Country	Scenario	Implications Statements
Malawi	Low climate risk (RCP2.6) / ineffective agricultural policies (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to increase by 1C by 2050, additional investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. In this scenario, the crop breeding and delivery process may be hampered by an absence of policies that effectively facilitate the movement of genetic material, improve access to new varieties for farmers, or enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation maize yields will decline by approx. 20%, across many regions. However, if varieties can be developed that sustain the duration of the crop, there is potential for yield benefits (increase of approx. 10%) to be realised. This investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur twice as frequently for maize by 2050 compared to the present day. There is also potential for yield gains, and less frequent yield shocks, to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / ineffective agricultural policies (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperature and rainfall patterns expected to be significantly different, to the present day by 2050, additional investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing climatic conditions. In this scenario, the crop breeding and delivery process may be hampered by an absence of policies that effectively facilitate the movement of genetic material, improve access to new varieties for farmers, or enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation maize yields will decline significantly (by approx. 30%), across all regions. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 12%) to be realised.

		As the intensity of extreme rainfall and temperature increase (significantly) over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur every 2-3 times more frequently for maize than in the present day. There is also potential for significant yield gains, and less frequent yield shocks, to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include tolerance to heat and drought stress, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	Low climate risk (RCP2.6) / effective agricultural policies (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. This process may be shorter in contexts in which effective policy facilitates the movement of genetic material and improved access to new varieties for farmers. With temperatures expected to increase by 1C by 2050, additional investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding process Without adaptation maize yields will decline by approx. 10%, across many regions. However, if varieties can be developed that sustain the duration of the crop, there is potential for yield benefits (increase of approx. 9%) to be realised. This investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur twice as frequently for maize by 2050 compared to the present day. There is also potential for yield gains, and less frequent yield shocks, to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, , so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / effective agricultural policies (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. This process may be shorter in contexts in which effective policy facilitates the

		movement of genetic material and improved access to new varieties for farmers. With temperature and rainfall patterns expected to be significantly different, to the present day by 2050, additional investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing climatic conditions. This may include investments in technologies that speed up the breeding process Without adaptation maize yields will decline significantly (by approx. 25%), across all regions. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 17%) to be realised. As the intensity of extreme rainfall and temperature increase (significantly) over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur every 2-3 times more frequently for maize than in the present day. There is also potential for significant yield gains, and less frequent yield shocks, to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include tolerance of heat and drought stress, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
South Africa	Low climate risk (RCP2.6) / low land reform (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 1C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation, maize yields will increase in the west but significantly decrease in the north east regions of the country (overall decrease of approx. 30%). However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 25%) to be realised nationwide. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops

		may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / low land reform (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 2.5C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation, maize yields will increase in the west but significantly decrease in the north east regions of the country (overall decrease of approx. 43%). However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 37%) to be realised nationwide. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include heat and drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	Low climate risk (RCP2.6) / high land reform (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 1C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation, maize yields will increase in the west but significantly decrease in the north east regions of the country. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 12%) to be realised nationwide. Under a scenario of

		significant land reform, we might expect increased irrigation to also contribute to this yield gain. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / high land reform (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 2.5C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation, maize yields will increase in the west but significantly decrease in the north east regions of the country. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 14%) to be realised nationwide. Under a scenario of significant land reform, we might expect increased irrigation to also contribute to this yield gain. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include heat and drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
Tanzania	Low climate risk (RCP2.6) / low technology (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 1C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include the alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers and enhance

		farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation maize yields will decline significantly (by approx 15%), across all regions by 2050. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 6%) to be realised. This may be particularly important in the absence of other technological developments (such as irrigation and other land management techniques). As the intensity of extreme rainfall and temperature increase over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur more frequently for maize than in the present day. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include heat and drought stress tolerance, flood tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / low technology (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 2C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include the alignment of policies that facilitate the movement of genetic material improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation maize yields will decline significantly (by approx. 30%), across all regions by 2050. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 11%) to be realised. This may be particularly important in the absence of other technological developments (such as irrigation and other land management techniques). As the intensity of extreme rainfall and temperature increase significantly over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur 2-3 times more frequently for maize than in the present day.

		There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include heat and drought stress tolerance, flood tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	Low climate risk (RCP2.6) / high technology (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 1C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding process. Without adaptation maize yields will decline significantly, across all regions by 2050. However, in this scenario of high technological development, crop adaptations may be taking place that sustain the duration of the crop. In such circumstances there is potential for significant yield benefits (increase of approx. 9%) to be realised. Other technological developments in agriculture may also support these yield improvements. As the intensity of extreme rainfall and temperature increase over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur more frequently for maize than in the present day. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include drought stress tolerance, flood tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / high technology (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 2C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding process. Without adaptation maize yields will decline significantly, across all regions by 2050. However, in this scenario of high technological development, crop adaptations may be taking place that sustain the

		duration of the crop. In such circumstances there is potential for significant yield benefits (increase of approx. 15%) to be realised. Other technological developments in agriculture may also support these yield improvements. As the intensity of extreme rainfall and temperature increase significantly over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur every 2-3 times more frequently for maize than in the present day. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include heat and drought stress tolerance, flood tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
Zambia	Low climate risk (RCP2.6) / low market efficacy (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 1C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding process or alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation maize yields will decline by approx. 20%, across all regions by 2050. However, if varieties can be developed that sustain the duration of the crop, there is potential for yield benefits (increase of approx. 7%) to be realised. As the intensity of extreme rainfall and temperature increase over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur more frequently for maize than in the present day. There is also potential for significant yield gains to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include drought stress tolerance, adaptation to shorter rainfall seasons, crop

		pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / low market efficacy (LT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. With temperatures expected to be warmer by 1-2C by 2050, increased investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding process or alignment of policies that facilitate the movement of genetic material, improve access to new varieties for farmers, and enhance farmer participation in seeds value chain activities (e.g. seeds production and commercialisation). Without adaptation maize yields will decline significantly (by approx. 30%, across all regions by 2050. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase of approx. 10%) to be realised, the potential for these benefits to be realised is particularly high in the north and east. As the intensity of extreme rainfall and temperature increase significantly over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur more frequently for maize than in the present day (this is also mitigated to some extent by increased irrigation). There is also potential for significant yield gains, and less frequent yield shocks, to be realised within non-maize crops by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include heat and drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	Low climate risk (RCP2.6) / high market efficacy (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. This process may be shorter in contexts in which effective markets and policy facilitate the movement of genetic material and improve access to new varieties for farmers With temperatures expected to be warmer by 1C by 2050, continued investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding process. Well connected and efficient markets may be contributing to demand driven investments in crop breeding under this scenario.

		Without adaptation maize yields will decline across all regions by 2050. However, if varieties can be developed that sustain the duration of the crop, there is potential for yield benefits (increase of approx. 5%) to be realised. As the intensity of extreme rainfall and temperature increase over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur more frequently for maize than in the present day. There is also potential for significant yield gains to be realised within non-maize crops (for which there may be new market opportunities) by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes. Traits that might become particularly important for breeding include drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.
	High climate risk (RCP8.5) / high market efficacy (HT)	It can take up to 20 years from initial investment in breeding for new varieties to be available and in farmers' fields. This process may be shorter in contexts in which effective markets and policy facilitates the movement of genetic material and improved access to new varieties for farmers. With temperatures expected to be warmer by 1-2C by 2050, increased investment in crop breeding is required in order to ensure that the adaptation of crops can keep pace with changing conditions. This may include investments in technologies that speed up the breeding processes. Well connected and efficient markets may be contributing to demand driven investments in crop breeding under this scenario. Without adaptation maize yields will decline significantly, across all regions by 2050. However, if varieties can be developed that sustain the duration of the crop, there is potential for significant yield benefits (increase by approx. 13%) to be realised, the potential for these gains is particularly high in the north and east. As the intensity of extreme rainfall and temperature increase significantly over the next 30 years, this investment will pay off in particular in mitigating against the significant yield penalties that we expect to occur more frequently for maize than in the present day (this is also mitigated to some extent by increased irrigation). There is also potential for significant yield gains, and less frequent yield shocks, to be realised within non-maize crops (for which there may be new market opportunities) by 2050, in some cases with less significant adaptation required, so investing in breeding in non-maize crops may be cost effective and contribute to improved nutrition outcomes.

		Traits that might become particularly important for breeding include heat and drought stress tolerance, adaptation to shorter rainfall seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.