



# Hybrid maize production and climate variability in Zambia

## Student handout

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### Activity 1: Role-playing activity

Please read the following story about a Zambian farmer trying to decide what decision to make on his farm next year. Answer the discussion questions that follow, imagining you are the farmer in the story.

#### *Protensia's neighbor's maize*

Protensia looked out at the maize field next to his house. The plants were only about waist high and he could see bare patches of red dirt. His youngest daughter Agness could still run through them with her head above the tassels. It was extremely hot today. And dry. It hasn't rained in 13 days. He heard that Kariba dam barely has any water left in it and Choma, the district town hasn't had electricity for a week since they depend on the dam for hydroelectric power. Protensia was sitting on a bag of maize he borrowed from his neighbor Chilungu earlier this morning. This is the second bag in the past two weeks. And on top of that he borrowed two more last month from another neighbor. The rains weren't as bad last year but Protensia's harvest was pathetic. His maize storage bin was about half full right after the harvest in October but he sold half of that to pay for the school fees and the storage bin was empty by the end of February. Sometimes he wished he didn't have so many kids. He loved them but all but the school fees are just too much. And Nellie, his eldest is always so embarrassed by her clothes that she throws a tantrum at the beginning of the school year so he ends up buying them all new clothes each year. His wife, Milimo told him he was stupid for planting the same maize variety again this year. It doesn't make sense though. He has been planting a local maize variety called Gankata for 25 years. His children's bones were practically made of Gankata and his wife grew plump on it. Last year was bad and this year was awful but how many times in the last 10 years was it this bad? Starting with the thumb of his left hand he ticked off the number of bad years until he reached his right pinky. Six. Maybe she was right. He hated when she was right. But he didn't pay anything for the seed since he reuses seed from the harvest and he hasn't had to use



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fertilizer on that field, really ever. Maybe a bag here and there when he had the money in December. His neighbor, Chilunga had to put five bags on his field last year. That was almost 1000 kwacha. Not to mention how much Chilunga paid for those hybrid seeds. What company was that? He thought he remembered it was Zamseed. It seems like almost everyone in the village is planting Zamseed 606 this year. A lot of people had it delivered for free through the government funded farmer input support program (FISP). Forty kilograms of hybrid seed and two hundred kilograms of fertilizer for free! Not bad, he thought. Protensia signed up for FISP almost 5 years ago but he still isn't on the list to receive free seeds and fertilizer and he isn't sure if he wants to plant hybrid maize. He pulls at the piece of canvas hanging off his shoe and his gaze wanders back up to the stunted maize plants. And then he looks over at Chilunga's field. Even if he has to buy Zamseed 606 next year maybe he should do it. There was a time when Chilunga used to borrow maize from him. There was that season that his maize plants were taller than him by December and all the neighbors were worried that the hybrids were a bad idea. He still can't believe it. They planted in the middle of December and they still ended up with more bags of maize than him. And in 2012 his Gankata did great and Chilunga had no crop at all. These hybrids seem to be really sensitive to drought spells before tasseling—certainly much more than the Gankata and the other local varieties. Protensia pulls harder on the piece of canvas and it tears a bit exposing his calloused brown toe. His father would be angry knowing that he is even thinking of buying hybrid maize. He thought one by one about everyone on this side of the village and couldn't think of anyone who wasn't planting hybrids. Was he really the only one that still only planted traditional varieties? Was he the only one not actually enrolled in FISP? He took his torn shoe off, and then the other one. The ground was hot. This red dirt is just useless he thought. His father never applied fertilizer and now the soil is just tired. He was tired. And not sure what to do next season.

Discussion questions:

1. What would you do if you were Protensia?
2. Why would you take this course of action?
3. What are the tradeoffs Protensia faces?



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## Reading #1

### *Institutions and maize subsidies in Africa*

Once hybrid varieties were introduced to Africa, grain production increased particularly since the 1960s, yet Africa is still struggling to achieve a Green Revolution. Since the initiation of market reforms in sub-Saharan Africa in the 1970s and 1980s, numerous African governments have responded to food deficits by implementing costly and ambitious fertilizer and hybrid crop subsidy programs with limited success (Denning et al., 2009; Mason et al., 2013). Maize continues to be the target of breeding programs in Africa (McCann, 2009). Investment in the maize sector during the colonial period led to maize breeding success in countries like Kenya and Zimbabwe, particularly during the 1970s and 1980's (Smale and Jayne, 2003). Innovations in technology, smallholder-oriented policies and institutions, and breeding of improved crop varieties were at the core of this success. Coupled with improved seeds were investments in extension, seed distribution and delivery, and later fertilizer subsidies and delivery and access to credit.

In recent years, numerous countries in SSA including Ethiopia, Ghana, Kenya, Malawi, Nigeria, Tanzania, and Zambia have all implemented input subsidy programs at substantial cost to government and donor budgets (Mason and Ricker-Gilbert, 2013). Fertilizer subsidy programs have existed in almost every year for decades in Malawi and Zambia. The majority of these programs focus on providing inorganic fertilizer to small farmers at subsidized prices although many of the programs also expanded to provide subsidized seeds, particularly hybrid maize seeds. While the majority of countries experienced a decline in absolute maize production during the 1990s, others (such as Malawi) experienced an increase due to input support programs (Smale and Jayne, 2003).

One notable breeding development in this period was the establishment of shorter-season hybrid varieties that were tolerant of late planting. By creating varieties that were able to flourish despite late planting, maize breeders allowed smallholders to adapt to changing climatic conditions by planting later into the season. The new varieties combined with subsidized credit for seed and fertilizer led to a doubling of maize area (in Zambia) during the 1970s and 1980s (Smale et al., 2015).

The government of Zambia (along with numerous other African countries) liberalized the seed market in the 1990s as a result of pressure from the International Monetary Fund and the World Bank through the Structural Adjustment Program. During this process, Zamseed was privatized, and new regional and international seed companies entered the market. The number of hybrids and improved open pollinated varieties (OPVs) doubled between 1992 and



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1996 (Howard and Mungoma, 1997). Since then hundreds of new varieties have been released in Zambia by 14 different companies and research institutions, and the rights of almost all these varieties are held by private seed companies (Smale et al., 2015).

At the time of market liberalization, the government of Zambia was building an agricultural support program focused on hybrid maize seed and fertilizer. During Zambia's 52 years of independence, there was only a brief period in the early 1990s where there were no agricultural subsidies in Zambia (Mason et al., 2013). Prior to liberalization, the government of Zambia provided farmers with subsidized fertilizer and seed on credit and purchased their harvest through the parastatal National Agricultural Marketing Board (NAMBOARD) (Smale and Jayne, 2003). The government abandoned NAMBOARD due to its high operational costs but found it politically infeasible to stop subsidies. The Fertilizer Credit Program (FCP), started in 1997, was an input loan until the end of the season but loan default was high and the FCP morphed into the Fertilizer Support Program (FSP) in 2002 (Mason et al., 2013). The name of the program was changed to the Farmer Input Support program (FISP) in 2009 but the goal remained the same.

Originally FISP allocated maize varieties to farmers that were members of participating cooperatives based on an assessment of agroecological suitability made by the FISP, leaving farmers no choice among cultivars. These varieties were targeted to various regions based loosely on agroecological needs and the seed and fertilizer was delivered directly to the cooperatives. Over time FISP allowed farmers to choose between more varieties of hybrid maize and gradually offered more seed variety choice to farmers each year. With the introduction of the e-voucher program in the 2015-2016 growing season farmers are now able to choose from any hybrid maize seeds available from agro-dealers using electronic vouchers from the FISP.

Through investment, liberalization, and subsidies the Government of Zambia effectively institutionalized hybrid maize production among small-scale farmers in Zambia over the last few decades. Adoption of hybrid maize in Zambia is the highest of all African countries and most of this is focused on earlier maturing varieties.

Discussion questions on reading #1:

1. Do you think maize subsidies or a good thing or a bad thing for farmers? What evidence do you have to support your argument?
2. What do you think are all the impact of market liberalization for the country?
3. Why do you think it is politically infeasible to remove the FISP program?



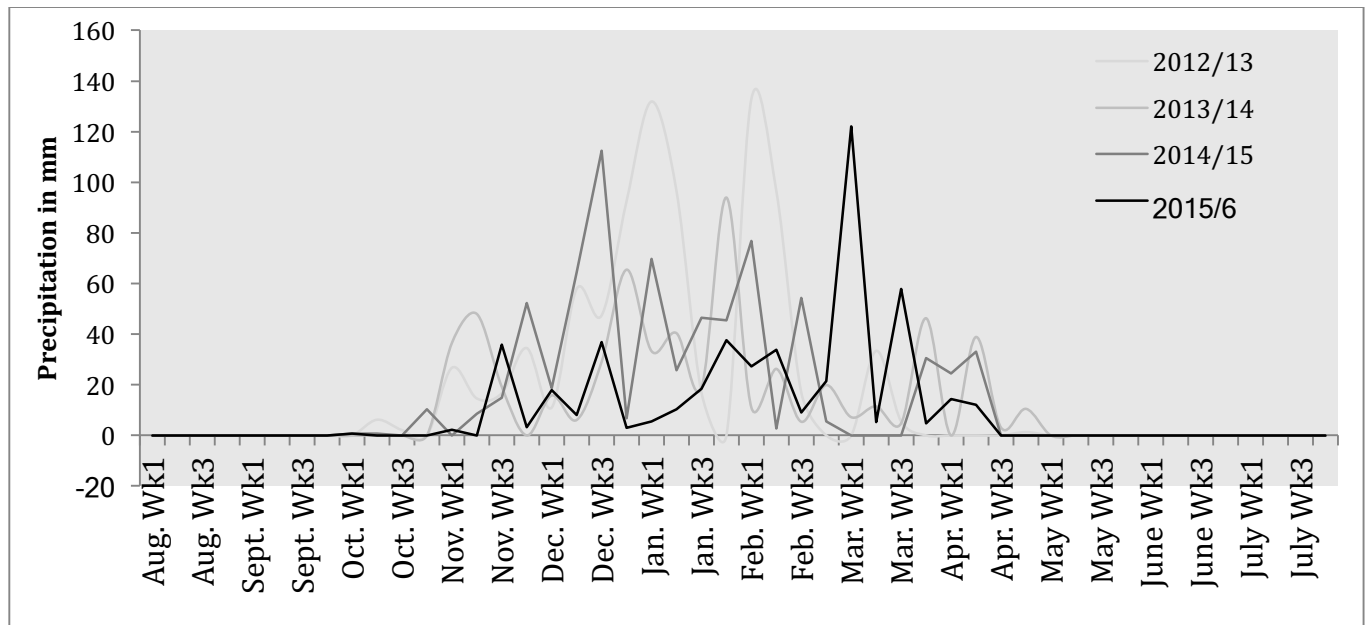
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## Activity 2: Analyze the maps and figures on climate variability

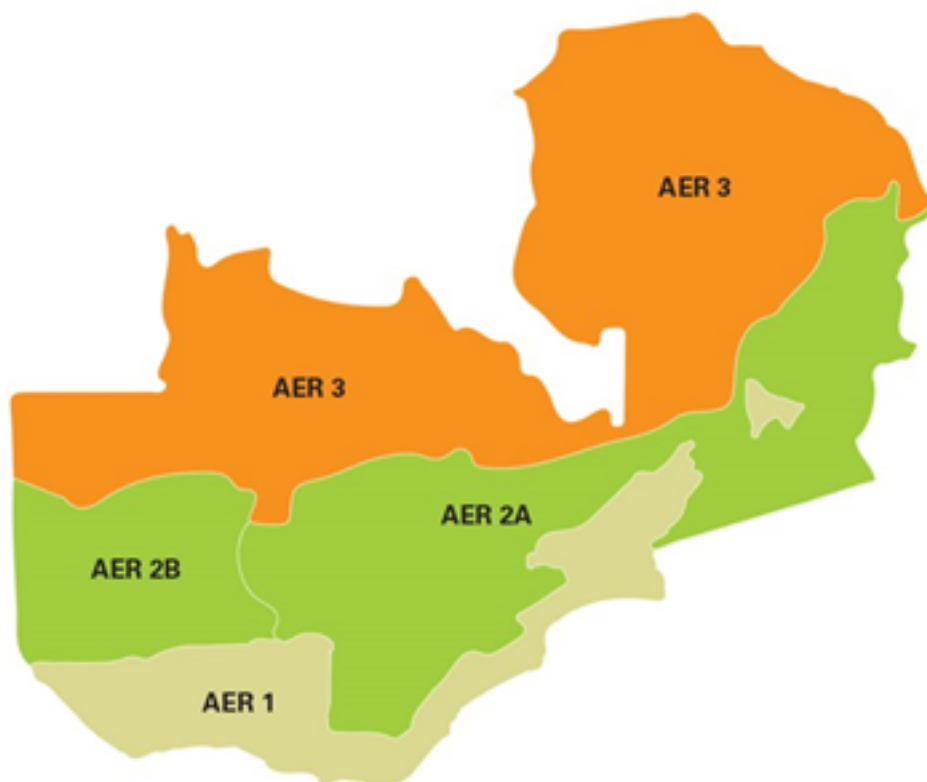
Use the maps and data below to answer the following discussion questions:

1. What observations can you make about the climate in Zambia from the figures below?
  - a. What is the approximate length of the growing season in map A?
  - b. When is the safest week for farmers to plant maize?
  - c. Is this consistent with the descriptions of the agroecological regions in map B?
2. What observations can you make about total annual rainfall? How do you know?
3. What do farmers think is happening with the start of the growing season?

### A. Rainy season in Southern Zambia



B. Map of Zambia with agroecological regions or zones (I-III)

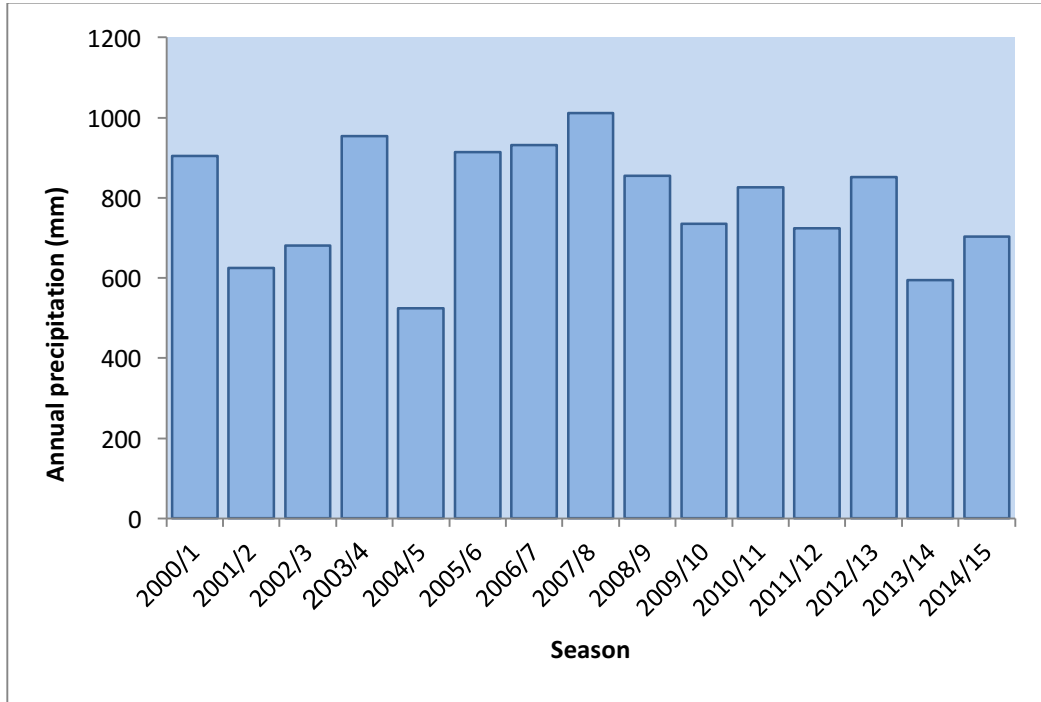


	AER 1	AER 2	AER 3
Rainfall	<800mm rainfall annually	800-1000 mm rainfall annually	>1000 mm rainfall annually
Length of growing season	<120 days	120-150 days	150-190 days
Hybrid suitability	Early maturing	Early, Medium maturing	Early, Medium, Late maturing

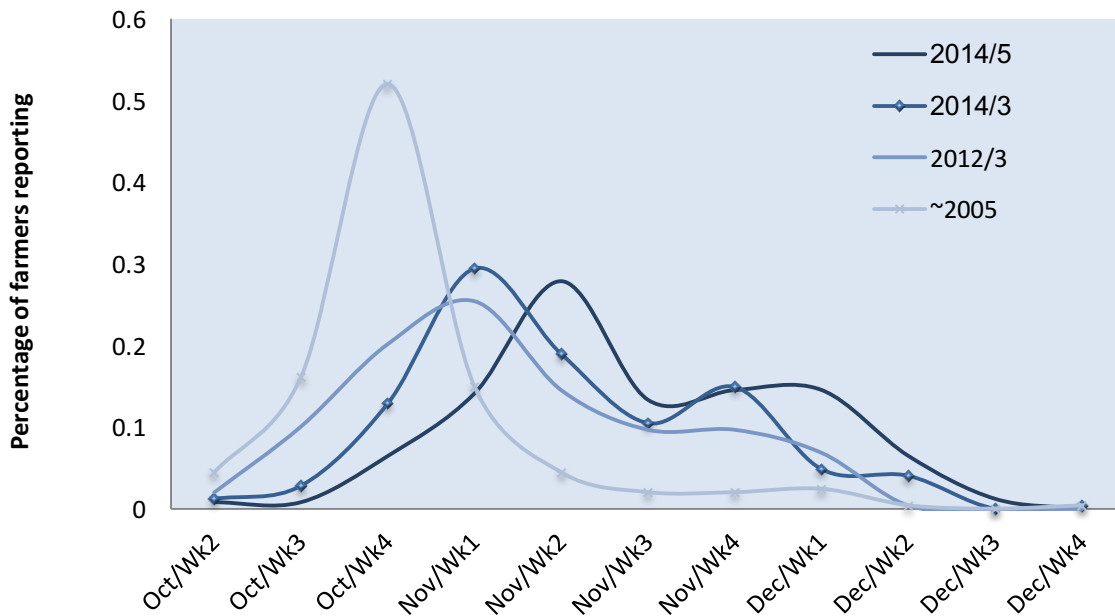


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C. Cumulative annual rainfall in Southern Zambia (AER2)



D. Farmer perceptions of the changing onset of the rainy season





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### Activity 3: Write a policy brief

A policy brief is a concise summary of a particular issue. It gives some background on a policy relevant issue or problem, outlines possible policy oriented solutions to the problem, and discusses the advantage and disadvantages of each policy option. It ultimately takes a side, offering recommendations for the best policy option. It is aimed at policymakers and others who are making policy decisions or interested in influencing policy decisions. Policy briefs tend to range from 700-3000 words. Here is an outline of a policy brief and a website where you can find more information about what is typically in a policy brief.

#### Policy brief outline:

- Introduction: To/from/date/ title
- Statement of issue (including introduction)
- Policy options (should be a minimum of two policy options, includes advantages and disadvantages of each policy option)
- Policy recommendations
- Sources or references: Author(s), year, title, journal or source, volume number, issue number, page numbers (if applicable).
- See sample policy brief at:  
<https://web.stanford.edu/class/siw198q/modelppr/amber2.htm>

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