GCRFAFRICAP
CLIMATE SMART AGRICULTURE FOR DEVELOPMENT

iFEED POLICY TOPIC SUMMARY **March 2022**

Nutrition Security In The Context Of Climate Risks

KEY MESSAGES

- iFEED focusses on changes to population-level nutrition security[1] and climate-smart agriculture at the national level. Analysis includes 2050 projections of national food production, nutrition security and emissions for four contrasting scenarios, with resulting implications for national food system policy processes. Subnational simulations of future climate, crops and emissions underpin projected changes at the national level.
- Alongside climate risks, other policy-driven conditions, and the production responses to them, are as important in determining nutrition security outcomes. Whilst some scenarios result in improvements at the population level relative to the present day, the picture is very uneven and in no case is complete nutrition security achieved for all nutrients.
- Some improvements result from the increased nutrient supplies associated with adaptation responses that prioritise higher yields from a small number of crops. However, this is rarely adequate to supply the amount of all micronutrients to achieve population-level nutrition security. Without wider diversification of nutrient-dense crops, or more balanced production regimes, there will need to be an increased reliance on importing nutrient-dense foods to achieve an adequate supply for population-level nutrition security.
- Improving agriculture's resilience and contributions to nutrition security therefore requires an integrated and coherent policy environment in which production decisions are actively informed by and aligned with other social, economic, and environmental objectives, such that climate-smart and nutrition-sensitive outcomes are designed-in from the outset.

KEY FINDINGS

- Climate risks, and the domestic agricultural production responses to them, exert varying degrees of pressure on nutrition security across the four AFRICAP countries:
    - In Malawi, Tanzania and Zambia, the degree of climate risk has much less impact on nutrition outcomes than the effectiveness of policy implementation, the extent of technological transformation, and the degree of market connectivity and functionality in each country, respectively.

[1] An adequate supply of energy and nutrients to meet requirements at a population-level

  - In South Africa, the degree of climate risk generally has a greater impact on nutrition outcomes than does land reform.
  - In Malawi, nutrition security outcomes are similar for the high and low climate-risk scenarios. Conversely, in Tanzania, South Africa, and (only marginally) Zambia, higher climate risk is associated with better nutrition security. In Tanzania and Zambia the assumed adaptation response was reduced crop diversity and increased homogenisation of higher yielding crops, leading to higher production volumes. However, if maize consumption continues to be prioritised, to secure the micronutrients required by individuals would necessitate overconsumption of calories on a per capita basis, which would risk increasing the prevalence of obesity. In South Africa, the assumed adaptation responses under the high climate risk scenarios result in increased irrigation and a move away from maize towards all other crops, including other cereals and fruit and vegetables, leading to increased production volumes.
- Across all four countries, in any given scenario, nutrition security outcomes are broadly similar across all the trade vignettes that represent expectable future trade patterns, i.e., self-sufficiency, continuation of business-as-usual, and based on the expert judgements of in-country stakeholders. This is largely a result of low-level international food imports and exports making a relatively minor contribution to population-level nutrition security in the baseline period (centred on the year 2000). This suggests that trade patterns would have to evolve markedly before 2050 to make meaningful differences to nutrition security outcomes that otherwise largely stem from domestic agricultural production levels.
- Relative to the baseline period, per capita nutrition security:
  - In Malawi and Tanzania, generally worsens in the low policy effectiveness and low technological transformation scenarios (respectively), and generally improves in the corresponding high scenarios.
  - In South Africa, marginally improves when assuming some degree of international trade (i.e. vignettes other than self-sufficiency).
  - In Zambia, generally worsens in all scenarios other than the high market connectivity with high climate risk scenario, where per capita nutrition supply marginally improves when assuming some degree of international trade.
- In absolute terms, in no scenario is any country completely secure in the supply of all nutrients. However, the situation varies widely from deep deficiencies in almost all nutrients to just one nutrient being marginally inadequate, typically calcium or iron. Generally, outcomes in South Africa are among the best, but calcium and iron remain among the nutrients most challenging to secure at a national level. Zambia is the most consistently nutrition insecure county across scenarios, in part due to smaller expansion of agricultural areas than in other countries. For Malawi and Tanzania, in the scenarios that have generally nutrition-insecure outcomes, supplies of vitamin C tend to be better than most other nutrients; generally in more nutrition-secure scenarios, fat, zinc, calcium and iron are among the nutrients with the least adequate supplies. The predominant staple of maize limits the nutrient diversity so a more balanced supply of different food items would be required to achieve adequacy.
- An alternative analytical approach was used to optimise the supply of all foods to achieve complete nutrition security at the recommended daily per-capita level of calories (whilst respecting current dietary patterns). Across all countries, this would result in the 2050 per capita supply of nutrients being derived from a more diverse collection of foods (Figure 1). Given these optimised supply requirements and the modelled production outcomes, there is generally

domestic agricultural production that is surplus to nutritional requirements, and therefore available to export in the scenarios associated with high technology, market connectivity, and policy effectiveness in Tanzania, Zambia, and Malawi (respectively) and in all South Africa scenarios. However, to secure the optimised supplies under the modelled production patterns, there is also a nutrition-security imperative to import additional nutrients. This suggests there may be scope to reorientate domestic production to better meet national nutritional requirements by reallocating resources supporting exportable production to better support improved nutritional outcomes.

POLICY BARRIERS AND ENABLERS

- In all four countries, demographic pressures in the coming decades will make achieving population-level nutrition security considerably more challenging, with population increases between 2000 and 2050 expected to be 285% in Tanzania, 276% in Zambia, 242% in Malawi, and 68% in South Africa.
- With smaller increases to agricultural areas in Zambia compared to other countries with comparable population growth, Zambian domestic production will struggle to provide sufficient food by 2050.
- The results are based on average supplies across the time horizon and across the population. The reality will be much more complex and volatile due to climatic extremes and other supply shocks that acutely compromise nutrient availability, and geographic and socioeconomic inequalities in access to food. If food is neither affordable nor accessible, then marginalised populations will not achieve food or nutrition security even with adequate supplies at a national level. Therefore nutrition security cannot just be left to agricultural policy, but requires supportive and aligned social and welfare policies. Without policy alignment, even under favourable production conditions, individual nutrition insecurity has the potential to exacerbate inequalities, reduce labour productivity, increase entrenchment of gender-differentiated care roles, and lead to detrimental health outcomes, for example.

POLICY PATHWAYS

- The contrasting regimes of the increased diversity under nutrition-optimised supply and the greater production homogenisation under some of the modelled responses to climate risks and policy pathways show that there are multiple routes to improving nutrition.
- While some nutrition outcomes can be improved with potentially fewer crops than in the baseline period simply by maximising production, such improvements, a) could require overconsumption of calories per capita to attain required micronutrients if maize is prioritised in diets; b) are likely to result in continued deficiencies in some key nutrients, so would require supplementation from other, nutrient-dense, food items.
- These approaches are also likely to differ in terms of resilience – fewer crops are likely to be more susceptible to crop failure and reduce biodiversity, for example. There is 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 compensate for both drought stress and shortening growing seasons, crop pests and disease resistance, nutrition enhancement and food safety traits.

- Improving agriculture's resilience and contributions to nutrition security therefore requires an integrated and coherent policy environment in which production decisions are actively informed by and aligned with other social, economic, and environmental objectives, such that climate-smart and nutrition-sensitive outcomes are designed-in from the outset.
- Recognising the significant production, demographic, and environmental challenges in the region over the coming decades, agricultural and food trade may increase in importance for achieving nutrition security – especially under extreme conditions – as well as for generating exchange earnings. Trade policy therefore needs to be cognisant of domestic production limitations to nutrition security and to prioritise resilience and nutrition alongside economic returns.
- De-risking policy requires not only a holistic perspective, but one that enhances resiliency to acute shocks that may materialise in unforeseen ways – functional redundancy in approaches to nutrition security will therefore be critical.

This work was supported by UK Research and Innovation as part of the Global Challenges Research Fund, Grant Ref: BB/P027784/1

GCRF Funded by UK Government

About the Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy (AFRICAP) Programme
The Agricultural and Food-system Resilience: Increasing Capacity and Advising Policy (AFRICAP) programme is a four-year research programme focused on improving evidence-based policy making to develop sustainable, productive, agricultural systems, resilient to climate change. The programme is being implemented in Malawi, South Africa, Tanzania, Zambia, and the UK led by the University of Leeds, in partnership with the Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN), a pan-African multi-stakeholder policy network. The programme is funded by the UK Government from the Global Challenges Research Fund (GCRF), which aims to support research that addresses critical problems in developing countries across the world. It is administered by the UK's Biotechnology and Biological Sciences Research Council (BBSRC) - UK Research and Innovation (UKRI).

Implementing Partners: FANRPAN; University of Leeds; University of Aberdeen; the UK Met Office; Chatham House - Royal Institute of International Affairs; the Civil Society Agriculture Network (CISANET), Malawi; Department of Agriculture Research Services (DARS), Malawi; National Agricultural Marketing Council (NAMC), South Africa; Economic and Social Research Foundation (ESRF), Tanzania; and the Agricultural Consultative Forum (ACF), Zambia.

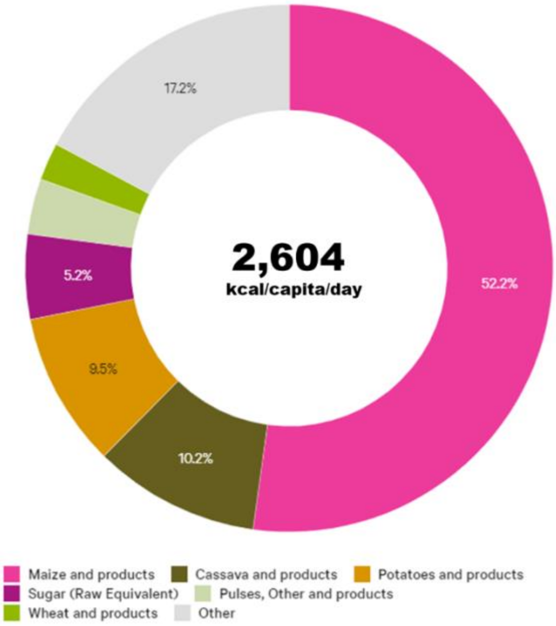
For More Information

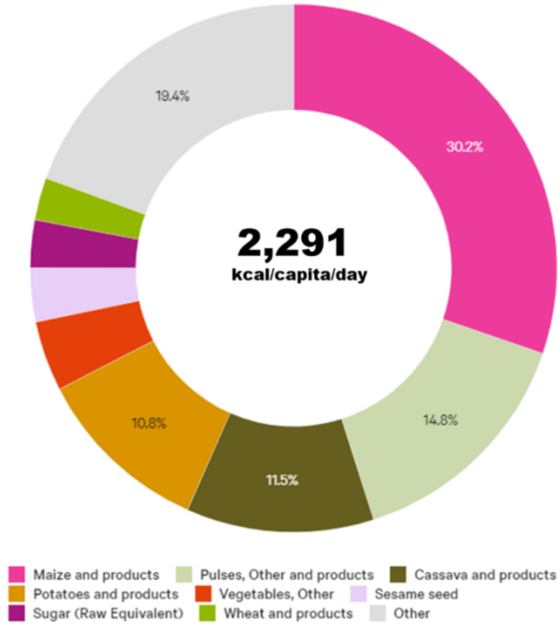
Website: https://africap.info/ Twitter: @gcrfafricap Email: contact@africap.info

Figure 1: Proportional contributions of different food types to per capita food supplies (measured in calories) in the baseline period and with 2050 supplies optimized to achieve nutrition security. Maize is consistently the main food type in both periods, but its dominance is significantly reduced and the diversity of food types increases when nutrition security is attained.

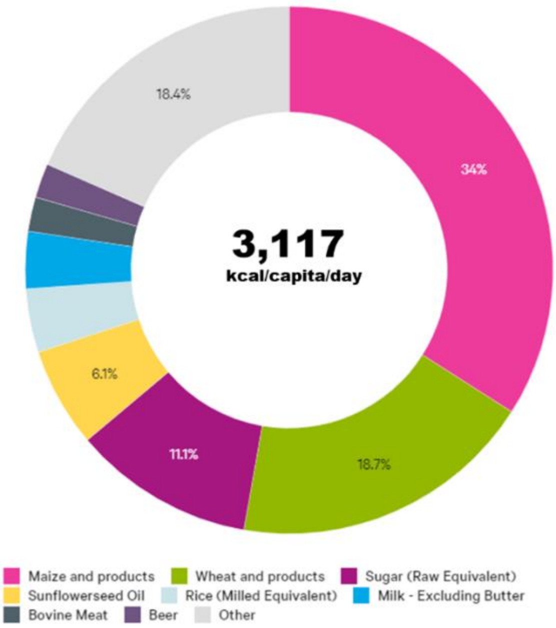
2000 Baseline Supplies | **2050 Optimized Supplies**

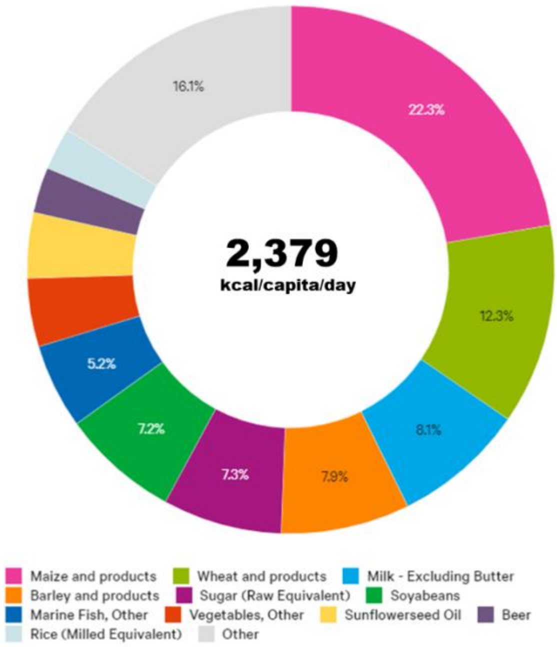
Malawi



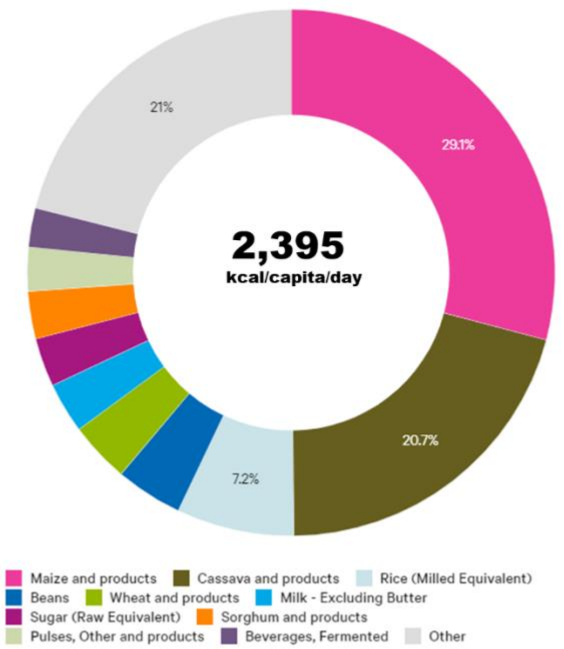


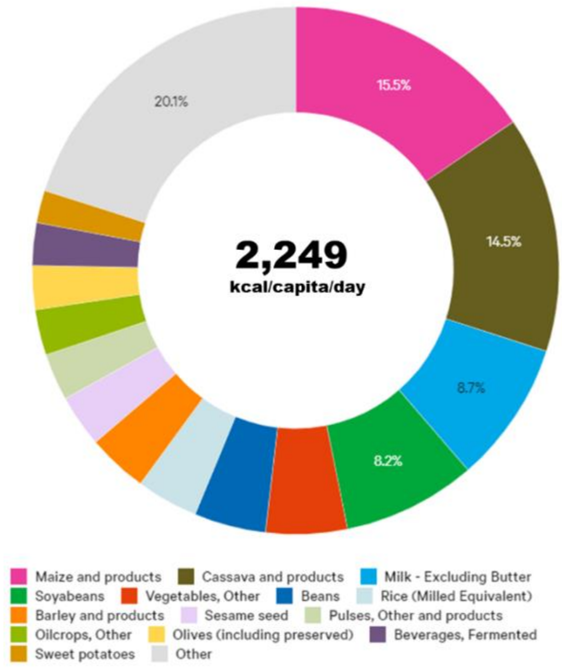
South Africa





Tanzania





Zambia