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CRIFS Risk Profiles: NIGERIA
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Our understanding of agricultural adoption decisions has come a long way from assuming that beneficial technologies will necessarily find their way into small-scale producers' (SSPs) hands and fields. The importance of the policy environment, functioning markets, delivery systems, and basic benefit-cost calculations for suppliers and consumers are generally recognized. Yet in Nigeria, for example, reported adoption of some adaptation production technologies has declined despite farmers increasingly reporting exposure to climate shocks.

What are we missing?

First, agriculture is inherently risky, with risk stemming from both climate and market variability and uncertainty.

Second, we know little about how small-scale producers view climate risk – the probability of a climate event, and their likely exposure and vulnerability. We do know that individual risk perceptions often differ from measured risk. Risk perceptions refer to the process of collecting, selecting, and interpreting signals about uncertain outcomes (Wachinger et al., 2013); a process that may depend on heuristics - cognitive shortcuts that govern judgement under uncertainty (Tversky and Kahneman, 1974), and on qualitative dimensions of risk such as dread, controllability, and familiarity (Slovic, 1987).

Third, decisions have always been made under uncertainty, so is there a meaningful way to distinguish production and adaptation? Given that even the most proximate season's climate risk and market information is uncertain (and we find, largely not acted upon), we doubt that decisions will be meaningfully affected by SSP's thinking about more distant seasons weather forecasts. We therefore largely settle on increasing this season's net returns as a form of risk management.

And finally, while investors and interventions consider the risk and benefit-cost of non-adoption, SSPs must also consider the relative risk and benefit-cost of moving from the status quo. Even measured and self-reports of experienced drought shocks diverge, with up to 38% of households in Ethiopia and Malawi and just under a third in Nigeria reporting drought experience despite not being exposed to abnormally low cumulative rainfall (Mayorga et. al., 2025). Some differences between measured and self-reported may be scale related, but initial analyses suggest that such local heterogeneity alone does not explain cross-household variation.

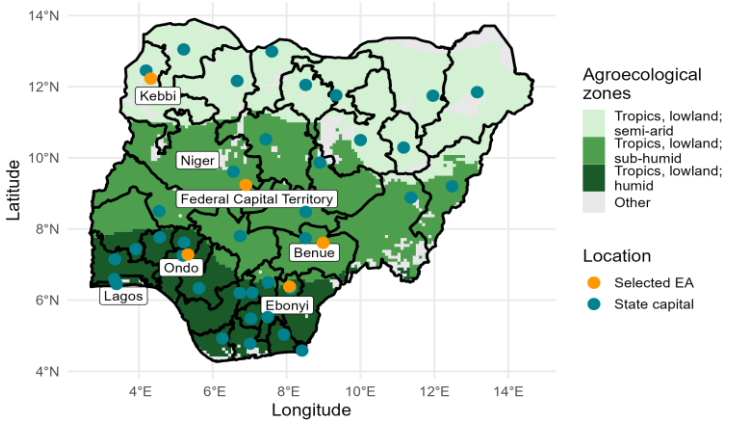


Figure 1: **Nigeria AEZs and Fieldwork locations**[1]

[1] Built using data on historical (1980-2010) AEZs from GAEZ V4

To better understand how access, economics, information, and risk perceptions affect SSP's adoption decisions, we began with a desk analysis of satellite weather and land use data, household surveys, and government statistics and reports. With the Nigerian National Bureau of Statistics (NBS) and timed to the planting season, we conducted a 20-minute phone survey of 696 farming households with questions around risk, climate, and decision-making. Respondents were drawn from, and then merged back with, the nationally representative General Household Survey (GHS) to leverage the farm and household data collected over that two+ hour survey. With our other partner Dev-Afrique, we conducted focus groups and market visits in five villages across Nigeria's three main agroecological zones (AEZs) to speak directly with farmers and agro-dealers, and observe markets. Our report is organized by AEZ. We present key findings and suggestions to inform messaging and investments.

Establishing SSP Climate Risk

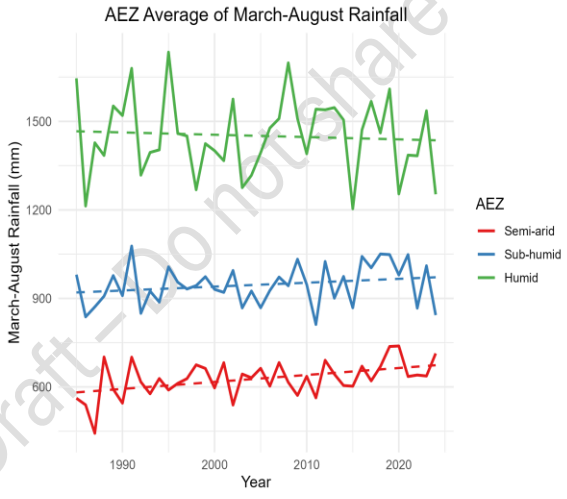
Following the IPCC, we consider risk "the potential for adverse consequences" with the impact of, and responses to, determined by exposure and vulnerability. (Reisinger, et. al., 2020).

Exposure: According to the most recent Agricultural Census, over 40 million Nigerian households practice predominantly rainfed agriculture (NASC, 2024), which, combined with rising temperatures, frequent droughts and dry spells, and recurrent river-basin floods increasingly threatens yields and food security (World Bank, 2021). In the 2022 Census, communities reported on average, experiencing drought and flood about three times, heavy rainfall about four times, extreme wind three times, extreme temperature four times, and fire disaster three times in the past three years. Reported 3-year averages were higher for flooding in Lagos state (10x), drought in Edo state (7x), and extreme temperature in Kebbi State (8x) (NASC, 2024, p.35). In the 2024 growing season, a 33-state drought transitioned to flooding across 31 states, destroying 17,000 hectares of farmland (NAERLS, 2024).

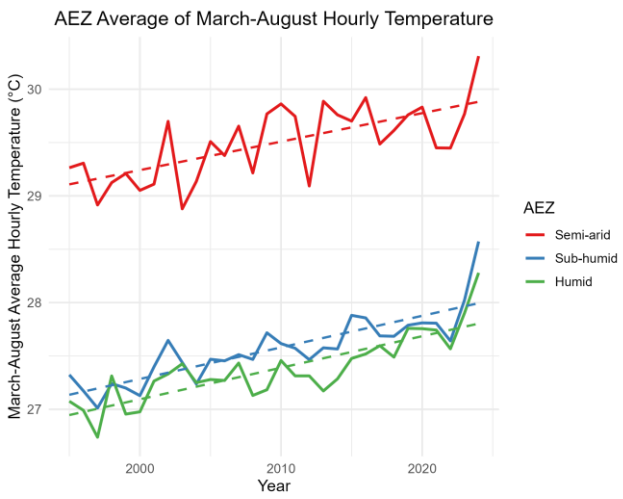
Announcement of the Nigerian Meteorological Agency's (NiMet) 2026 El Niño informed Seasonal Climate Prediction (SCP) begins by: "warning of variable rainfall patterns, prolonged dry spells, a severe August Break in some parts of the country, and generally warmer temperatures across Nigeria." (NiMet, 2026)

Figure 2: **Mean rainfall and temperature by AEZ (1985-2024)**

Panel A: Mean rainfall



Panel B: Mean temperature



Notes: EPAR calculations using CHIRPS monthly rainfall data (Funk et al., 2015).

Meso-scale (~5km) weather time series data show increasing rainfall variability and rising temperatures across three major AEZs. Interpreting the impact of climate stress and trends depends on human, crop, and livestock physiological thresholds

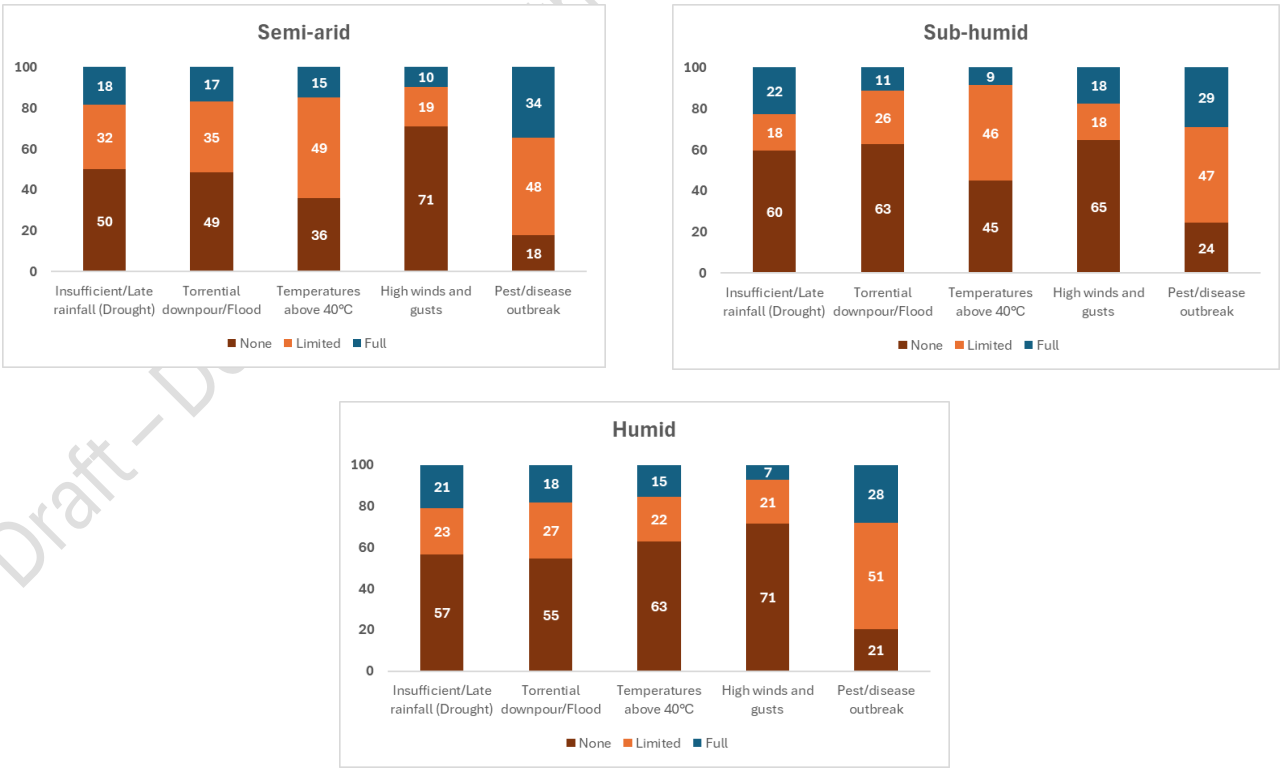
around heat and precipitation volume, variability, and extremes. Based on available thresholds in the semi-arid zone, the majority of households face borderline precipitation conditions and more than 1 harmful degree day (HDD) above 30ºC.

Vulnerability: Across GHS waves, the reported adoption of key agricultural technologies has declined, with an increasing number of households indicating that they were "doing nothing" in response to the shock. SSPs (rural agricultural households) are estimated to cultivate crops on an average of 0.97 hectares and have between 0.76 (GHS, 2024) and 1.3 (NASC, 2024) Tropical Livestock Units. Estimated average rural household income is less than $2/day in 2021 PPP USD (GHS, 2024).

Key Empirical Findings

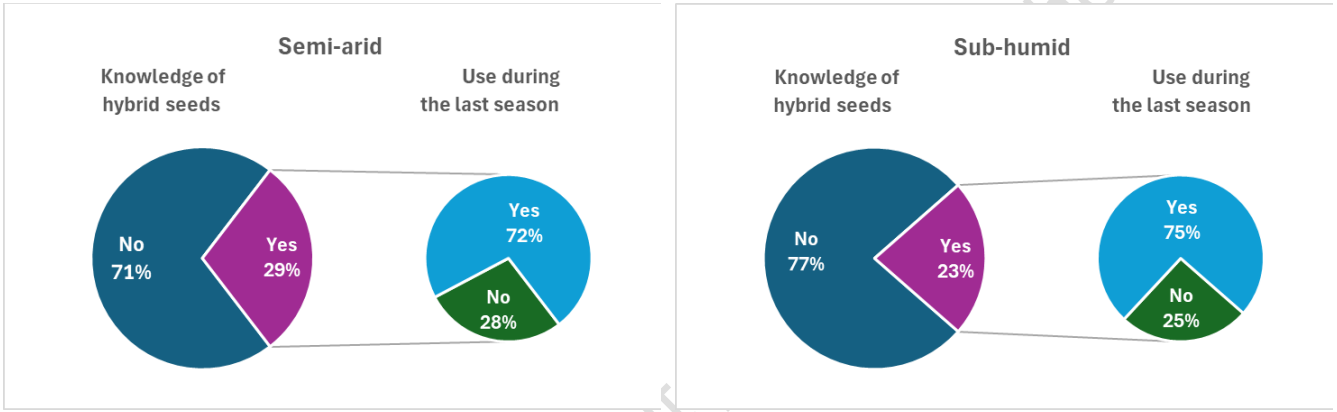
- **Self-reported ≠ measured shocks**. > 50% of households exposed to meteorological drought do not report being affected. Larger households and more diversified livestock holdings may buffer hazard sensitivity.
- **AEZ variability**: there is considerable variability across AEZ around climate; awareness and use of production technologies and crop and soil adaptation strategies (with water management consistently the least known); and SSP attitudes. Trusted sources of weather information vary by AEZ, but reasons for not acting on weather information (timeliness and relevance) are more common.
- **Hazard Variability**: The ranges of households reporting "regularly affected over the past 5 years" across semi-arid to humid, are highest for heat (16% to 40%), drought (9% to 31%) and lowest for pest/disease (13% to 5%). Among these households the percent expecting **"likely" future occurrences** in the next two years varied from almost 25% to 50% for drought and pests /disease, with heat the most consistent at around 40%.
- **Across AEZs farmers report feeling less control against weather shocks than pests/diseases.** 70% and 57% feel unable to control high wind and drought losses. Less perceived control over a potential hazard may diminish the incentive to buy an expensive input.

Figure 3: Extent of control over losses caused by climate events



- **Technology awareness is low, though adoption conditional on awareness is high.** Only 20% of respondents reported knowing about hybrid seeds, but among the aware, 72% reported using hybrid seeds in the last agricultural season.
- **The term hybrid is not consistently understood.** "Hybrid" does not similarly translate to consumers or suppliers across local languages. For example, in the Yoruba language, the term for hybrid "irugbin arabara" is also used for improved seed more broadly. In Hausa, hybrid seeds are "iri dan aure," which translates to "seed sourced from marriage." Other hypotheses for particularly low awareness in the humid AEZ are that two of the three largest crops (as measured by hectares planted) are tubers: cassava (86%), maize (43%), and yams (43%) per 2023-24 GHS estimates.

Figure 4: Knowledge and use of improved seeds

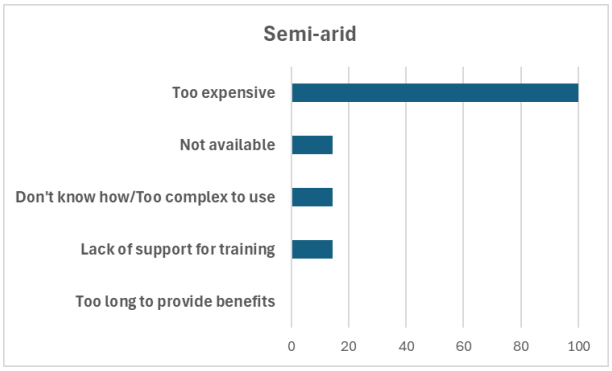


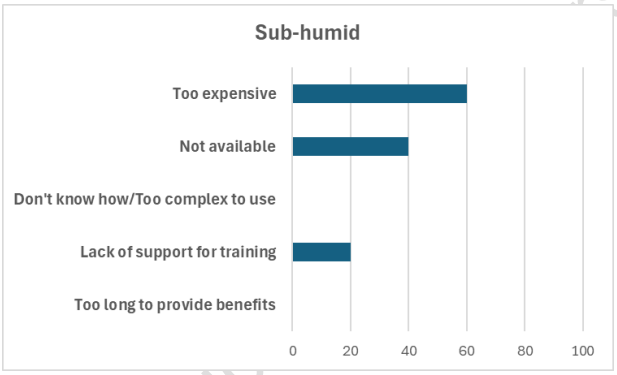
Yam tuber storage in Ebonyi state (Fieldwork: March 2025)

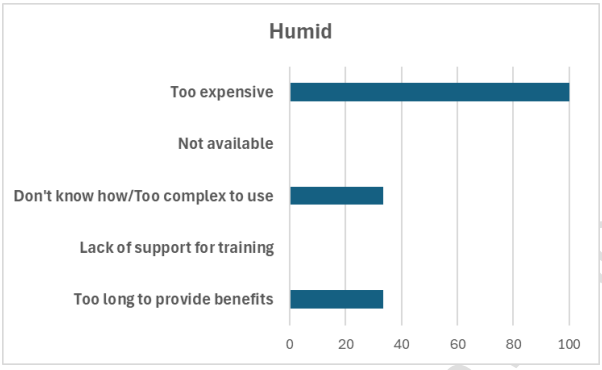
- **Measurement limitations likely mask actual adoption rates.** Key agricultural surveys ask about "improved variety" seed adoption, with use estimates among male plot managers falling from 16% (2015-16) to 5% (2023-24). Wefind that SSPs commonly define "improved" by where seed was obtained (e.g. market or NGO). Only about a third of respondents identified a hybrid as an improved seed.

- **Misidentification remains a problem:** Consistent with other surveys, we found both non-improved seed identified as improved (false positive) and improved seed identified as non-improved (false negative).
- **High upfront costs and liquidity constraints likely constrain adoption.** Among farmers aware of hybrid seeds, 96% expect them to increase profits, yet 28% don't use them, citing cost as a top barrier to uptake.

Figure 5: Reasons for not using hybrid seeds in the current year (never used or dis-adopting)







Urea being sold in market in Kebbi state (Fieldwork: March 2025)

- Nationally, knowledge of **inorganic fertilizers (78%), and herbicides or pesticides (65%)** is higher than for hybrids. Among those with knowledge, reported use in the last agricultural season is 88% for both.
- **More uncertainty around costs than benefits**: SSPs are more homogeneous in their beliefs around technology benefits than in their beliefs around technology costs, including labor and other inputs.
- **Climate information often doesn't translate to action.** 52% of farmers who received weather information didn't act on it. Top reasons farmers cited were that the information wasn't relevant to their farm (27%), that they had no affordable way to respond (27%), or that it arrived too late (20%).

Investment and Messaging Implications

Our findings suggest specific messaging strategies based on what we are learning about SSP risk perceptions and innate attitudes. Econometrically obtained results (i.e. controlling for other variables) are denoted with **.

- **Uptake is likely to be most effective if the message acknowledges the perceived risks and net returns held by SSPs.** The most recent Agricultural Census survey (NASC, 2024) finds a high literacy rate among agricultural household heads, with 95% having completed primary education or higher. Messaging to inform rather than marketing to sell may be more effective "demand creation."
- **Be upfront about the costs of adoption** and provide clarity around total costs (e.g. annual seed purchases, fertilizer and labor costs, etc.). Known techniques such as small packaging, return policies, and other mechanisms can shift risk from buyers to sellers.
- Highlight the risks addressed by the technologies **that SSPs feel some control** over e.g. pests or disease, rather than wind dislodging or precipitation and heat extremes.
- ****SSP Segmentation**: After accounting for observable socio-economic household characteristics and exposure to low rainfall shocks in recent years, across-AEZ differences in attitudes remain: Age is positively associated with farming confidence and negatively associated with an interest in changing economic activities; Women are less likely than men to want their children to become farmers; SSPs in the subhumid and humid AEZs are less likely to say that they want their children to become farmers, SSPs in the semiarid region are more likely to believe that climate will be more unpredictable in the future; and Individuals with Quranic or Integrated Islamic education as the highest level of educational attainment are associated with a higher degree of fatalism and autonomy.
- **AEZ-specific messaging**: in the subhumid and humid AEZs, technology adoption may need to increasingly compete with exit from farming rather than the status quo alone; in the predominantly Islamic semiarid region, easing credit constraints may be more challenging given social norms.

Mango and palm oil trees in Ebonyi state (Fieldwork, March 2025)

Cassava mounds in Benue state 1-2 months before the beginning of the planting season (Fieldwork, March 2025). Cassava is planted year-round in the subhumid AEZ of Nigeria.

- Especially for FHH, **time horizons are short**, and messages that emphasize near-term productivity outcomes rather than longer-run adaptation benefits may be more effective.
- There is **easier traction of weather information** focused on an immediate decision (e.g. when to plant/harvest with a monsoon onset date) and a seasonal one (e.g. what to plant given a three-month precipitation forecast) (Rosenzweig & Udry; 2014). Information-to-action pathways are more uncertain and often more complex in long-run forecasts with multiple dimensions of weather risk, including precipitation totals, onset and cessation dates, temperature anomalies, etc. (Carleton et al., 2024).

Table 1: Future aspirations, patience, risk-taking, and worldview by AEZ

	% Semi-arid		% Sub-humid		% Humid	
	Disagree	Agree	Disagree	Agree	Disagree	Agree
I am confident in myself as a farmer	2	93	4	96	6	92
I would like my children to become farmers	10	84	29	66	37	**51**
I am interested in changing or expanding to new economic activity	08	85	5	89	14	80
I am optimistic about the future	1	95	2	95	5	91
I am willing to forgo a profit opportunity in the short-run in order to benefit from potential profits in the long-run	7	88	8	88	9	87
I consider myself a person who is willing to take risks in farming	5	92	8	88	12	85
I believe that climate will be more and more unpredictable in the future	3	**90**	12	81	13	**77**
If misfortune is meant to strike my farm I cannot avoid it.	16	**76**	23	72	32	**60**
I do not want anyone to tell me what to do on my farm	49	**45**	62	**34**	53	40

Millet plantation in Kebbi state (Fieldwork March 2025). Millet is a heat-resistant crop that is well suited to the high temperatures of the semi-arid AEZ

One farmer from a Kebbi state said: *"I have not done anything different to adapt to climate change, I just trust God", while another farmer from a different Kebbi state noted: "Sometimes I replant the crops that were damaged."*

- **Calibrate** performance and cost expectations under localized conditions, e.g. soil nutrients and water accessibility, plot slope, household labor, cropping choices. In addition to creating trust, it may create "psychological ownership" to increase uptake (Saccardo, S., Dai, H., Han, M.A. *et al.* 2024);
- When the technology is **unfamiliar**, SSPs may need **multiple information sources and reminders** before they adopt to reinforce the message, including agro-dealers, local radios, producer groups and especially farmer social networks which can create highly beneficial spillovers (Carter et. al., 2021);
- For **familiar technologies**, referencing relative to similar technologies "in-use" may be helpful, for instance, pertaining to correct dosage and/or technique (Magruder, 2018 and Takahashi et. al. 2019);
- **Frame the technology in terms of gains (productivity or resilience).** Evidence suggests that gain framing is most effective when actions are viewed as preventive (avoiding a future problem) or curative (addressing an existing condition to improve outcomes). Loss framing can create a 'double negative' that can trigger avoidance rather than action (Ngo et al., 2022; Pope et al., 2018; Yanuarti et al., 2026).

Table 2: Which of the following providers of weather/extreme weather event information do you trust? Select all that apply						
	Semi-arid		**Sub-humid**		**Humid**	
	Percent	N	Percent	N	Percent	N
Government extension service	**41**	223	**30**	242	16	230
NGO	20	223	12	242	03	230
Farmers Group/Association/Co-Op	**42**	223	31	242	17	230
Farmer field school (FFS) or lead farm	19	223	09	242	03	230
Other peer farmer	24	223	11	242	08	230
Trader, market stakeholder, or private	20	223	09	242	01	230
National Weather Service	16	223	13	242	23	230
Radio or television program	**49**	223	**52**	242	**59**	230
Other	00	223	00	242	11	230

- Messaging is most likely effective if it addresses the issue of control and agency directly, perhaps using community leaders, imams, or other influential and trusted allies for messaging in rural communities.

We did not ask directly about National systems and whether they can be leveraged. NiMet's SCP in 2026 included temperature predictions for selected areas within all 36 states, rainfall predictions for 774 local government areas, and predictions of the onset of the rainy season and growing season cessation dates for different regions of the country. Advisories are often tied to seasonal (longer-term) recommendations to plant drought-resistant or early maturing varieties, or in the case of livestock, administering vaccinations.

Rice being dried in Niger state (Fieldwork: March 2025)

The National Agricultural Seeds Council (NASC), an agency of the Federal Ministry of Agriculture and Rural Development, is charged with certifying seed health and quality. If these certifications are trusted and well-understood, they may offer a vehicle for communicating and packaging the production, stress resistance, and other performance traits of "improved" and hybrid seed, for a more consistent understanding between upstream suppliers (from a breeding program) and SSPs (from whom the seed was sourced). Fraud, misidentification, and trust is an issue given the difficulty of measuring the underlying genetic traits in a seed.

What did we learn?

Agriculture is inherently risky

1. *It may not be physically or economically viable to sufficiently offset some agricultural risks with seed or other inputs alone, especially for extreme precipitation or heat events where SSPs feel little control. Technology adoption plus water and soil management may be complementary but have low current awareness. Rising temperatures may challenge even larger investments, e.g.in irrigation, and investments to benefit SSPs may require more structural livelihood shifts.*

How do SSPs view climate risk? (differently from actuarial risk)

2. *SSPs perceive climate risk based on past exposure, their sense of control over the hazard, their fatalism, especially associated with a Qur'anic education, and their vulnerability, associated with their asset base.*

Some aspects of risk perceptions can be addressed through technology design, messaging and targeting that recognize AEZ differences across hazard type and exposure. Some SSP attitudes, such as future orientation, risk tolerance and fatalism, may be more difficult to overcome and address at scale.SSPs in the subhumid and humid AEZs are less likely to say that they want their children to become farmers, and in the semiarid region SSPs are more likely to expect climate to be more unpredictable in the future, yet more likely to believe they cannot avoid misfortune if it is meant to strike their farm. Both attitudes can reduce investment incentives.

Is there a meaningful way to distinguish production and adaptation decisions?

3. *Importantly in theory and design, yes. But in practice, messaging in terms of maximizing current net returns may be more salient than long-run adaptation.*

The risk and benefit-cost of non-adoption relative to moving from the status quo.

4. *Varies by and within AEZ given exposure, vulnerability and incentives, but also sensitive to timing, including when technologies are available in markets or elsewhere; and on the seller side, given perishability, the ability to stock and adequately store to meet demand, or suppliers erring on understocking to avoid waste.*

Beyond the specific messaging insights, some broad considerations are:

Scale out rather than across: Start with high probability of success locations, as scaling across AEZ and SSP risk profiles may be counterproductive. Then leverage *farmer to farmer* channels in digital strategies for spillover.

Broaden goals from AT to reducing rural poverty: Yield and productivity are a starting point, but SSPs face the twin challenge of generating a surplus and navigating a market – for inputs and outputs. Complementary post-harvest investments to smooth income (e.g. cool storage facilities, small-scale electrification) and supporting livelihood diversity (e.g. agro-processing, business training) can increase farm-level investment incentives, and supporting co-ops, groups and aggregation hubs can facilitate information sharing, reduce transaction costs, and increase market power.

Understand demand: Risk arises from uncertainty and variability which can be managed with information and advisories – but behavior stems from SSP's risk perceptions, not ours.

Risk Profiles by AEZ, References and Appendices Available in the full report

We include five appendices for further detail: Appendix 1 is the CRIFS conceptual model of an SSP technology adoption decision pathway; Appendix 2 lays out the methodology behind this report and the Nigeria fieldwork; Appendix 3 presents some biophysical thresholds from the literature; Appendix 4 presents other relevant background, mostly from the LSMS-ISA GHS, and Appendix 5 presents more detailed econometric results.