Zerbe, 2004), Zambian officials cited the “precautionary principle” as necessitating rejection (BBC News, 2002). The use of the precautionary principle is interesting as, while the term is

rooted in the German principle of *vorsorgeprinzip*, the precautionary principle was explicitly cited just two years prior by the European Union, in the Lisbon Treaty, as being instructive when considering the potential impact of polluters on the environment.

The decision process that goes into state-wide acceptance or rejection of biotechnology generally, and GMO specifically, is important when viewed from either the perspective of the developing state or those attempting to export the technology. Understanding the concerns that motivate a government to reject GMO, even when facing food shortages and famine, could go a long way towards steering future programs in a more successful direction. Getting safe, higher yield crops planted in regions that are facing food shortages seems like a win for all involved, but it is unlikely that future programs would be able to allay the fears of the developing states if there isn't an accurate picture of their chief concerns. A comparative examination of states where GMO has been accepted, and those where GMO has been rejected, could be instructive in teasing out some of the details of the decision process. Such a comparison would need to control for as many other variables as possible, and thus states with similar reliance on agricultural production and being regionally bound, would be ideal.

This paper will proceed by examining the current literature surrounding the topic of the acceptance and rejection of GMO food in Southern Africa. Each fails to fully account for the motivations behind the Zambian rejection, and posits an overly simplified causal relationship between a single factor and rejection. The "Knowledge Gap" school of thought asserts that the Zambian rejection stems from a fundamental lack of knowledge about the technology; likewise, the "Market Preservation" literature posits that rejection is purely an attempt by Southern African states to ensure access to the European Union, where GMO's future remains uncertain. Still more literature revolves around the Zambian adoption of "The Precautionary Principle", that

is the idea that, in situations where environmental impact of a new technology is not certain, a conservative position should be taken; this literature fails to address the question of what makes these Southern African states believe the impact of GMO is uncertain, however. Additionally, a school of thought revolves around the idea that rejection is motivated chiefly by food sovereignty and intellectual property concerns of small farmers; Southern African small farmers to the point of the famine were predominantly locally self-sufficient and, consequently, lacked any organization or institution representing their needs to the state. As such, the failure of the argument that GMO rejection is fulfilling the will of the small farmer is that, it would seem, no one has yet asked him. The school of thought that I found most salient and consequently based most of my work on is the “Maize to Modernity” literature. Zambia persisted in rejecting GMO maize because cultivating the crop means something to the Zambian state that is not immediately apparent to outsiders. The WFP’s program was not a failure of a backwards African state to accept the help they needed, or a flat-out rejection of technology, but a failure of the WFP to adequately tailor the program to comport with the long term goals and visions of the Zambian state for their agricultural program.

Following my evaluation of these schools of thought, I will seek to answer the chief research question of this paper, namely why Zambia and Zimbabwe, despite similarities in their background conditions and initial positions, arrived at differing policies regarding GMO. I will discuss the experience of the two states, both before and after the famine, in an effort to tease out what led to their variation in transgenic food policy. I will follow with a discussion of my findings: that the Zambian and Zimbabwean states differed in their commitment to agricultural subsidies, such as input credit and output marketing assistance. For Zambia, maize cultivation came to symbolize modernity in the years following the fall of their industrial sector.

Consequently, the Zambian state had in place a well-organized infrastructure for supporting rural farmers with agricultural inputs, whereas Zimbabwe's similar programs were significantly hampered by the ongoing land reform process in that state. In conclusion I will discuss the implications of my findings including a discussion of the need for tailored programs, such as the World Food Program's famine assistance. An understanding of how technology policies in developing countries actually evolve over time, rather than a reliance on assumptions of "backwardness" or simple cause and effect narratives, is necessary if these programs are to ever meet with success.

## **II. Southern African GMO Rejection: A Review of the Literature**

An examination of the literature surrounding the rejection of GMO in Southern African states reveals a few broad schools of thought none of which, taken alone, provide an answer to the research question undertaken in this paper. The first, consisting of the market preservation literature, find the uncertain future of GMO acceptance in the European Union to be instructive when searching for causes of GMO rejection in Southern Africa. The second, built on early work examining the reason for GMO rejection in the European Union, finds a gap in knowledge on the part of the public to be a key mechanism in rejecting states. The third examines the role of the “precautionary principle” in predicting GMO rejection, while the fourth examines the role of environmental NGOs and advocacy groups purporting to act on behalf of small farmers. The fifth, and most salient, is instructive in explaining the persistence of GMO rejection in Zambia: maize production has come to symbolize Zambian modernity, but chiefly through a focus on large scale agricultural programs. While small farms may benefit from the introduction of GMO, the Zambian government is interested chiefly in supporting large scale agricultural production for exportation and domestic use. Zimbabwe was chosen as the comparative case for this paper, despite maize not playing a similar “modern-making” role in that state. The two cases are the most comparable due to the fact that the research question revolves around GMO; while another crop may play a more “modern-making” role in a different state, the GMO debate is most relevant and observable in these two neighboring Southern African states.

### **Market Preservation**

The market preservation literature is built around the idea that the Southern African states are acting chiefly to preserve their export market in the European Union. The idea is that the

states are acting in a rationalist manner, weighing the costs and benefits of their GMO policy with regards to their future export-based revenues. This body of literature is politically charged, with calls for the E.U. to accept GMO to depoliticize the issue (Bodulovic, 2005) or the United States to step in to promote biotechnology in Africa (Paarlberg, 2003). In the “current scenario, it is possible that most southern African nations will not waver in their general opposition to GM crops and food until there is a real change in the attitude of the European Union and products of agricultural biotechnology become more widely accepted” (Bodulovic, 2005). E.U. rejection of GMO is thus framed as being causal for all manner of environmental destruction and impoverishment in Southern Africa.

The market preservation literature is actually weakened by the work of one of its early proponents, Robert Paarlberg. He asserts that, while the European Union has been known to reject shipments of crops thought to be contaminated with GMO strains, the complete exclusion of imports from a state known to plant GMO varieties is all but unheard of. Even imports of GMO-laden maize from the United States were accepted, under the condition that the products containing the maize be properly labeled (Paarlberg, 2006). The most damning evidence produced by Paarlberg as to the concern of market preservation being the cause of GMO rejection, however, is the simple fact that the crops being offered to the Southern African states are not those for which there is a significant export market in the recipient states; “By far the most frequent export destination for ‘possibly GM’ products from these selected African countries was other countries in Africa itself” (Paarlberg, 2006). The percentage of crops for which there are GMO varieties and that had historically been exported to GMO-unfriendly states, such as the European Union, is very low. Furthermore, there is a body of work in the economics literature that suggests the increase in crops for “domestic consumers ... is far more than the

small gain in terms of greater market access to the EU” (Anderson & Jackson, 2005). Assuming perfect knowledge about their markets, it seems unlikely then that the Southern African states that reject GMO are doing so to preserve trading markets in Europe.

### **Knowledge Gap**

The knowledge gap literature, in large part building on the earlier work of Borlaug (2000), argues that the rejection of biotechnology solutions to problems of food production stems from a lack of knowledge on the part of the consumers. Speaking initially of the European Union, Borlaug cited the lack of sufficient education on the topic of GMO as causing unnecessary fear and a generally misunderstanding of the technology; he further stated, “Privileged societies have the luxury of adopting a very low-risk position on the genetically modified crop issue ... But the vast majority of humankind ... does not have such a luxury” (Borlaug, 2000). This notion, that GMO rejection stems from a lack of knowledge of the technology, was exported from the EU to the developing world along with the transgenic crops.

The knowledge gap hypothesis has also been taken up by the communications literature. Authors calling for improved cooperation between journalists, scientists, and governments have cited the need for open channels of communication with the public if any progress is to be made in increasing GMO acceptance with the general population. In order to alleviate concerns as to the safety of GMO, public information programs focusing on “social engagement and improved community knowledge” (Mugwagwa & Wamae et al, 2010) have been discussed at length. This body of literature takes for granted the safety of GMO, and thus sees the begged question as being one asking why the message of GMO-safety is not being conveyed successfully. The assumption is that the anti-GMO message is being propagated along community channels, and

being rendered more convincing by its messenger, whereas the pro-GMO message is being propagated by sources perceived to be less trustworthy, such as transnational institutions.

One major flaw in the knowledge gap literature is that there is no indication that a high level of public understanding of GMO is sufficient or even necessary for GMO acceptance. This truth is perhaps nowhere else better illustrated than in neighboring South Africa. South Africa ranks second in the world for total GMO crop hectare production per year, behind only the United States (GMO Compass). Despite this fact, a 2005 study performed by the HSRC found that 63% of respondents in South Africa were unaware as to whether or not they had consumed GMO food. When asked if they believed it was possible to “put animal genes in to plants”, the basis for many genetically modified strains of crops, 62% indicated that they didn’t know, and 24% indicated that it was not possible. Further, 88% of respondents reported that they did not know what they thought when they heard the phrase “genetic modification”, with the remaining 12% running the gamut with positive and negative connotations (Rule & Ianga, 2004). Clearly, the key to GMO acceptance does not lie in an increased public understanding of the technology alone.

Furthermore, there is evidence that small farmers are in favor of increasing GMO strain usage (Sitko, 10). Additionally, while awaiting shipment back out of the country, several stores of GMO grain were broken in to and looted by villagers (GM Maize Looted by Starving Villagers, 2002). The reluctance to accept GMO, even in the face of famine, does not appear to be a trait shared by all Zambians. Indeed it would appear that the chief opponents of transgenic crops existing within the spheres of the government and large agricultural firms.

### **The Precautionary Principle**

An instructive body of literature regarding the causal mechanism of GMO rejection in Southern Africa focuses in on the “precautionary principle” as a guiding light for policy decisions. This body of literature is a logical offshoot of the “Knowledge Gap” hypothesis, positing that there is not a lack of knowledge of GMO, but a lack of complete certainty in the safety of the technology and it is that lack of certainty which necessitates rejection. The precautionary principle was first articulated as a standard by which to make policy decisions in the United Nations Rio Conference, or Earth Summit, in 1992. The use of the precautionary principle as a means of evaluating environmental policy was formalized in the Lisbon Treaty, in 2000, specifically as it pertained to dealing with environmental polluters. The precautionary principle literature is linked to South African GMO rejection by a statement made by the Zambian Agricultural Minister, citing the precautionary principle, in conjunction with the current lack of a scientific consensus, as necessitating the rejection.

In large part, the connection between the phrase and the E.U. was seen as further indication that the rejecting states were merely mirroring the policies of Brussels, in an effort to ensure future access to European markets. As the aforementioned “Market Preservation” literature would indicate, however, it seems that market factors do not appear to be predictive of GMO rejection. Instead, it would appear that the adoption of the precautionary principle sets an artificially low bar for those NGOs that seek to persuade Southern African states to reject GMO solutions to food shortages. The precautionary principle shifts the burden of proof entirely off of those advocating maintaining the status quo, GMO opponents, and on to the shoulders of GMO advocates. It sets an unreachably high bar for advocates, as any vague notion of future risk, regardless of how slight, is seen as sufficient evidence for rejection. The use of the precautionary principle on the parts of the rejecting states also falsely holds the maintenance of the status quo

as being a low-risk proposition, with risk being segregated on the “change” side of the decision tree. Thus the Zambian scientists sent to the United States and Europe to evaluate the long term risks of GMO would have never arrived at any conclusion save for complete rejection.

The “Precautionary Principle” and “Market Preservation” literature are simultaneously weakened by the fact that the most commonly offered GMO crops are not those that have a large export market in the European Union. The theory behind the former school of thought is that the use of the precautionary principle as a reason for rejection is a paraphrase of the current E.U. policy regarding GMO. The Southern African states, seeing the EU market as key to their economy, simply adopted the same policy as the EU itself. This argument falls apart, however, when the “Market Preservation” literature is rendered spurious by the fact that the chief export markets for the Southern African states are other African states – with loose GMO policies.

The chief shortcoming of the “Precautionary Principle” literature lies in the lack of a clear logical reasoning for the persistent rejection of GMO. While it is possible the Zambian government has continued to resist the importation of transgenic seeds and foodstuff for purely principled reasons, it seems unlikely that there is not more to this story. The literature takes for granted the safety of GMO and, like the work surrounding the “Knowledge Gap” hypothesis, presumes states taking an anti-GMO position have done so because they have been insufficiently convinced of the science. It reduces the famine states’ decision to either accepting GMO grain or rejecting it out of a misguided fear, leaving no room for the possibility that a policy of acceptance may simply not be in line with the rejecting state’s long term plans for food sustainability.

The precautionary principle literature also fails to account for the change in policy on the part of Zimbabwe, Mozambique, and Malawi. If the precautionary principle prevented those three states from accepting milled grain, what changed and prompted them to change policies? If the precautionary principle was presumed true and taken to be steering policy, it would have to be assumed that states following the principle would arrive at policy decisions so varied so as to render the predictive value of the hypothesis nil. Finally, the precautionary principle literature is substantially weakened by the inadequacy of the aforementioned “Market Preservation” literature. The literature turns on the idea that the rejecting states were using the “precautionary principle” term as a nod to Brussels and the Lisbon Treaty; so with the rejection of the market preservation hypothesis we must also reject the precautionary principle.

### **“Food Sovereignty”, NGOs, and Small Farmers**

The vast majority of Africa’s 33 million small farms are on plots of land consisting of less than 10 hectares (Altieri, 2009). Most of these farms rely on “low resource” farming methods, being locally self-sufficient. Going hand in hand with this local resource reliance is a lack of any sort of overarching organization representing the needs of small farmers. While 80% of African farms are “small-farms”, and two-thirds of those small-farms are less than two hectares in size (Altieri, 2009), respondents to a survey in South Africa on agricultural hurdles faced by the region “perceived the typical small-scale farmer problems (such as post harvest losses, lack of irrigation facilities, bad transport network and inadequate market conditions) as not being very important” (Aerni, 2005). What is or is not beneficial for small farmers in Africa has, in large part, been vocalized by virtually any individual and organization other than the farmers themselves.

The standard bearers for food sovereignty and environmental concerns have mostly emerged as environmental NGOs. They have framed the topic of GMO as an extension of the Green Revolution, and rejected biotechnology as a solution. A key distinction found in the environmentalist GMO literature is whether the Green Revolution “bypassed Africa”, as Kenyan President Daniel Arap Moi stated, or whether it “failed Africa.”; “The technologies did not bypass Africa: they were available but unpopular and ineffective” (Kuyek, 2002). Environmental and other GMO-opposed NGOs have also framed the debate in terms of protecting small farmer’s intellectual property rights. They tie accepting GMO to accepting the western “acceptance of intellectual property rights on living organisms” (Kuyek, 2002). The NGOs present themselves as representing the interests of the small farmers, and ensuring the future “food sovereignty” of states in the region.

The focus by NGOs on the implications of GMO for small farmers in Southern Africa is problematic. There is every reason to believe that small farmers would indeed benefit from the use of transgenic, drought or pest resistant, crops. The high-minded ideal of “food sovereignty” is married to the image of the small farmer, planting heirloom seeds on land he has cultivated for generations. The reality seems to be that GMO’s chief opponents lie in the government and large-scale farmers, not small rural farmers eking out a living. Indeed, Zambian President Levy Mwanawasa was quoted as saying his people would rather starve than be poisoned by GMO (Conko & Prakash, 2004) while, at the same time, an underground market for smuggled GM soybeans was thriving and donated GMO grain had to be kept under lock and key to prevent villagers from raiding GMO grain being “stored” at a chief’s palace (Zambia Denies GM Aid for Refugees, 2002).

Small farmers in Southern Africa seem to be constantly spoken for, though rarely heard from. The body of literature surrounding the topic of food sovereignty and the rights of small farmers contributes much to the debate in terms of what may cause a state to reject biotechnology solutions to food shortages, in the midst of a famine. As previously mentioned, there is every reason to believe small-farms would benefit from the use of transgenic crops and “they may in fact be warmly embraced” (Sitko, 10). Thus, any pressure being placed by NGOs on governments to reject GMO would appear to be serving the interests of the NGOs or perhaps the government, but not those of the small farmers.

In states where GMO has been accepted, as in Zimbabwe, there are hurdles to food security that amount to more than simple input shortages for the agricultural sector. In the case of Zimbabwe, “food security” can be little affected by the presence or absence of GMO; land resettlement programs have created a food crisis that no amount of agricultural inputs will be able to resolve in the short term. Indeed, “at a time when the food security situation in other countries in the region has begun to show some improvement, Zimbabwe’s crisis has widened” (Loewenson, 2003, pg. 4). Unresolved land resettlement issues make acceptance of donated grain and other foodstuffs, as in the WFP GMO program, a necessity. The land resettlement crisis has further hampered Zimbabwe’s ability to create an infrastructure of support for its own agricultural sector, leaving the state with no immediate method for a production-encouraging alternative to food aid. Thus in a way, “food sovereignty” is not an immediately salient issue for the accepting states in the midst of famine, and “food security”, with the inclusion of food aid, is a more achievable short term goal.

### **Crop Symbolism**

The “Crop Symbolism” school of thought incorporates some of the assertions made by the preceding areas of research but view them from a discursive perspective; namely, researchers in this arena see large scale agricultural programs as being a key symbol of achieved modernity for the farmer in a post-colonial context. The concept of symbolic value inherent in a national crop is not unique to Southern Africa. A crop’s symbolic value can be deeply ingrained in a culture, independent from any dietary or economic reliance on that particular crop, as in the case of Japanese rice. Indeed, “rice has become a dominant metaphor of the Japanese despite the fact that a large segment of the population has always been engaged in occupations other than rice agriculture and ... rice has not been a quantitatively important source of food” (Ohnuki-Tierney, 1993, pp. 6). Historical circumstances and experiences can imbue a crop with more significance within a culture than the sum of its subsistence or export value.

The symbolic value of a crop can exhibit more permanence than its economic or food production utility. In the case of Zambia, crops have been proposed that are more drought resistant than the dominant maize, and yet have struggled to gain acceptance. Cassava and sorghum, despite promising higher yields and a better chance at Zambian food sovereignty, have largely been viewed, in contrast to maize, as steps away from modernity. This has little to do with the actual agricultural production of maize, and more to do with what maize production has come to symbolize for the Zambian people. Maize is more than just a food and export crop for Zambia, it is symbolically powerful: “A full *butala* (silo), which is often spatially positioned within homesteads in full view of passers-by, identifies the owner as a ‘good farmer’, with the necessary knowledge to negotiate access to inputs and to use them appropriately” (Sitko, 3). Possessing the knowledge to cultivate maize is equated with self-sufficiency, the modern farmer, and modernity itself. Attempts to supplement the food supply by cultivating the more drought-

tolerant cassava have met with similar fates to that of GMO: cassava success in “Zambia requires a representation of cassava as a technological advancement and not as a technological regression” (Sitko, 10). If agricultural programs in that state are to be successful, they must proceed with an understanding of what “being modern” means to the *Zambian farmer* specifically, and in post-colonial states more generally.

The research within the “Crop Symbolism” school of thought is the literature I found most salient for this research project. An understanding of the specific needs, conceptualizations and priorities of the recipient states is necessary if food programs such as that attempted by the WFP are to be successful. In post-colonial states it is especially imperative that local knowledge and the cultural importance of subsistence crops be taken in to account before any relief program is attempted.

### **III. Case Selection: Zambia and Zimbabwe**

The 2002 famine affected all of Southern Africa, creating a laboratory for examining the variance in food policies across that region. Agriculture is an economically important sector for much of Southern Africa, including the four states the WFP sought to donate grain to: Zambia, Zimbabwe, Mozambique and Malawi. The sole variation in the GMO policies of the Southern African states was in the decision of Zambia to persist in rejecting GMO grain, even after the WFP agreed to have the maize milled, which would destroy any potentially viable seeds. The aim of this paper is to explain the contributing factors behind the continued rejection of GMO grain on the part of Zambia. Following the rejection, news outlets and academic scholarship alike sought to explain Zambian reluctance to accept GM food through overly simplified causal mechanisms. There were assumptions that it was a case of a backwards technophobic state dooming its population to famine out of a fear of progress, or that it was the result of a simple economic cost-benefit analysis with regards to export markets. The solutions then were educating the Zambian people on the safety of GMO or convincing the European Union to issue a decree that there was no GM import ban on the horizon, respectively. Shifting the focus away from simple cause and effect narratives and on to the actual motivations and concerns behind Zambia's rejection can help ensure future programs intended to alleviate food supply issues are more acceptable for the recipient states.

In examining the cases of the Southern African states that rejected GMO, the most efficient course of action for teasing out causal mechanisms is juxtaposing states in a "most-similar systems" research design and choosing from among the initial rejecters is the most logical point from which to proceed. An interesting variation is apparent when Zambia breaks rank with the rest of the rejecting states and refuses to accept milled GM grain. The agreement by the donating

states to mill grain prior to shipment to Southern Africa sufficiently satisfied all of the famine-stricken region, save for Zambia, and so their motivations for rejection might be presumed to differ from the accepting states. In this section an argument is made for the sufficient similarity of Zambia and Zimbabwe so as to allow for a useful comparison.

### **Primacy of Maize**

The most important similarity between the two cases lies in their shared primacy of maize as a subsistence crop. Maize provides more than half of the caloric intake for the average Zambian, with Cassava coming in a distant second at 13% of calories consumed (Chapoto, Govereh, Haggblade et al, 2010). Wheat has become a more important staple crop in recent years, but remains behind both maize and cassava nationally and in most regions individually. Interestingly, Zambian “urban areas tend to favor wheat consumption, relative to rural areas” (Chapoto & Govereh & Haggblad et al, 2010) which leads an additional political wrinkle to Zambia’s 2002 rejection of non-GMO wheat as a maize alternative.

The case is similar in Zimbabwe, with maize as the chief staple food, consisting of 47% of Zimbabwean caloric intake (FAO Country Report, 2009). Domestic yields have consistently fallen short of sufficient production to keep up with needs, however, and Zimbabwe has necessarily turned to imported grains. Additionally, shortages in foreign currency have led to periodic grain shortages (FAO Country Report, 2009). The comparable role in both cases helps rule out the possibility that the Zambian rejection can be explained by differing levels of reliance on maize as a staple crop. Zimbabwe’s reliance on imported maize, more so than its neighbor Zambia, is a potentially confounding difference between the two states. It would seem, however,

that this difference helps to explain, through a sort of path dependence or inertia, Zambia's reluctance to accept donated foodstuffs – even in a famine situation.

### **Economic Similarities**

In terms of economies, Zambia and Zimbabwe do differ in pure GDP numbers. The economy of Zambia is roughly twice that of Zimbabwe, \$19.219 million USD and \$8.8 million USD, respectively. Likewise, their per capita GDP come down along similar lines, with Zambia coming in at \$1,611 and Zimbabwe \$515. These are limitations to the comparisons between the two states but, it is the opinion of the author that they do not preclude the two cases from being compared along the lines necessary for the purposes in this paper.

The key similarities for the purposes of this paper are, however, the percentage of the labor force in the agricultural sector; the percentage of each states GDP stemming from the agricultural sector, and the percentage of the population below the poverty line. On these numbers, the two cases are quite similar. Zambia's agricultural sector accounts for 21.5% of their GDP, and Zimbabwe's is 20.4%. The percentage of the labor force employed in the agricultural sector is 65% and 80% in Zambia and Zimbabwe, respectively. While the difference between these sector percentages are not insignificant, for the purposes of this paper they are sufficiently similar to allow for comparison, as a reasonable argument could not be made that merely 60% of the labor force being employed in the agricultural sector allows the Zimbabwean state to engage in practices that might undermine the agricultural market. The agricultural sector employs a large percentage of the population in both states and, as such, it can be assumed that both governments would be loathed to endanger their agricultural sector.

The chief export product for Zimbabwe is cotton, whereas Zambia relies on maize and soybean. Likewise, the chief export partners for Zambia and Zimbabwe differ, with Zambia trading chiefly with Switzerland and Zimbabwe the Democratic Republic of the Congo. This paper is limited, therefore, to a consideration of the rejection/acceptance of GMO maize for domestic consumption in each state. The chosen research question surrounds what caused Zambia to reject milled GMO grain for consumption, and Zimbabwe to accept the same. The question as to what caused the two states to reject GMO maize seeds, while touched on here, is one for future research.

### **Colonial Legacies**

Zambia and Zimbabwe share a colonial legacy in their history as colonies of the United Kingdom. Zambia achieved independence in 1964, while Zimbabwe declared independence in 1965 but was not recognized as a sovereign state by the United Kingdom until 1980. Controlling for colonial legacies helps limit the possibility that there exists clear differences between the cases with regards to interactions with the west. While no two states share identical histories, controlling for colonizing power seems an efficient way to minimize widely varying pre-independence trajectories.

During the late nineteenth century and first half of the twentieth, Zambia existed as the British colony of Northern Rhodesia. Its counterpart Southern Rhodesia, now Zimbabwe, was economically unimportant to the British, and was granted white “self-government” in 1923. Northern Rhodesia, however, contained copper reserves that, by 1928, were found to be significantly larger than was once thought. As such, Northern Rhodesia was a profitable colony for the United Kingdom and mining strikes and independence movements were put down with equal force. The turning point for Northern Rhodesian independence came with the election of

the first African majority in the Northern Rhodesian Legislative Council, in 1962. A vote of secession was held and, at least in birth, the Republic of Zambia was formed with minimal violence.

Zambia's independence pre-dated Zimbabwe's, but the newly-independent state faced considerable challenges. The lack of a developed bureaucracy, internal conflicts, and the scarcity of independent African states with which to trade, coupled with the state's reliance on the shrinking copper market, forced Zambia to take out large loans from the International Monetary Fund (IMF) and World Bank. Through the Cold War, Zambia adopted a leftist political stance, nationalized many of the major industries, and engaged in import substitution industrialization. The Zambian economy rose and fell with the boom and bust of the copper industry and, following the collapse of the copper industry in the 1970s, fell in to a recession from which it has not yet fully recovered.

Zimbabwe declared independence through a Unilateral Declaration of Independence (UDI) in 1965, but was not formally recognized as a sovereign state by the United Kingdom until 1980. While officially in rebellion, trade sanctions were imposed upon Zimbabwe in 1966 and 1968. This, coupled with an ongoing guerilla war between nationalist forces and the white majority government, left the state in straits not unlike those found in Zambia. Additionally the Zimbabwean state was weakened by a civil war between the Zimbabwe African People's Union (ZAPU), led by Joshua Nkomo, and the Zimbabwe African National Union (ZANU), led by Robert Mugabe.

A shared colonial legacy of colonization by the United Kingdom, coupled with a rocky start to life as independent states, renders the colonial legacies of the two states sufficiently

comparable for the purposes of this paper. Differences between the two state's legacies are not insignificant, with Zimbabwe enduring a prolonged civil war and considerably later independence date. However, while Zimbabwe was considered in rebellion from the date of its declared independence, 1965, to the date it was granted independence, 1980, no attempts were made by the United Kingdom to regain control by force. This is likely due to Zimbabwean whites retaining control of most of the arable land, a condition comparable to that found in Zambia.

### **Land Apportionment**

Prior to colonial involvement, Zambia and Zimbabwe shared a notion of land as not something that is owned by one individual or another, "People were linked to land through ethnic groupings. ... However, with the coming in of the western colonialism and capitalist-oriented thinking, control over land started to emerge" (Ng'ombe, 2007). Zambia and Zimbabwe were both marked by predominant, if not exclusive, white land ownership during colonialism.

A problem common to both Zambia and Zimbabwe in the post-colonial era has been the issue of land reform. In Zimbabwe, the Mugabe government has engaged in forced land reform for a number of years. Just prior to recognized independence in 1979, the majority of arable land was in the hands of the small minority white population. By 2010, land seizures left fewer than 400 white landed farmers in Zimbabwe, down from 4,500 in 2000. This forcible land redistribution has been controversial and an entire body of literature exists revolving around whether or not it has been successful. For the purposes of this paper, however, suffice it to say that Zimbabwe has had its fair share of land reform issues.

Zambia has had issues of land reform, if not on the scope and scale of that found in Zimbabwe. The 1964 independent Zambia was granted a state comprised of three categories of land: native reserves, crown and trust land (Ng'ombe, 2007). Crown land was given to the state while the rest remained in private hands. President Kenneth Kaunda, and the United National Independence Party (UNIP) enacted legislation allowing unworked land to be redistributed (Ibid). The focus for the time was on domestic redistribution, and a discouragement of foreign investment. Later in 1995, following the move to a multi-party system, the Zambian government passed a Lands Act in the hopes of attracting foreign investment (Ibid). Further in 2011, Zambia enacted policies to encourage South Africans to homestead and grow maize in the country (Pearce, 2011). Land redistribution has been an ongoing priority of Zambian governments since independence, but it never reached the destabilizing levels of that found in Zimbabwe.

### **Limitations**

No comparison of two states is perfect, and Zambia and Zimbabwe differ on a number of variables that have been touched on under the previous subheadings. For the purposes of this research question the two cases provide the best basis from which to launch a comparison. The research question necessarily limits the cases from which to choose from to the five initial rejecting Southern African states. Significant differences in GDP and colonial legacies, as well as variations in the chief agricultural products and reliance on the agricultural sector, eliminated all but Zimbabwe and Mozambique as reasonable comparative cases. Mozambique was eliminated owing to the fact that maize is not their chief agricultural product, neither for export nor domestic consumption. I felt a reliance on maize was the most important factor if a “most similar systems” research design was to be used, and thus Zimbabwe was chosen as the comparative case.

Comparing Zambia and Zimbabwe is not without precedent: In 2000, Goldman compared the two states, along with South Africa, for the purposes of poverty analysis and rural development (Goldman, 2000). Likewise, Thierfelder and Wall compared the two states for an investigation of conservation agriculture as a means to mitigate future effects of climate change, and specifically focused on maize production and productivity (Thierfelder & Wall, 2010). Finally, Rusike, Howard & Maredia built a comparative analysis of seed sector evolution around the two states (1997) following earlier seed sector structural reforms. While a comparison of Zambia and Zimbabwe is not without its problems, it is the most reasonable way to go about answering the research question and earlier comparisons by established authors left me confident that my case selection was sufficiently justified.

#### **IV. Maize and Zambian Modernity**

The knee-jerk reaction of much of the Western world to the Zambian rejection of the GMO maize was to search for a single causal factor. The Zambian government persisted in rejecting the milled grain out of a fear of the safety of transgenic foods, or to preserve the European export market, or from a fundamental misunderstanding of GM. The reality is something of a confluence of issues which, taken together, begs the question as to why the WFP chose the course of action it did. A cursory understanding of the conditions in Zambia would raise questions as to the wisdom of treating the Southern African famine with the one-size-fits-all WFP grain donation solution. In 2002, the Zambian government already had a system of agricultural subsidies for inputs such as hybrid seeds and fertilizer in place to support the agricultural sector. Aid would have better come in the form of agricultural inputs, and would have been more in keeping with the plan Zambia had in place for achieving its own food security and sovereignty. With an understanding of the differences between Southern African states, such as Zambia and Zimbabwe, treating famine-stricken Southern Africa with a uniform model of relief is to completely ignore the steps the receiving states have already taken to improve their situation.

Zambia's maize industry has its roots in the copper industry. Maize cultivation expanded and thrived as the copper industry boomed, and continued to be an integral part of the economy even after the bust. The link between maize and copper also made the crop symbolically important to Zambians. The collapse of copper left Zambia a partially-modernized state, as the industrialization that came with the expansion of copper had brought with it a level of urbanization that was unsustainable post-copper. When the copper mines were shuttered, maize continued to be subsidized by the state as an important source of employment and food for the

disenfranchised urban workers. The input subsidization economy eventually became important in and of itself, and the fertilizer and seed markets had their own path dependence that made the 2002 grain donation unlikely to be acceptable to a subset of the political elites.

### **Maize and Copper**

The cultivation and production of maize has been an integral part of the Zambian economy since the discovery of copper in the early 20<sup>th</sup> century. Demand for maize increased steadily as mining operations expanded and continued to grow rapidly “because of ... surplus land, new varieties better suited to smallholders’ conditions, favorable input prices, and the physical availability of input and product marketing outlets” and by the late 1980s, maize subsidies and support constituted 17% of the government budget (Byerlee & Eicher, 45). Small farmers initially grew maize in addition to other subsistence crops, such as sorghum, groundnuts and pumpkins. These alternative crops gave way to nearly exclusive maize production, thanks to maize’s ability to thrive in the regions surrounding the mining towns in the Copper Belt. Technologies imported from South Africa and the United States, including hybrid seeds and improved fertilizers, further cemented the crop as a subsistence mainstay.

The initial reliance of the copper industry on maize production, and the Zambian economy’s reliance on the copper industry, made governmental support of maize production a necessity. The Zambian government directly subsidized maize and made fertilizer and seed available on credit. “Fertilizer use quadrupled between the 1960s and the late 1980s and fertilizer consumption in the remote areas increased from 15 to 39 percent” (Byerlee & Eicher, 53). But the relationship between copper and maize runs deeper than economics. After the collapse of the copper industry, it was maize production that would help Zambians redefine their modernity.

## **Zambian Self-Perception**

Few states have endured the kind of boom and bust cycle that has been the last forty years of Zambian history. Ferguson (1999) refers to it as “modernization through the looking glass, where modernity is the object of nostalgic reverie, and ‘backwardness’ the anticipated (or dreaded) future” (p. 10). Ferguson argues that “Zambia’s recent crisis is not only an economic crisis but a crisis of meaning, in which the way that people are able to understand their experience and to imbue it with significance and dignity has been dramatically eroded” (Ibid). This conception of modernity lost is not limited to the copper industry, but has implications for current and future policy decisions in Zambia. In the absence of copper, the cultivation and harvesting of maize came to symbolize the modern Zambia.

In the decade following independence, as is true of many post-colonial states, there was a perception among the new ruling elite that the vestiges of colonial rule had to be shaken off if modernization was to be fully achieved. All aspects of the economy, including the agricultural sector, would need to be retooled for the move to modernity. The subsistence economy was to be revamped, and Maize Control Boards (MCBs) were introduced to provide a market for small-farmers and subsidize the production of the crop. These MCBs “provided small-scale Zambian farmers with the tools of modern, intensive agriculture, such as fertilizer and hybrid seeds” (Sitko, 2007, pg. 5). The early independent Zambian infrastructure was built around the cultivation and harvesting of maize, and the weight of the government was thrown behind a model of modernization that incorporated urban and rural Zambia, asking subsistence farmers to “join the urban population on the path to modernity” (Sitko, 2007, pg. 5). Far from being left behind, Zambia’s agricultural sector was seen as an important part in the modernization process,

both economically and as a method of mitigating the effects of a protracted modernization process.

At the point of independence, in 1964, Zambia was a rapidly urbanizing state. The copper industry had propelled Zambians in to industrialization, and “urbanization was understood to involve not simply a movement in space but an epochal leap in evolutionary time” (Ferguson, 1999, pp. 4). Modernization and urbanization were inextricably linked, and Zambia was modernizing quickly. The idea of a convergence with a European model of industrialized state “thus seemed to be no speculation” (Ibid). The copper boom of the 1960s had brought with it a revolution of rising expectations, and the copper bust had rendered those expectations unachievable. Ferguson (1999) argues that much of the traditional literature on the Zambian Copperbelt boom era glosses over the effect industrialization had on urbanization, opting instead for a simple cause-and-effect narrative. He does not debate, however, the fact that the era produced an “expectation of urban permanence” (Ibid) among a subset of Zambian population. As such, the point of no return had been crossed for Zambians: the ascent to modernity and urbanization had been cut short, and left Zambians unable to return to their rural roots, and yet unable to achieve this urban permanence. The Zambian state sought ways to return the urban workers to the agricultural sector and continue the post-Copperbelt Boom march to modernity, through shifting subsidies from the urban population to the agricultural sector. Part of this process included ending urban food subsidies (Macmillan, 1993, pg. 709) in an effort to drive the population back to towards rural regions and relieve some of the pressure on the urban economy.

### **Post-Independence: Zambian Agricultural Programs**

The Zambian government had a vision for the post-Copperbelt boom Zambia as one marked by a renewed commitment to agriculture. Following the bust of the copper industry in

the 1970s, the state enacted a series of policies that encouraged urban workers, many formerly employed by the copper industry, to resettle in the countryside. The plan was that “urban workers might revitalize agriculture by investing in farming the local countryside ... surrounding the towns of the Copperbelt [as it] is remarkably little developed in agricultural terms” (Ferguson, 1999, p. 148). Zambia thus undertook their land reform early on in their independence, contrasted against Zimbabwe’s continued reforms away from “backwards” agrarian practices in the 1980s, and their subsequent resettlement policies of the late 1990s.

From independence to 1989, the Zambian state supported agricultural input subsidies through a centralized marketing parastatal called NAMBOARD. NAMBOARD was a buyer of last resort for domestically produced maize, and ensured both food security for the urban population and income for rural farmers. It set price floors for maize, allowing the market to dictate prices above the floor price. Prior to liberalizing in 1986 in response to the Economic Structural Adjustment Programme (ESAP) NAMBOARD operated as a monopoly, centralizing the maize and fertilizer markets. In 1989, NAMBOARD was dissolved and responsibilities for maize reserve maintenance and fertilizer importation were shifted to the Zambian Co-operative Federation (ZCF) and the Nitrogen Chemicals of Zambia (NCZ); the subsidization of inputs remained a focal point of the state even in a liberalized maize market.

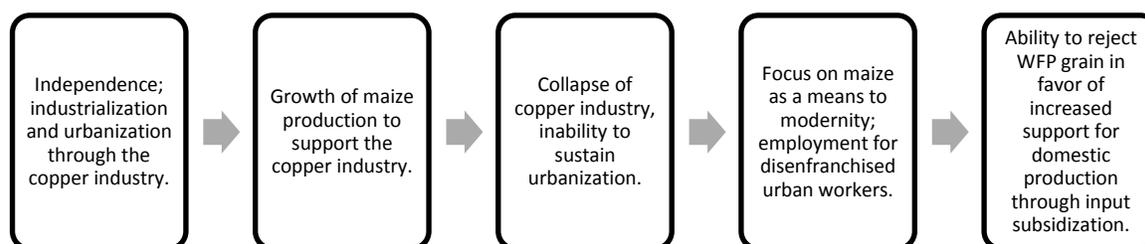
Through the 1990s the Zambian government rolled out rural group businesses (RGB) and input and crop depots, to assist rural farmers with increasing maize yields and bringing their harvest to market. The programs met with a modicum of success, as in 1999 participating farmers earned \$198 more per year than nonparticipants (Kelly et al, 2003, pg. 390). The Zambian state was committed to subsidizing input credit and output marketing through well-organized farmer’s associations, and put the weight of their agricultural assistance behind those

programs. Indeed, it has been posited that Zambia's input credit system is little more than a government handout, as the repayment rate has seldom risen above 40% in a year (FSRP Zambia, 2002).

Despite earlier efforts, in 2001 the Zambian government commissioned a study that found that "only 30% of smallholders had access to improved seeds and just 20% had access to fertilizers" (Baltzer & Hanson, 15). Later in 2002, months prior to the offer and rejection of the WFP's GMO maize, the Zambian government launched the Fertilizer Support Program (FSP). The initial aim of the FSP was to provide Zambian farmers with directly subsidized fertilizer for a period of two years, existing as a temporary means of boosting agricultural production and encouraging the use of hybrid maize seeds. Since 2002 the program continued and was expanded upon, with expenditures reached ZMK 150 billion in 2007 (WorldBank). The FSP's successor, the Farmer Input Support Program (FISP) has taken over where the FSP left off, installed as a more permanent arm of the Zambian government, providing 75% subsidies for purchases of improved maize seed and fertilizer.

The Zambian state has exhibited continuous commitment to its agricultural sector, and to the support of farmers with input subsidies and credits. Whether or not their methods are effective remains an open question, though the steady increase in their harvest and yield in the years since the famine would suggest *something* is working. Regardless of the efficacy of their programs, the Zambian state clearly sees the promotion of their domestic agricultural sector, and the subsidization of inputs, as an integral part of their move towards food sovereignty and security. Large amounts of money has moved through the fertilizer and seed subsidy systems in the decades following independence, ensuring that any foreign food aid that might undermine that system would be met with trepidation at best and hostility at worst.

**Figure 1: Charting the Path from Zambian Independence to GMO Rejection**



### **Path Dependence**

Years of input subsidization has created several classes of individuals in Zambia that are reliant on the continuation of these programs. First there are the farmers, large and small, that have come to rely on subsidized fertilizer and seeds, and guaranteed lines of credit. Second, but no less importantly, there are those individuals unofficially (or illegally) tied to the subsidy market. The subsidy and credit programs have been focused mostly on the hurdles involved in getting credit and fertilizer to the most rural of farmers, and have done little to control for skimming and patronage.

The Zambian fertilizer distribution programs, pre-dating the FSP, were structured in a way that did little to insulate them against corruption. These programs were structured so that “local ‘agents’ receive program fertilizer on credit according to procedures that consistently lacked transparency [and] the agents’ role has been to forward the fertilizer to ‘resource poor’ farmers on credit, and ... to recover the loans through maize purchases” (Jayne, Govereh, Wanzala et al, 2003). This led to widespread corruption, with the Deputy Information Minister being fired for stealing \$300,000 worth of fertilizer from a distribution program in 2003 (“Zambian Minister Sacked for ‘Fraud’”, 2003). The existence of a well-developed bureaucracy for input subsidizing and output marketing in Zambia meant that there was a subset of political

elites that would not have been amenable to a grain-donation solution to the 2002 famine. The flip side of the successes of the fertilizer programs and input credit subsidies is the reality of the corruption in the system; in either case a segment of society is reliant on the input subsidization program.

The Zambian input subsidy programs have exhibited a large degree of path dependence. Despite calls from the private sector to abolish government-subsidies for inputs such as fertilizers and hybrid seeds, and despite the fact that “Fertilizer use by smallholder farmers has declined precipitously since the 1980s” (Jayne, Govereh, & Wanzala et al, 315), the government programs have continued unabated and, as has been previously mentioned, have been expanded upon. Additionally, the state has not taken steps to make improvements in the transportation infrastructure or attempted to expand educational programs for rural farmers on new agricultural technology or crop techniques. They have instead continued to support and subsidize maize cultivation and farmer inputs in this one very specific manner, through fertilizer subsidization and credit systems. This is clearly the Zambian solution to the Zambian food security and sovereignty issue.

The Zambian economy has for nearly a century relied on maize, both economically and culturally. While maize was initially cultivated to feed the burgeoning copper industry, it has become symbolically important since the copper bust. Thus it wasn't GMO that threatened the Zambian state in 2002, but the potential for undermining the Zambian maize economy and its related input economies. The WFP sought to solve the Southern African food supply issue with a generic Southern African solution and in so doing failed to recognize the importance maize played in the Zambian state and the comparative advantage of Zambia's agricultural infrastructure. While other states, as in the case of Zimbabwe to be discussed in section V, had

embarked upon the path to modernity through other means, Zambia had inextricably linked their success in modernity to their maize cultivation and harvest.

## **V. Zimbabwe: Land Redistribution and Modernity**

Zimbabwe is a study in land reform unto itself. In the 1990s, the Zimbabwean state pursued a radical land redistribution program unlike anything found elsewhere in Southern Africa. Large-scale, white owned “corporate” farms were acquired by the state and redistributed to native Zimbabweans in an effort to bolster the Mugabe regime’s revolutionary credibility. Land apportionment and reapportionment has long been at the forefront of Zimbabwean politics, and the state’s economy has been at the whim of the current status of land reform for some time. Indeed, Zimbabwean independence came about in large part due to the disparities between black and white land holdings.

Early land redistribution programs followed a willing buyer/willing seller policy, with resettled populations being drawn largely from landless farmers and veterans of the war for independence. “Resettlement was intended to create a rural farming community that would move from subsistence to commercial production”(Bourdillon, Hebinck, Hoddinott et al, 8). The Zimbabwean land redistribution program sought to resolve the same issues that Zambia attempted to mitigate with agricultural subsidies and maize, specifically: subsistence, employment, and the move to modernity. However, it did so in a way that made the agricultural sector appear unstable to foreign investment, and failed to provide the new landholders with the support necessary for successful production.

### **Land Reform**

In the 1980s, there was a move away from large scale farms and farming practices, and renewed focus on small resource poor farmers in Zimbabwe. “The idea was to transform the poor, backward, inefficient farmer from the reserves to a fulltime farmer who followed all the

recommendations stipulated by the planners and extensionists” (Chaumba, Scoones & Wolmer, 2003, pg. 6). In the 1980s the perceived obstruction to development and modernity were the conservative vestiges of a “backwards” existence: “chiefs, headmen, and other traditional elements of rural society” (Ibid). This flight away from traditional farming practices lead to land reappropriation policies favoring resettlement schemes that benefited political elites positioned to take advantage of the lack of transparency and oversight.

The land redistribution programs were not as interested in the fair distribution of land as they were in the return of arable farmland to non-white Zimbabweans. The resettlement era of Zimbabwean history also drew a clear dividing line between the “resettlement” areas and their less productive “communal” counterparts. The full weight of the Zimbabwean government was thrown behind the former, while the latter were held as obstructions to modernization. This in no small part due to Zimbabwe’s independence being achieved just as the “major shifts in the dynamics of international capitalism ... soon to be termed ‘globalisation’, were beginning” (Bernstein, 2003, p. 212). In order to compete in the global marketplace, the perception was that farming practices had to be modernized, and in order for the benefits of modernization to be enjoyed by native Zimbabweans, land holdings had to be more equitably split between black and white. For Zimbabwe, land reform was and continues to be used as a major tool and yardstick for movement towards modernity.

The focus on land apportionment at the expense of production has led to economic reversals, as in 1999, following a decade of consistently high agricultural sector production, the technocratic land resettlement policies of the 1980s and early 1990s were rejected in favor of farm occupations and a resettlement of native Zimbabweans on vast swaths of previously white-owned land; the resettlements have been “cast ... as either a spontaneous rejection of

bureaucratic process of land reform or a state-orchestrated process” (Chaumba, Scoonies & Wolmer, 2003, pg. 9). While whether these farm occupations were state-driven is open for debate, the reality of these occupations was the destabilization of the agricultural sector. Thus, despite economically promising production, either the Zimbabwean state saw their “fast track” land distribution as being expedient in achieving their ends, or land redistribution went off without one driving agent or class (Bernstein, 2003). In either case, the result was a dramatic decrease in harvests and yields, a flight away from domestic food sovereignty, and a serious threat to Zimbabwean food security.

### **Unequal Land Distribution**

If we are to blame the solution, land redistribution, we must also point a finger at the problem land reform sought to resolve: the historical inequality of land distribution in Zimbabwe. Inequality in land holdings is what created the political situation that made land reapportionment feasible. In addition to contributing to that political climate, the inequality of land holdings prior to land redistribution may have doomed the Zimbabwean small farmer a life of unprofitability.

Only a small portion of the arable land in Zimbabwe is cultivated, creating a problem for large farms that would seek to employ workers at low wages – disenfranchised workers could simply move on to an unoccupied parcel of land and engage in subsistence farming. Deininger and Binswanger (1995) argued that the landed elites used their political capital to create a condition that would make small-holder farms economically unfeasible, even if the land was available. A per-capita tax was imposed on all farmers, forcing subsistence farmers to bring at least a portion of their crop to market. Additionally, small holders were restricted to land

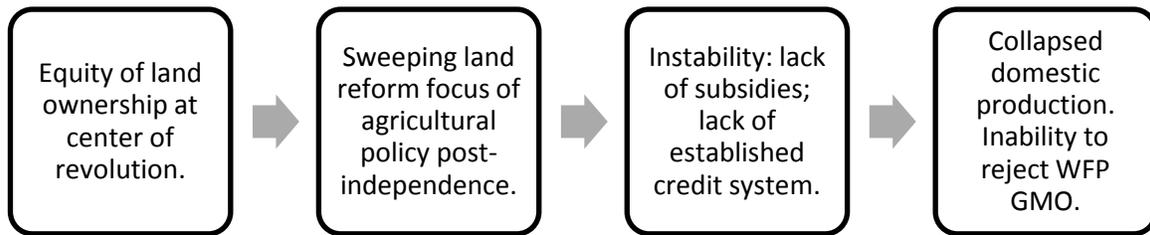
reserves, and “as of 1915, almost all of the reserves were located more than 25 miles from railway” (Deininger and Binswanger, 1995 pp. 503) in an effort to ensure they would not be able to have sufficient access to the market so as to make cultivation profitable, and to prevent their threatening larger industrial farms. Finally, cash crops were tightly controlled, with the Zimbabwean state dictating what could and could not be brought to market (Deininger and Binswanger, 1995 pp. 496). These taxes and market interventions tailored the Zimbabwean agricultural sector to be small-farm unfriendly, and to discriminate against crops cultivated for the domestic market.

Finally, landed elites attempted to choke out domestic maize production specifically. In the 1930s, dual pricing was employed in order to subsidize imported maize and squash domestic production. In fact, white landholders had to “declare publicly that they never intended to teach the natives to grow maize in competition with European producers” (Deininger and Binswanger, 1995 pp. 511). In Zimbabwe, in contrast to Zambia’s equation of maize and modernity, the cultivation and harvesting of maize had been actively discriminated against.

### **Agricultural Inputs**

In Zimbabwe the monopoly of the state in agricultural inputs, present during colonial rule, was largely left untouched through the early 1990s. “These monopolies confer structural advantages to the large farm sector, distort prices, and also drain government funds” (Deininger and Binswanger, 1995 pp. 516). These state-run input monopolies were mostly unsuccessful in supporting the agricultural sector, with less than 50% of farmers using fertilizers. When the state finally did relinquish control of agricultural inputs, it was by all accounts in an effort to reduce their drain on the budget, not to hand over the reins to a capable market. The Zimbabwean

Figure 2: From Zimbabwean Independence to GMO Acceptance



government then shifted its attention on to its land reform policies, creating a political situation that ensured foreign input investment would not be forthcoming.

There exists a direct relationship between the current status of Zimbabwe's land reform program and the failure of the Mugabe government to support the agricultural sector with inputs. To begin with, the Zimbabwean government did not begin to form a program comparable to Zambia's FSP until 1999, with help from the Citizens Network for Foreign Affairs (CNFA). Additionally, the land reform program caused a series of runs on the credit guarantee system, with claims rising "tenfold (from only one percent of credit in 2000-1) because of uncertainty surrounding Zimbabwe's land reform program, and a virtual monopoly over input supply granted to the government-owned Grain Marketing Board" (Kelly et al, 385).

The Zimbabwean state has been further hampered in any attempts to support its agricultural sector by a drop in export earnings. "The land reform has resulted in a dramatic drop in food production and export earnings, which have induced food shortages and reduced the Government's financial capacity to address them through commercial imports" ("Zimbabwe: Insight into the humanitarian crisis and food policies"). Agricultural subsidies were simply not a priority of the Zimbabwean state in the years following independence and pre-dating the 2002

famine. By the time of the famine, the depressed economic situation ensured that no input support program could be rolled out in time to be a viable solution to the food shortage.

International support for the Zimbabwean agricultural sector has also negatively affected that segment of the economy. A “critical effect of land reform is the serious deterioration of the Government’s relationship with some western countries and consecutive restrictions to foreign aid” (“Zimbabwe: Insight into the humanitarian crisis and food policies”). This aid has been shifted away from the areas of resettlement, which were themselves chosen for being the most viable for crop cultivation. Aid has also been shifted away from the agricultural sector and on to either emergency food relief, as in the case of the WFP’s 2002 famine response, or less politically charged topics such as HIV/AIDS.

## **VI. Comparisons and Implications**

Comparing the GMO policies of Zambia and Zimbabwe is instructive in teasing out the variation between the two states with regards to GMO. Despite similar colonial and post-colonial contexts, the two states followed very different agricultural policies and maintained significantly different priorities through the post-independence era. A comparison of the two states of Zambia and Zimbabwe reveals a plausible hypothesis accounting for the variation in their GMO policies: Zambia's persistent rejection is accounted for by the presence of a well-organized agricultural input subsidy program, and the fact that the WFP's grain donation program ran counter to the food security program Zambia had envisioned for itself.

Zimbabwe's earlier efforts to hamstring the small-holder farm market set in motion a series of events that ensured it would not have the kind of agricultural infrastructure necessary to resist accepting GMO inputs in 2002. The heavy handedness of the policies enacted by the landed elites made the sustainability of the situation impossible. When independence came, then, the revolutionary focus was on rectifying the inequality in land holdings, not unraveling the policies put forth by the colonial powers or restructuring the agricultural sector. As such, effects from the discrimination against small-holder farmers persisted, and no subsidy structure was put in place to support them. Without access to credit or inputs, the agricultural sector was in no position to support the sweeping land reforms under the Mugabe regime when they came.

Whereas Zambia had in place a well-organized infrastructure for supplying rural farmers with agricultural input credit and output marketing, Zimbabwe's land reform program had created too unstable of a situation, politically and economically, for any such program to have been successful. They had prioritized land reform and resettlement ahead of agricultural

production or input subsidization. This decision reflected the longstanding focus on land holding equitability that existed before, and was one of the contributing factors to, the Zimbabwean war for independence. Zimbabwe had relinquished much of the progress they had made towards food sovereignty in the 1990s in favor of their land resettlement programs. This created the situation in 2002 where, without a domestic solution to their food shortages, Zimbabwe had little choice but to accept the WFP's milled GMO maize. The necessary technical and financial support of farmers was wholly lacking in Zimbabwe, owing in no small part to the perceived instability caused by the land reform programs in the eyes of the international community.

Zambia was in a position to reject the WFP donated grain in 2002 in large part because its earlier policies had given it a feasible alternative in an increase in foreign and domestic agricultural subsidies; For Zambia, however costly the famine and subsequent food shortage might be the issue was a temporary one. In Zimbabwe, however, there was no end in sight as foreign subsidies would not be forthcoming and the state had neither the infrastructure nor the resources to support the agricultural sector. In the years before the famine, who owned the land in Zimbabwe had proven more politically and culturally important than how productive that land was. Zimbabwe rejected unmilled grain, perhaps in an effort to maintain a unified front with its Southern African neighbors but, along with Mozambique and Malawi, was unable to join Zambia in rejecting milled grain.

The uniform initial-rejection of the Southern African states would seem to indicate that they all had real reservations against accepting GMO grain. The acceptance of the donated grain by Zimbabwe, Mozambique, and Malawi, was likely therefore not an acceptance of the technology as a safe and efficacious solution to their food shortage issues. In fact, the issue of GMO has remained a contested one in those three states in the decade following the 2002 famine. It would

**Figure 3**  
**Variation in Agricultural Subsidization and Land Reform Programs in Zimbabwe and Zambia**

	<b>ZIMBABWE</b>	<b>ZAMBIA</b>
<b>POSTCOLONIZATION PRIORITIES</b>	Zimbabwe has focused efforts in its agricultural sector first and foremost on land distribution and the equity therein. There was very little focus on productivity.	Immediately following the collapse of the copper industry, the Zambian government worked to employ disenfranchised urban workers in growing and harvesting maize. Efficiency and productivity were hallmarks of “modernity.”
<b>TYPE OF LAND REFORM</b>	Sweeping, with land seizures and large scale resettlement programs. Focused on discouraging white landholdings and foreign ownership.	Initially aimed towards encouraging domestic investment, later policies were designed to allow foreign investment and the redistribution of unworked land.
<b>INPUT SUBSIDY PROGRAM</b>	Not well-established. The political and social situation that was created as a byproduct of the land reform programs created a situation too unstable for significant foreign investment. The fertilizer subsidization program in 2002 was nascent, having only been established in 1999.	Extremely well-established. In place and continually expanded upon from independence through until the present day. Includes fertilizer and hybrid seed distribution centers for large and small-holders as well as the establishment of lines of credit.

seem, instead, that the three acquiescing states were merely the three states that could least afford to turn down free grain during a famine. Foisting a technology on a state in desperate need of famine relief is not likely to bode well for the future of the technology. If steps are to be made to convince Southern African states of the biotechnological solutions to their food shortage issues, they must be made on those states’ terms.

Broadly, the case studies of Zambia and Zimbabwe during the 2002 famine provide some contrasts that are portable to other parts of the developing world and other bodies of literature. In the Zimbabwean case study, we find the vast and varied repercussions of land resettlement

policies. In comparing Zambia to Zimbabwe, we see how a culturally significant crop can shape policy over a period of decades. We further find the case of Zambia to be instructive when examining how GMO rejection hampers, or doesn't hamper, a state's agricultural production in the 21<sup>st</sup> century.

In terms of Zimbabwe's land reform and resettlement policies, the damage caused to the economy by their inaction is likely larger in scope and scale than the existing literature on the topic would give it credit (or blame) for. Economies recover and, in generations, human rights abuses may even be forgotten, but the creation of a situation where a new technology is forced on a population is not likely to have only short-term implications. For better or worse, biotechnology and genetic modification are technologies that are going to become an increasingly important part of daily life. It is impossible to foresee the long term effects of a new technology being foisted on a famine-stricken population. The land reform and resettlement policies may have sealed Zimbabwe's fate with regards to achieving food security, much less sovereignty, and poisoned the biotechnology well in that region for generations to come.

The Zambia and Zimbabwe case studies also illustrate the salience of the cultural significance of a crop. Zambia chose to face a famine without foreign assistance rather than either accepting donated wheat or threatening their domestic maize economy. These kinds of priorities by donor states must be taken in to account prior to the formation of emergency relief policy. There is no "Southern Africa" that can be treated with a one-size-fits-all famine relief package. While many Southern African states share a common colonial and even post-colonial legacy, they each have been shaped by unique aspects of their history that, from afar, may seem insignificant. The implications of the Zambian copper boom wouldn't appear to include 21<sup>st</sup>

century biotechnology policy, and yet they do. A proper understanding of local conditions should render uniform solutions to regional issues that cut across state lines few and far between.

From the perspective of a GMO opponent, Zambia should stand as a clear example of traditional agricultural practices and input support carrying the day. While it would not be reasonable to argue that the continuing issues faced by Zimbabwe have been caused or even impacted by the acceptance of the GMO grain, the successes in Zambia and strides towards food security have occurred in spite of their GMO rejection. If Zambia has suffered for its rejection of GMO, its comparison with Zimbabwe does not show it.

## VII. Conclusions

Whether or not genetically modified organisms are the solution to Southern Africa's food supply issues is a question that is not undertaken or addressed in this paper. There exists in the social and physical science literature much debate as to the efficacy of GMO. Further, authors such as Vandana Shiva have called in to question the sustainability of increasing yields through genetic modification and the socioeconomic costs of increasing productivity in regions where employment is an equally scarce resource (Shiva, 99). Whether or not GMO presents a viable food security and sovereignty solution, an understanding of the reasons behind GMO rejection is important and useful for the crafting of future food relief programs.

It is one thing to point out the flaws in the WFP's 2002 approach to the Southern African famine, and quite another to present an alternative that might have met with more success. Clearly, as indicated by the outright rejection by Zambia and the eventual acceptance by Zimbabwe, Malawi and Mozambique, treating all of Southern Africa with the same grain-donation bandage was not the proper approach. While this paper has focused mostly on Zambia's persistent rejection of GMO, and the reasons behind the same, a similar comparative study before 2002 of any two of the other states might also have found reasons to be skeptical of the WFP's uniform treatment. In general, a treatment of the Southern African food crisis with a generic "throw food at the problem" solution seems to be the major shortcoming of the WFP's approach. Consequently, an understanding and acknowledgment of what steps each individual recipient country has already undertaken to mitigate the food security issue would go a long way towards ensuring future programs meet with more success.

My intention in writing this paper has been to use a comparison of two states with similar histories and economies, but different policies regarding GMO during the 2002 famine, to

generate a hypothesis as to what conditions are predictive of GMO-rejection. The chief aim was not to ascertain what would lead to acceptance, but to draw a clear line around one set of circumstances that did lead to rejection, and attempt to tease out what the mitigating factors were. It is not possible to point to one difference between Zambia and Zimbabwe and declare that the causal factor; rather, there are a series of differences in their economic histories and cultures that lead each to make the decisions they made in the midst of the famine.

The chief finding of this paper has been that differing conceptions of modernity placed contrasting pressures on Zambia and Zimbabwe's agricultural sectors. Specific historical circumstances, namely urbanization and the subsequent collapse of the copper industry, caused the Zambian state to put an emphasis on maize cultivation, from their colonial era through independence to the present. Zimbabwe placed more emphasis on who owned the land that was being cultivated, rather than the productivity of the agricultural sector. Consequently, Zimbabwe undertook sweeping land reform policies that hampered the agricultural sector generally and maize cultivation specifically. When the 2002 famine struck Zambia and Zimbabwe, Zambia had a robust agricultural input subsidy program that was tasked with improving yields. Zimbabwe had only a nascent input program, and had no choice but to accept the WFP's offer of GMO grain. This is explanatory when examining the two cases of Zambia and Zimbabwe, but cannot be expanded to other cases without further study.

### **Limitations to Generalizability**

The two comparative cases of Zambia and Zimbabwe are instructive in examining the specific research question undertaken in this paper: namely, what were the reasons and motivations for the persistent rejection of donated GMO grain in Zambia. The case studies contained in this paper do succeed in teasing out these reasons for this specific case, but can be

generalized only with further analyses of further cases. There are a few reasons caution should be used in attempting to apply this analysis to other developing countries. First, the cases may themselves contain unique factors that would confound any application to other cases. Second, the Southern African export market, namely other African states and the European Union, may explain some of the policy positions taken up by the two states.

The two cases each possess histories marked by anomalous periods and policies. In the case of Zambia, there are few states in the developing world that have endured the boom and bust cycle that was the *Zambian Copper Boom* of the mid-20<sup>th</sup> century. It is possible that the experience of rapid urbanization and equally rapid urban collapse gave rise to the cultural significance of maize on a scale that is simply not present anywhere else in the developing world. If the cultural significance of maize caused the persistent rejection of GMO in Zambia, as this paper contends, it is not known what other sequence of events could have caused the same level of significance in another state. It is therefore not possible to apply the cases studied in this paper to other states merely because they also have a culturally significant crop. For instance, rice is an extremely significant crop in Japan, and yet genetically modified strains, developed domestically and abroad, are cultivated and integrated in to the food supply. The differing conceptions of rice in Japan and maize in Zambia may be an interesting avenue for future research.

Additionally, while land reform is certainly not unique to Zimbabwe, the land resettlement practices that have marked the last two decades of Zimbabwean history are unique in the developing world. The scope and scale of land reapportionment may be more explanatory in considering Zimbabwe's acquiescence than this paper gives it credit for. The acquiescence of Malawi and Mozambique, in addition to Zimbabwe, would suggest that the land resettlement

program doesn't have a causal relationship with GMO grain acceptance, but cannot exclude its importance. Future use of this study should take care to ensure the specific manner in which the Zimbabwean agricultural sector was disrupted by land resettlement does not render the case study wholly ungeneralizable.

Finally, care must be taken to control for export markets when putting these case studies to use. The sort of vacillation in GMO policy found in Southern Africa is not present in developing South American agricultural states, which may in part be due to those states' chief export partner, the United States, having very permissive GMO policies. While a direct causal link between export market preservation and GMO policy has been excluded in this paper, that is not to say that the GMO position of the EU and its member states does not exert some influence over the policies of Southern Africa. As mentioned in section II, the crops for which GMO strains have been promoted are not those that the Southern African states export to the EU. However, one can imagine a scenario in which the Southern African governments are crafting policy with an eye towards Europe, so to speak, while the South American governments are doing the same with the United States.

### **Broad Lessons**

While considering the aforementioned reasons to employ caution in generalizing the findings contained in this paper, there are not necessarily specific "lessons" that can be directly cut and pasted on to other cases. There are, however, broad observations and suggestions that the analysis might suggest in dealing with similar situations in the developing world. There are three broad steps that might be taken to help design future programs in a way that is acceptable to recipient and donor country alike.

First, cultural information regarding the significance of individual crops must be made available and known to policymakers and NGOs. In famine and emergency relief services at the transnational level, there seems to be a feeling of *beggars not being choosers*. While it does not seem to be the case that the west, through the WFP, was “dumping” excess grain on Southern Africa (as some have contended), there does not appear to have been sufficient thought put in to the individual cultural and socioeconomic conditions of the recipient states. Either this knowledge was not available, or was simply not taken in to account when the WFP relief program was put in place. In either case, the information must be made available if the policymakers are to be taken to task for ignoring it.

Second, and more broadly, reservations towards new technologies in the developing world should not simply be assumed to stem from a lack of knowledge. Millions of dollars are spent for education campaigns to assure citizens of the developing world that new technologies are safe and efficacious. These funds would be better spent helping to integrate the new technologies in to the existing cultural and social frameworks in place in those states. If maize is a culturally significant crop to be cultivated in Zambia, efforts should be made to tailor relief efforts in a way that is considerate towards that position. Relief efforts can be targeted towards helping to support efforts already undertaken by the state. In the case of Zambia, agricultural inputs such as hybrid seeds and fertilizer can be contributed at the state or local level in a relief situation. These solutions are not as rapidly deployable as donated grain, but agricultural input support that bolsters the following season’s crop cycle is of more use to a starving population than GMO grain that is destroyed or returned to the donor states.

Third, an effort must be made to move away from single-causal theories with regards to technology adoption or rejection in the developing world. The reality of the situation in Southern

Africa is that a confluence of factors made accepting the WFP's donated grain a less-than-ideal situation for all of the recipient states. The acquiescing states, in worse straits than Zambia, had no choice but to accept the grain donations -- but their acceptance of the donated grain should not be conflated with their acceptance of the technology. The recipient states have a number of reasons to be skeptical of GMO technology, not the least of which is a concern about becoming reliant on western firms for seeds and tailored pesticides. Imagining their reluctance as stemming from a single causal issue belies the truth of the matter, and makes single-issue solutions a reasonable response to their rejection. The recipient states likely did not have sufficient information to make an informed decision as to the safety of the donated grain, but they also would be wise to consider the effect of the presence of GMO on their European Union market, over the long term. The long term sustainability of solutions to issues in the developing world must be considered from the perspective of the states that are to be assisted.

In the years since the 2002 famine, the production levels in Zambia and Zimbabwe have diverged dramatically. Zambia has continued to see growth in its agricultural sector generally, and its maize production specifically. Zimbabwe has continued to suffer from food shortages and an underperforming agricultural sector. While drawing a causal link between these outcomes and the acceptance or rejection of GMO grain in 2002 is probably a long shot, and definitely a matter for another study, it is safe to say that *something* in Zambia's approach is working. Potential avenues for future research may include a comparative study of several input subsidy programs across Southern Africa, and an examination of the role of foreign investment in those programs. An understanding of how foreign investment, or even direct input subsidization, would have been used most effectively during the 2002 famine will be instructive in designing responses to future famines in the region.

## References

- Aerni, P., & Bernauer, T. (2006). Stakeholder attitudes toward GMOs in the Philippines, Mexico, and South Africa: The Issue of Public Trust. *World Development*, 34(3), 557-575.
- Altieri, M. (2009). Agroecology, Small Farms, and Food Sovereignty. *Agroecology Monthly Review*, 0, 102-113.
- Anderson, K., & Jackson, L. (2005). Some Implications of GM Food Technology Policies for Sub-Saharan Africa. *Journal of African Economies*, 14(3), 385-410.
- Baltzer, K. & Hansen, H. (2011). Agricultural input subsidies in Sub-Saharan Africa. Unpublished paper presented by the Institute of Food and Resource Economics, University of Copenhagen.
- BBC NEWS. Famine-hit Zambia rejects GM food aid. (2002, October 29). *BBC News - Home*. Retrieved October 22, 2012, from <http://news.bbc.co.uk/2/hi/africa/2371675.stm>
- Bernstein, H. (2003). Land Reform in Southern Africa in World-Historical Perspective. *Review of African Political Economy*, 96, 203-226.
- Bodulovic, G. (2005). Is the European Attitude to GM Products Suffocating African Development?. *Functional Plant Biology*, 32(12), 1069-1075.
- Borlaug, N. (2000). Ending World Hunger. The Promise of Biotechnology and the Threat of Antiscience Zealotry. *Plant Physiology*, 124(2), 487-490.
- Bourdillon, M., Hebinck, P., Hoddiinott, J., Kinsey, B., Marondo, J., Mudege, N., et al. (2003). Assessing the Impact of High-Yielding Varieties of Maize in Resettlement Areas of Zimbabwe. *FCND Discussion Paper Number 161*.
- Byerlee, D., & Eicher, C. K. (1997). *Africa's emerging maize revolution*. Boulder, Colo.: Lynne

Rienner Publishers.

Chapoto, A. & Govereh, J. & Haggblade, S. & Jayne, T. (2010). Staple Food Prices in Zambia.

Unpublished paper presented at the COMESA Policy seminar on “Variation in staple food prices: Causes, consequence and policy options”. Maputo, Mozambique.

Chaumba, J., Scoones, I., & Wolmer, W. (2003). From jamba to planning: the reassertion of technocracy in land reform in south-eastern Zimbabwe?. *The Journal of Modern African Studies*, 41(4), 533-554.

Conko, G., & Prakash, C. (2004, December 13). Can GM Crops Play a Role in Developing Countries?. *AgBioWorld*. Retrieved January 21, 2013, from

<http://www.agbioworld.org/biotech-info/articles/agbio-articles/gm-crop-role.html>

Deininger, K., & Binswanger, H. (1995). Rent Seeking and the Development of Large-Scale Agriculture in Kenya, South Africa, and Zimbabwe. *Economic Development and Cultural Change*, 43(3), 493-522.

FAO Country Report. (2009, December 15). *FAO: Food and Agriculture Organization of the United Nations, for a world without hunger*. Retrieved March 15, 2013, from

<http://www.fao.org/isfp/country-information/zimbabwe/en/>

GMO COMPASS - Information on genetically modified organisms. (n.d.). *GMO COMPASS*.

Retrieved October 22, 2012, from <http://gmo-compass.org>

GM maize looted by starving villagers. (2002, September 24). *Global food industry business news, information, insight and executive interviews*. Retrieved December 11, 2012, from

[http://www.just-food.com/news/gm-maize-looted-by-starving-villagers\\_id69637.aspx](http://www.just-food.com/news/gm-maize-looted-by-starving-villagers_id69637.aspx)

Goldman, I. (2000). Institutional Support for Sustainable Rural Livelihoods in Southern Africa:

Results from Zimbabwe, Zambia and South Africa. *ODI: Natural Resource*

*Perspectives*, 50.

- Jayne, T., Govereh, J., Wanzala, M., & Demeke, M. (2003). Fertilizer market development: a comparative analysis of Ethiopia, Kenya, and Zambia. *Food Policy*, 28(4), 293-316.
- Karimjee, M. (2011, August 11). GM Foods | Famine | Africa | Kenya | Bill and Melinda Gates Foundation | Agriculture. *World News / Breaking US News and International News Headlines - GlobalPost*. Retrieved October 22, 2012, from <http://www.globalpost.com/dispatches/globalpost-blogs/global-pulse/GM-foods-famine-Africa>
- Kelly, V., Adesina, A., & Gordon, A. (2003). Expanding Access to Agricultural Inputs in Africa: A Review of Recent Market Development Experience. *Food Policy*, 28, 379-404.
- Kuyek, D. (2002). The Past Predicts the Future: GM crops and Africa's Farmers. *Seedling - GRAIN Publications*, 2002.
- Loewenson, R. (2003). Relief and Recovery in Zimbabwe: Food Security in the Current Humanitarian Crisis. *TARSC Monograph*, March 2003.
- Mugwagwa, J., Wamae, W., & Outram, S. (2010). Agricultural Innovation and Food Security in Sub-Saharan Africa: Tracing Connections and Missing Links. *Journal of International Development*, 22(3), 283-288.
- Ng'ombe, A., (2007) 'The role of grassroots organisations in fostering local communities' access to land: lessons from the Copperbelt and North Western Provinces of Zambia', N-AERUS 8th Conference, [www.n-aerus.net/web/sat/workshops/.../Final\\_Ngombe\\_paper.pdf](http://www.n-aerus.net/web/sat/workshops/.../Final_Ngombe_paper.pdf), Accessed: 29th October 2012.
- Ohnuki-Tierney, E. (1993). *Rice as self: Japanese identities through time*. Princeton, N.J.:

Princeton University Press.

Paarlberg, R. (2003). Reinvigorating Genetically Modified Crops: Poor Farmers in Developing Nations will Benefit if the United States Asserts Itself in the International Arena to Develop and Promote Biotechnology. *Issues in Science and Technology*, 19(3), 1-1.

Paarlberg, R. (2006). Are Genetically Modified (GM) Crops a Commercial Risk for Africa?. *International Journal of Technology and Globalization*, 2, 81-92.

Pearce, F. (2011, May 1). South Africa's white farmers are moving further north | Environment | The Guardian . *The Guardian* . Retrieved March 23, 2013, from <http://www.guardian.co.uk/environment/2011/may/01/boers-moving-north-african-governments>

Rule, S., & Ianga, Z. (2004). HSRC Client Survey 2004: Report to Public Understanding of Biotechnology. *Public Understanding of Biotechnology*.

Rusike, J., Howard, J., & Maredia, M. (1998). Seed Sector Evolution in Zambia and Zimbabwe: Has Farmer Access Improved Following Economic Reforms. *Food Security International Development Policy Syntheses*, 31, 15-19.

Shiva, V. (2000). *Stolen harvest: the hijacking of the global food supply*. Cambridge, MA: South End Press.

Sitko, N. (2008). Maize, Food Insecurity, and the Field of Performance in Southern Zambia. *Agriculture and Human Values*, 25, 3-11.

Thierfelder, C., & Wall, P. C. (2010). Investigating Conservation Agriculture (CA) Systems in Zambia and Zimbabwe to Mitigate Future Effects of Climate Change. *Journal of Crop Improvement*, 24(2), 113-121.

“World Bank. 2010. Zambia - Impact Assessment of the Fertilizer Support Program : Analysis of

Effectiveness and Efficiency. © World Bank.

<https://openknowledge.worldbank.org/handle/10986/2878> License: Creative Commons Attribution CC BY 3.0.”

Zambia denies GM aid for refugees. (2002, September 11). *BBC News*. Retrieved February 3, 2013, from <http://news.bbc.co.uk/2/hi/africa/2250933.stm>

Zambian minister sacked for 'fraud'. (2003, April 5). *BBC News*. Retrieved March 23, 2013, from <http://news.bbc.co.uk/2/hi/africa/2921015.stm>

Zimbabwe: Insight into the humanitarian crisis and food policies (2006). *Action Faim: ACF*

*International Network*, from

<http://reliefweb.int/sites/reliefweb.int/files/resources/D132DB62CB0AEB5D852571640065B2D1-acf-zwe-4may.pdf>

Zerbe, N. (2004). Feeding the Famine? American Food Aid and the GMO Debate in Southern Africa. *Food Policy*, 29(6), 593-608.