

ADDRESSING THE FUTURE OF FOOD & YOUTH IN SUB-SAHARAN AFRICA:
THE CASE FOR GOVERNMENT-LED, SCHOOL-BASED AGRICULTURAL EDUCATION

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by

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ABSTRACT

Governments in sub-Saharan Africa are prioritizing agriculture and youth development to meet rising environmental, economic, political, and population challenges. Failure to feed the growing population or engage youth in economically meaningful opportunities could threaten peace and stability in the region; however, these challenges also offer new opportunities to educate, empower, and engage youth as drivers of economic and social change and innovation. School-based agricultural education (SBAE) offers a cost-effective, scalable, and transformative solution. An expanded model of SBAE rooted in the traditional U.S. model was first piloted by AgriCorps in 2012 and 2013. Since 2014, Liberia, Ghana, and Uganda have adopted this model of SBAE. This paper seeks to define SBAE, determine factors that make it a successful model, and examine enabling environments from each case study to propose a set of indicators for future implementers that predicts where this intervention would be most effective.

BIOGRAPHICAL SKETCH

Michelle Corio is a graduate student in the Department of Global Development at Cornell University, focusing on international agriculture and rural development. She graduated with her bachelor's degrees in political science and sustainability from the University of South Dakota in 2015 and earned a certificate in teaching English as a foreign and second language. Prior to her studies at Cornell, Michelle served as a legislative staffer in the United States Senate in Washington, DC, where she worked with constituents across the agriculture and education sectors. She also worked as a teacher and teacher trainer with WorldTeach in Ecuador for 2017 and the Peace Corps in Myanmar from 2018-2020. She supported the roll out of new English language curricula and the capacity of local teachers in rural government schools.

To my students,
for their curiosity and their heart,
and my counterpart teachers,
for their friendship and wisdom

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A special thanks also to the practitioners in sub-Saharan Africa currently implementing and supporting school-based agricultural education (SBAE), who generously offered their time and insight: Jessica Spence, IAEFP coordinator at Texas A&M's Norman E. Borlaug Institute for International Agriculture and Development; Priyanka Subba, operations manager for Catholic Relief Services' Farmer-to-Farmer Program; Dr. Tobin Redwine, assistant professor at Texas A&M University, board member for Field of Hope, and learning analyst at Vivayic, Inc.; and Austin Peterson, Director of Programming and Training for Peace Corps Liberia and former Chief of Party in Liberia for AgriCorps. Thank you for sharing your personal experiences and perspectives and shaping my understanding of and appreciation for the dynamics and challenges facing advocates of SBAE and implementors at various levels, as well as for always highlighting the benefits and potential it can have for youth.

An especially special acknowledgement to all the youth, teachers, and parents who are leading the change and championing SBAE in their communities. I hope we can continue learning from your experiences and example and supporting you as you find new and innovative ways of preparing and empowering the next generation.

Finally, a very special thanks to my mom and dad, Thomas and Jaclyn Corio, for their love, sacrifice, and selflessness. Nothing would be possible without you.

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“Ghana”

an Original Poem by Theodora Kumi¹

Ghana
Oh, Ghana
The land of rich natural resources
The land of great scholars scattered all over the world
Let's name it
Dr. Carmen Chroma, Koijiyagi, Kofi Annan, who became the first black UN
Secretary General
Ghana
The land of rich vegetation cover and rich natural resources and minerals
From the south with good forest cover to the savannah in the north
But today
Today your children are hungry for food
And even testing for clean water
Ghana
Your youth are on the streets
Crying for jobs in the cities
But they cannot find one
Why
Because our rich resources have been destroyed
By illegal mining
Our great rivers, Oti, Pra, Birim and the others
Have all been destroyed
Where is the future of agriculture without these great rivers
Where is the future of agriculture without these great rivers
Ghana
We must learn from the ants
Who store food in the dry season to survive on
In the rainy season
No country, I mean no country, has developed without agriculture
You know why
Because we eat to live
We must embrace school-based agriculture education now
To teach our young children how to till the land
It is the only means, I mean it is the only means, to prepare our children
To protect our land and our natural resources
Agriculture is all we've got now, I mean agriculture is all we've got now
School-based agricultural education is the key to unlocking this future

(AgriCorps, 2021, 5:35-8:00)

¹ Theodora Kumi is attending teacher-training college in Akropong, Ghana, and is a former 4-H member.

I. Context:

The Region, Challenges, and Solutions

In an era characterized by climate extremes, population growth, resource scarcity, food insecurity, institutional instability, and civic unrest, envisioning a positive future for young people can be daunting. These issues are particularly important and challenging for countries and leaders in sub-Saharan Africa, which is the last major region in the world to undergo the process of structural transformation (Losch et al., 2012) and whose rising youth population is set to come of age in a rapidly changing, threatened, and uncertain environment. Failure to feed the growing population or engage youth in economically meaningful opportunities could threaten peace and stability in the region (Adekoya et al., 2018); however, this demographic shift also offers new opportunities to engage youth as drivers of social and economic change and innovation. Consequently, governments have set regional priorities for agricultural and youth development, though how best to both engage youth and maximize agricultural productivity across contexts remains unclear.

Shifting Demographics and Rising Food Insecurity

The State of Food Security and Nutrition in the World (FAO et al., 2021) recently reported that more than one-third of the world's undernourished, roughly 282 million people, resided in Africa at the onset of the COVID-19 pandemic. With one in five people facing hunger, Africa has more than twice as many undernourished proportionally as any other region (ibid). Levels of food insecurity in sub-Saharan Africa are even higher, with nearly one in four people facing hunger, levels which have not been experienced since 2005 ("Table 1: Prevalence of Undernourishment (PoU) in the World: 2005-2020," FAO et al., 2021). In addition, 37% of the world's children under

the age of five suffering from stunting, a key indicator of poverty and reflective of poor dietary diversity, live in sub-Saharan Africa (FAO et al., 2021; Sultana et al., 2019; Rah et al., 2010). Regional food insecurity also disproportionately affects young women into adulthood, as they are more than three times likely to suffer from anemia as compared to their North American or European counterparts (FAO et al., 2021). Undernourishment through poor dietary diversity and subsequent stunting can impact physical and cognitive development as well as economic productivity and potential (Hoddinott et al., 2013), while *sustained* food insecurity can drive regional instability and political unrest (Adekoya et al., 2018; FAO et al., 2021). As such, promoting climate-sensitive agricultural policies and interventions which strengthen food security in the region is paramount. However, a rapidly increasing population threatens to exacerbate existing climate- and conflict-related inequalities and insecurities in the food system, further threatening the environment and economy as a result.

Following the United Nations (1981) definition² of youth, sub-Saharan Africa boasts the world's youngest population, with more than 60% of its population falling under the age of 25 (Yeboah, 2018; Assad & Levinson, 2013). The region's rapidly increasing population, often referred to as the "youth bulge," is expected to double by 2050 (IFAD, 2019). This demographic shift would magnify existing issues of food insecurity and strains on the food system, as well as exacerbating shortcomings in value chains. In turn, it would also place greater economic pressure on governments and society to prepare youth for sustainable livelihoods against a backdrop of increasing economic hardship.

Demographic shifts can facilitate economic growth given the right supporting social and economic policies and investments. Gains resulting from a demographic shift are considered a

² The UN definition categorizes youth as young people from 15-24 years of age.

“demographic dividend” (PRB, 2012). In sub-Saharan Africa, the youth bulge represents an opportunity to attain such gains. The first step in attaining the demographic dividend emerges as productivity increases due to a larger, younger working population. Right now, sub-Saharan Africa has the youth population to support this but lacks the economic opportunity for countries to cash in on it fully, so investments in job-creating sectors and skills programs are vital (Folawewo & Adeboje, 2017; Baah-Boateng, 2016; Olokundun et al., 2014). The second step of the demographic dividend emerges with profitability as the working population outnumbers the non-working population, resulting in increased savings (IFAD, 2019). Ideally, once “financial institutions have properly developed, as a result of robust structural transformation, these savings will create higher investment levels and contribute to long-term, self-sustaining growth” (McKnight, 2021, p. 12).

Economic Downturns and Rising Youth Underemployment

Alongside conflict and climate extremes, economic downturn is the third key driver of food insecurity in Africa (FAO et al., 2021). The number of youth entering the workforce outpaces the number of jobs being created four to one, leading to unemployment, underemployment, and disillusionment. As a result, the African Development Bank (2016) estimates that “263 million youth will lack an economic stake in the system by 2025.” This economic disparity can lead to higher rates of poverty, migration, instability, and conflict and have negative effects of foreign direct investment (Adekoya et al., 2018).

If the definition for youth is expanded to meet the parameters designated in the *African Youth Charter*, which encompasses young people from 15 to 35 years of age³ (UNECA, 2011;

³ While the UN defines youth between the ages of 15-24 years, the majority of African countries' youth policies extend this age range from 29 up to 40 years of age (UNECA, 2011). The charter's definition is the result of a compromise among participating countries.

African Union, 2006), then the majority of African youth suffer from unemployment or underemployment. Unemployment alone is not the most accurate or representative indicator of youths' livelihoods in low-income contexts, as most youth there cannot afford not to work (Betcherman & Khan, 2018; Betcherman & Khan, 2015). Most African youth live in rural areas and have limited opportunities for gainful employment in the formal sector stemming from poor education and lower literacy rates and lack of skills, leading to three in four youth finding employment in the informal sector (Geza et al., 2021; Allen et al., 2016; AfDB, 2016). Therefore, youth in rural, low-income contexts are most likely to experience underemployment, which is marked by subsistence earnings and lack of benefits or protections, as opposed to outright unemployment. With these nuances in mind, the African Development Bank (AfDB) investigated youth employment further and found that one-third of youth were unemployed in 2015; one-third were vulnerably employed, and more than half of youth in low-income countries were underemployed (ibid). These ratios are significant because they signal that either youth do not have the skills to attain wage-earning positions (as seen in unemployment) or they are working hard but still unable to get ahead (as seen in vulnerable employment or underemployment). Both availability and quality of employment, then, will be important factors when considering interventions that support economic growth as well as youth development.

Although fully maximizing the potentials of the demographic dividend is a long-term goal, involving many years of intentional efforts and investments, that process starts with getting youth into the workforce, and agriculture presents the strongest opportunity and most strategic sector for investment in youth and the economy. Agriculture, and related innovation, will be essential in addressing emerging challenges of food insecurity, youth unemployment, and economic downturn, as the sector can spur economic productivity, provide employment opportunities, and strengthen

food systems for a growing population. The rising youth population could have an important role to play in streamlining innovation and productivity in the near-term that sets the stage for greater growth, development, and investment in the long-term.

The Role of Agriculture in Transformation

Agriculture—and the markets created by, for, and around it—is a core component of the economic and structural transformation process. Historically, all successful developing countries have undergone a structural transformation involving four main features: 1) a falling share of agriculture in overall economic output due to increasing agricultural productivity, 2) a rising share of economic activity in the industrial and service sectors, particularly in urban centers, 3) migration of rural workers to urban centers to meet emerging economic opportunities, and 4) a demographic shift marked by increasing fertility and decreasing mortality rates, leading to a population spurt (Timmer, 2009, p. 8). Sub-Saharan Africa is ripe for transformation as it is already experiencing a youth bulge, which is demonstrative of the kind of population shift necessary for transformation (Losch et al., 2012; Timmer, 2009). However, structural transformation is dependent upon agricultural productivity and the income generated from the surpluses it creates, so countries must first invest in agriculture to spur economic growth and the rest of the process.

To break this down further, economic transformation has three stages, beginning with agricultural transformation. This is marked by increased productivity as a result of improved agricultural innovation and rates of adoption, creating surpluses. Once farmers have surpluses, the next stage of the process, rural transformation, is set into motion. This stage is marked by profitability due to improved linkages to markets connecting rural food supplies to urban markets for consumption (Elliott et al., 2022; McKnight, 2021, p. 11; Timmer, 2009). The final stage of full economic transformation of a country is the structural transformation discussed above, notable

in its shift from farms to firms and its demand for more industrial versus agrarian labor. Agricultural transformation, then, is key. As productivity increases, living standards improve, and poverty declines, which in turn contributes to healthier diets, stronger communities, and more productive economies (Yeboah, 2018; Allen et al., 2016; Timmer, 2009). When thinking of how to spur agricultural transformation and employment opportunities for youth, viable interventions will need to focus on skills and technologies that promote productivity now while connecting surpluses to markets and securing opportunities for youth later, when they likely will move out of agriculture (Allen et al., 2016; Betcherman & Khan, 2015).

Investment in agriculture has been proven to reduce youth unemployment and is positively correlated with economic growth (Adekoya et al., 2018; Baah-Boateng, 2016; Olokundun et al., 2014). In addition, increased agricultural productivity can generate strong multiplier effects that enhance and expand job opportunities in the broader economy (Allen et al., 2016). Currently, agriculture consists of 15% of gross domestic product across sub-Saharan Africa and constitutes a majority of the region's employment (OECD/FAO, 2022; Yeboah, 2018), but recent increases in value and production have largely been the result of land expansion (OECD/FAO, 2022). Such gains have come at the cost of the environment and natural resources at a time when rural populations only continue to grow. To move forward sustainably, productivity will need to be increased through leveraging technology and innovations (Allen et al., 2016).

In rural sub-Saharan Africa, local economies will need to generate more than 12 million new jobs a year to meet employment needs of a rising youth population (Davis et al., 2020). With proper investment and support, on-farm production and off-farm processing could create 41 million jobs by 2025 alone (AfDB, 2016). Although labor will inevitably move away from agriculture through the transformation process over time, off-farm opportunities in the agri-food

system are not expected to match opportunities for new jobs offered through hands-on farming until at least 2026 (Allen et al., 2016), possibly later given delays from the COVID-19 pandemic. Besides, skills youth develop through agriculture, such as marketing goods or keeping records and basic accounting, can spur production and support livelihoods now and transfer to other employment opportunities in the future.

The Role of Youth in Agriculture

Youth have the potential to transform the agricultural sector and spur economic growth through innovation and entrepreneurship, particularly as early adopters. The majority of youth are already working in agriculture in some capacity, whether through seasonal labor, self-employment, or household enterprises, dedicating up to 70% of any working day to household farms, but they are largely unproductive, often maintaining multiple sources of income as a result (Betcherman & Khan, 2015; Yeboah, 2018; IFAD, 2019). As such, they are well-positioned for a youth-centered agricultural intervention focused on diffusion of production-enhancing knowledge and innovations wherein they could both accelerate and sustain development and the transformation process in the region (Betcherman & Khan, 2015; The Movement, 2022).

As founder of AgriCorps, which invests in youth development through agriculture, Trent McKnight noted that while agricultural innovations "save time, make farm life more comfortable, improve productivity, reduce loss, enhance nutrition and preserve natural resources," they "are only as good as their adoption rates" (McKnight, 2021a, p.6). By leveraging youths' role in society and interests in agriculture, education and extension interventions can position youth as early adopters. Founded in behavioral economic theories, working with youth as a point of knowledge diffusion is effective in transmitting it to the larger community by adjusting the reference point for farmers who would be reluctant to adopt the innovation otherwise.

For example, in a risk simulation, a person has two options. They can either be guaranteed \$0.45 for participating or could win \$1.00 in a coin toss if the coin lands on heads. However, if the person opts for the coin toss and the coin lands on tails, the person would receive nothing. In this scenario, most people take the gamble and toss the coin in part because \$0.45 does not feel like much of a loss. However, when the scenario shifts to guaranteeing a person \$450,000 for participating instead of \$0.45 and \$1 million for tossing a coin and landing on heads, people's behaviors change. When the amount of money changes in the second scenario, most participants now opt for the guaranteed amount for participation. Psychologically, if one gambled in the second scenario and the coin fell on tails, the person would feel they lost not only the gamble (\$1 million) but also the guaranteed amount (\$450,000) (McKnight, 2021b). This demonstrates the role of the reference point when considering risk. However, it does not consider the age or position of the person making the decision.

At an independent TEDx event, McKnight (2021b) extrapolated on this scenario further by giving it an agricultural lens. In this adapted scenario, consider a new hybrid seed for corn that has been developed for sub-Saharan Africa that is scientifically proven to double yields without any additional inputs or change in practices. The hybrid seed appears identical to the traditional one farmers in the area use, and no one has yet seen it demonstrated. In this scenario, the traditional seed and its yields would be the guaranteed outcome for participating. The new hybrid seed, and its greater potential yields, would be the gamble. "Based on reference point," McKnight poses, "Who is more likely to adopt the hybrid seed: a 13-year-old taking an agriculture class in junior high school or her father, a subsistence farmer feeding eight children at home?" He goes on to argue that not only is someone younger more likely to take the gamble, i.e. adopting the innovation through the hybrid seed, but also that someone younger is ideally positioned in a community to

share this innovation in a way that increases its likelihood of adoption among other, older farmers in the community, like her father (6:14-8:37). This scenario highlights the importance of reference points in taking risks while also acknowledging the role of the one taking the risk and how that can also alter others' perceptions of that risk and alter their reference points accordingly.

Much of agricultural innovation diffusion occurs through extension workers, who tend to be more educated and trained, or highly successful local farmers who tend to be early adopters and emerge as a reference point representing the innovation (and its risks) to other local farmers. In these cases, the reference point for a less productive, less educated farmer seems unrelatable or unattainable. Because the cultural perception of youth is that they rank below their more senior relatives and community members, when youth successfully adopt an innovation that increases yields, the reference point for these less productive or less educated farmers shifts. With youth positioned as early adopters and less intimidating reference points, those farmers are now more likely to adopt the innovation, a phenomenon which has been proven to apply from youth to adults as well as within existing extension programs (Nakasone & Torero, 2016; BenYishay & Mobarak, 2018). This is important because these are the farmers most often overlooked or left out of traditional extension and knowledge diffusion networks who could often benefit most from the innovation.

Additionally, it demonstrates that targeting youth as early adopters can also produce a multiplier effect and reach other members of the community. In a study conducted in southwestern Nigeria, age and years of education were significantly correlated to rates of technological and innovation adoption. Findings supported that usage of technology in a community can positively affect the rate of adoption more widely and could also improve perceptions of youth and their role in promoting food security within their communities (Ayinde et al., 2018). Thus, engaging youth

in agriculture as early adopters can expand informal knowledge-sharing networks that can strengthen food systems and spur economic and agricultural transformation.

Key Government Priorities

Regional government priorities, as noted below (Table 1), acknowledge the growing challenges related to food security and youth employment and are placing added emphasis on youth in agriculture as a pathway to peace and prosperity. Effective interventions will need to align with these broader regional government priorities, as well as the priorities of each country's context.

Table 1: Regional Priorities Related to Youth and Agriculture

Guiding Agreement	Summary
The Comprehensive Africa Agriculture Development Programme (CAADP)	The CAADP Compact calls for allocating 10 percent of public expenditures to agriculture and seeks 6 percent growth in annual agricultural productivity.
Malabo Declaration on Accelerated Agriculture Growth and Transformation for Shared Prosperity and Improved Livelihoods	The Declaration recommitted to the principles of CAADP, but with specific targets in agricultural finance and agrifood job creation.
Agenda 2063	The African Union has set Agenda 2063 as its blueprint for transforming the continent through improved education, modern agriculture, and environmental resilience.
Feed Africa Strategy	The African Development Bank's Strategy emphasizes the need for a new crop of young "agripreneurs," which will require empowering and training youth to change the traditional view of agriculture while equipping them with the skills and financing to be successful.

**transcribed from a virtual presentation given by Dr. Elliott for the National AIAEE Conference on May 18, 2022*

(Elliott et al., 2022, 25:46-26:33)

II. The Case for School-Based Agricultural Education

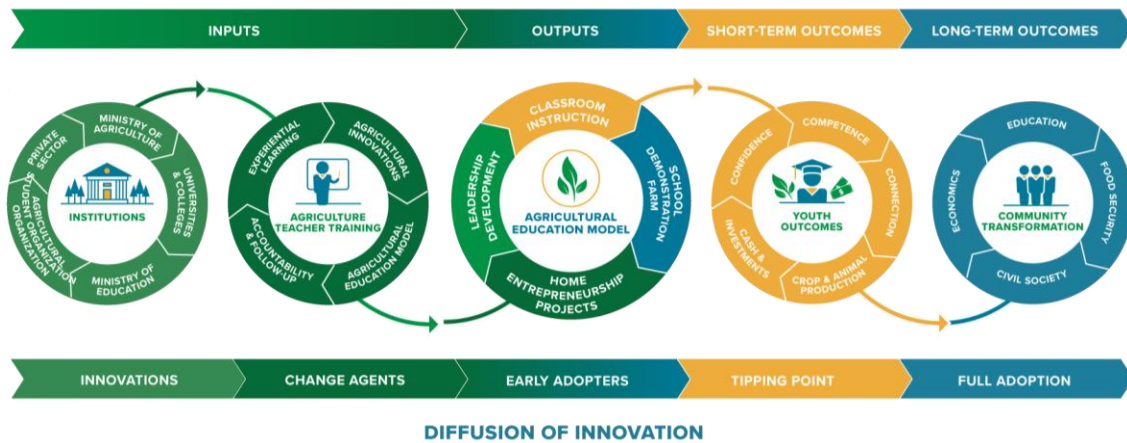
School-based agricultural education, hereafter referred to as SBAE, offers the most cost-effective, scalable, and transformative solution for engaging youth, diffusing innovation, and stimulating the economy in rural communities. This section focuses specifically on a model of SBAE developed and piloted by AgriCorps in recent years that modifies and expands upon the historic U.S. model of SBAE. In the context of sub-Saharan Africa, SBAE can be a cross-cutting, collaborative, youth-centered approach to development that provides post-primary students with experiential learning opportunities while leveraging existing extension and youth networks to meet emerging economic, educational, and food security needs. This section seeks to define SBAE and gain a deeper understanding of the foundational factors contributing to this model's success.

Overview of SBAE

SBAE is a pluralistic intervention that incorporates theories from behavioral economics, diffusion of innovation, agricultural education, and positive youth development to engage and develop youth through experiential learning that happens in conjunction with and ancillary to the formal education context (Figure 1). Its overarching objectives are to “contribute to the academic, vocational, and life skills development of youth through experiential learning methods” and “improve rural livelihoods by transferring skills and agricultural innovations into the home and community through schools” (The Movement, 2022). In these ways, SBAE happens within the existing school context while supplementing it with real-world, hands-on learning and decision-making. It operates on a very local level to develop youth more immediately while developing the community more widely over time through cascading diffusion of knowledge to achieve long-term transformation.

For SBAE to be successful, a number of actors must be involved at every level and stage of the process. Figure 1 highlights how the foundational theories work together to effect transformational change for youth and the communities they live in; this model was developed by AgriCorps and the Norman Borlaug Institute for International Agriculture and Development to reflect the evolving and cross-cutting processes of an SBAE system. The intervention begins with innovation, but it depends on adoption, adaptation, and diffusion.

Figure 1: The School-Based Agricultural Education Model



(“Figure 3,” McKnight, 2021, p. 19)

Diffusion of Innovation. Underpinning the intervention at the bottom of Figure 1 is the diffusion of innovations, stretching from development to adoption. Ministries of Agriculture, research institutions, extension agents, and/or other technical experts from the private or public sector test and select an appropriate, low-risk, high-reward innovation for diffusion. Local agriculture teachers from participating SBAE schools attend training to learn about the innovations. Post-primary schools act as delivery mechanisms for innovative practices through classroom instruction via the trained instructors. Youth taking the class learn about the innovation,

and through engaged learning and leadership development activities, they become early adopters of it, resulting in increases to agricultural productivity (Elliott et al., 2022). Once enough youth have adopted it and community members have seen it, they begin adopting it as well, leading to widespread increases in productivity; this is reinforced by the behavioral economics of altering the reference point for adult adopters as previously discussed (McKnight, 2021a). “By identifying youth as early adopters of agricultural innovations and empowering them to be change agents for the diffusion of those innovations, SBAE becomes an economic incubator for the entire rural community—amplifying existing agriculture and education initiatives” (The Movement, 2022). This kickstarts the agricultural transformation process and everything that follows.

Agricultural Education Model. While the innovation features prominently in the overall logos of the intervention, partnering schools are its ethos. To bridge the innovation with youth as early adopters, the school is an important forum for dialogue, experimentation, and exchange (Vandenbosch, 2006). SBAE utilizes the agricultural education model, combining classroom learning with supervised experiential learning outside of the classroom and supplementing it with leadership activities. Figure 1 differentiates these activities through the following core components: classroom instruction, school demonstration farm, home entrepreneurship projects, and leadership development.

Even though specific content and activities may vary based on context, past SBAE implementers reported similar patterns in each step of this four-pronged model, as captured below (Elliott et al., 2022; A. Peterson, personal communication, July 2, 2022; McKnight, 2021a; J. Spence, personal communication, October 22, 2021):

- **Classroom Instruction:** Students enroll in an agriculture class at school. A science or agriculture teacher delivers content specific to horticulture, agronomy, husbandry, accounting, or a related topic and introduces intentionally selected agricultural innovations they received through a previous training workshop led by the government or a private or nongovernmental partnering organization.
- **School Demonstration Farm:** The Parent-Teacher Association or school has secured a plot of land either on the school compound or nearby in the community. Students enrolled in the class choose what to plant and proceed to plant and care for the plot. Receiving guidance and feedback from the teacher, they utilize information from class to make decisions and may experiment with an innovation they learned about, testing it in a collective way. Students reap what they sow, market it, and decide how to spend the earnings.
- **Home Entrepreneurship Projects:** As part of the class, students opt-in to test an innovation on their own. Though working independently, they utilize the teacher as a mentor. This works to diffuse the innovation at the household level and promote spillover effects in the community. Again, students reap what they sow, market it, and decide how to spend any earnings, though on an individual and personal level this time.
- **Leadership Development:** Partnering with local 4-H or other youth organizations, students participate in extracurricular leadership activities at local, regional, and national levels. These activities are important for building soft skills like public speaking, goal setting, and more.

Experiential learning is an integral component to the agriculture education model and another important underpinning of the SBAE model. One of the foremost thinkers of his time, John Dewey (1938) was among the first to identify the role and importance of experience in creating and sharing knowledge. Inspired by Dewey's theories of experiential learning, David Kolb (1984) developed six characteristics of experiential learning, which include:

1. Learning is best conceived as a process, not a set of outcomes.
2. Learning is a continuous process grounded in experience.
3. Learning requires the resolution of conflicts between dialectically opposed modes of adaptation to the world.
4. Learning is a holistic process of adapting to the world.
5. Learning involves transactions between the person and the environment.
6. Learning is the process of creating knowledge. (Ibid)

Kolb's contributions importantly recognize learning as a process and learning as experiential, evolving, and iterative, involving the person doing the learning as much as the context of the learner. Everett Rogers (2003) later applied notions of experiential learning to innovation adoption, noting that adopters of innovation must be able to both test and observe their results firsthand. This aligns the theory of how innovations are diffused with the education model in SBAE, which employs complimentary experiential methods of at-home projects with the at-school farm demonstration plots so students can apply what they are learning in the classroom and make real-world connections in their own communities (McKnight, 2021a, pp. 15-16).

In addition to the importance of the experiential learning component, several actors are critical to the agricultural education model and SBAE more widely. One is the buy-in of the local school leadership, often in the form of the Parent-Teacher Association and head administrator.

This is important for securing land for the demonstration plot and cuing parents into what is happening (Elliott et al., 2022). Another is the buy-in of a local champion, typically in the form of an invested and passionate agriculture or science teacher who serves the dual role of being the local 4-H or youth organization's club advisor. This duality seems to have originated organically but serves a critical role in bridging the four components of the agricultural education model underpinning SBAE. Another important role is that of the local or regional extension agent, who is often assigned a certain number of schools doing SBAE and who serves as a technical reference or point of contact for teachers implementing SBAE (A. Peterson, personal communication, July 2, 2022). The final and most important actors are the students themselves. The structure is entirely voluntary, so student buy-in is important for motivation and driving participation and adoption; however, the agency and real-world applications of the experiential learning opportunities presented often attract students to SBAE, while the income generated from their labors further incentivizes their continued commitment and engagement.

Positive Youth Development. Youth represent the pathos of the intervention. Not only are they critical to its delivery and uptake, but their buy-in and personal growth and development will strengthen the community, economy, and country in the long-run. SBAE champions positive youth development (PYD) through systematically developing youths' skills and competencies and actively engaging youth organizations and networks. Conducting a longitudinal study of youth involved in 4-H, Richard and Jacqueline Lerner and colleagues (2013) sought to test and measure the key characteristics of PYD and their effects on the community. The study followed 7,000 youth from 2002 to 2010 across 42 states in the U.S., finding that youth involved in 4-H were more likely to be civically engaged, give back to their communities, and pursue science, technology, engineering, and mathematics outside of school, especially girls. The key characteristics of PYD

measured included aptitudes known as “the 5 C’s,” including competence, confidence, connection, character, and caring. Lerner et al. (2013) found that youth excelled in a sixth C as well, “Contributions to self, family, community, and to the institutions of a civil society” (p. 10). This sixth characteristic emerges when the original 5 C’s are present in a young person (p. 17).

Building on this body of work, AgriCorps undertook research in 2018 to test the preliminary impacts of SBAE in Liberia and Ghana, where it was being implemented. Findings generally supported Lerner et al. (2013), though results also encouraged AgriCorps to contribute two additional C’s to the model, now reflected in Figure 1. They include “cash/investments” and “crop/animal production” (McKnight, 2021a, p. 33). These additions to the PYD framework seek to reflect the value-added work youth are participating in through their engagement with the agricultural education model and the decision-making processes and entrepreneurial acumen they are honing through their engagement in SBAE.

Reports from agriculture teachers implementing SBAE show that students have used earnings from home projects for "food, clothes, school fees, supplies, college entrance exams, and better inputs for their farm" (McKnight, 2021a, p. 33), as well as school tuition and leisure, from a soccer ball to extra pencils for school (A. Peterson, personal communication, July 2, 2022; Elliott et al., 2022). These C’s embody the entrepreneurial spirit of youth involved in SBAE and its economic, as well as its civic and personal, advantages. Therefore, the SBAE system reflected in Figure 1 reflects a more comprehensive and evolved framework for PYD that positively impacts youths’ prospects as well as their communities.

Research embodied in the Building Blocks for Learning framework strengthens findings by Lerner et al. (2013) and reinforces the role of positive youth development and co-curricular activities like 4-H and other youth organizations championed by SBAE. The framework is the

result of decades of education research and identifies specific skills important for success in both school and life, with an emphasis on foundational, transferable skills applicable to students over time and place, making it particularly relevant to the goals and intentions of SBAE (Tavener, 2019, pp. 161-165). The SBAE model and approach particularly contribute to developing key mindsets outlined in the framework, which include the following: growth mindset, self-efficacy, sense of belonging, and relevance of school (Stafford-Brizard, 2016). These mindsets align with the five C's of positive youth development, as well as those further developed by Lerner et al. (2013) and AgriCorps. Growth mindsets develop when youth believe that their abilities and competencies grow with their effort. Self-efficacy aligns with confidence. Sense of belonging furthers connection, and relevance of school connects to caring and contribution, as students are more likely to buy-in and contribute and persevere when their learnings and work have meaningful results and provide future opportunities. Collectively, these building block mindsets further youth's resilience, agency, and academic tenacity, which contribute to the top-tier outcomes of learning: curiosity, self-direction, and civic identity (Figure 1, Stafford-Brizard, 2016, p. 5). The experiential learning opportunities offered by SBAE all strengthen these learning outcomes.

Reinforcing Research

The merits of and need for school-based agricultural education have been supported by other research as well. Firstly, SBAE offers a way to meet human capital needs for development. The most comprehensive support comes from a scoping review of youth's participation in agriculture which was undertaken by researchers at the University of KwaZulu-Natal in South Africa. The review, which sought to better understand challenges facing youth that prevent them from more fully engaging in the sector, found negative perceptions (by youth and toward youth) as a main barrier. Many youth did not view agriculture as a viable source of income or as a potential

career, while many elderly did not view youth as contributing members of the community, complicating youths' access to land. One recommendation resulting from these findings is to support policies and interventions that are "context-specific and promote meaningful youth participation in shaping future food systems" (Geza et al., 2021). Further, effective policies and interventions must focus on capacity building and skills that transition youth into adulthood while still taking into account youths' aspirations; this is corroborated by Betchman and Khan (2018). Geza et al. (2021) specifically recommend integrating agriculture into the school curriculum and developing hard and soft skills that are transferable to the agri-food system. These recommendations fit securely into the agricultural education model and positive youth development components underpinning SBAE. Developing the mindsets outlined in the Building Blocks of Learning framework through SBAE could also aid in positively influencing youths' perceptions of their role and potential in the community as well as the importance and potential of agriculture to meet needs and provide economic opportunity.

SBAE also fills a niche in the extension system. While engaging youth in agriculture, either as targets or providers of extension and advisory services (EAS), represents a scalable poverty-reduction strategy to meet economic needs, the best way to engage them has been less researched. In an effort to gain a better understanding of the different models for engaging youth through EAS, Franzel et al. (2020) conducted a landscape analysis in Rwanda, Niger, and Guatemala. They found that demand-driven EAS could help overcome challenges in existing technical and vocational education and training (TVET) programs. Unable to keep pace with demand and more difficult to scale, TVET tends to favor males and bars participation from many because it requires completion of a certain level of education. SBAE, on the other hand, could offer a more gender-equitable and scalable solution to engaging youth through extension, as well as offer an alternative to traditional

vocational training, by targeting information delivery to students before they drop out of secondary school.

This analysis was expanded upon by Davis et al. (2020), who looked more closely at Rwanda and Uganda. These findings supported the Feed the Future Developing Local Extension Capacity (DLEC) and USAID Bureau for Resilience and Food Security in developing several recommendations, which include the following: 1) differentiate among youth, 2) help young women, 3) provide market-based solutions, 4) ensure that youths also have incentives, 5) promote public-private partnerships, and 6) use digital tools. These recommendations align with SBAE in a number of ways. First, SBAE differentiates among youth and tailors program implementation to youth needs, recognizing and rewarding heterogeneity, by giving decision-making power to youth through clubs and leadership activities, at-home projects, and demonstration plots. The income generated from the projects and school-demonstration plots is tracked and then re-invested or spent by the youth themselves, incentivizing and rewarding heterogeneity, supporting youth engagement in local markets, and including girls in decision-making. The skills learned further incentivize youth by equipping them for future employment opportunities, which was a different yet equally important element to successful programming emphasized by the study (Davis et al., 2020).

SBAE can be a pathway for establishing important linkages economically through markets and educationally through extension. In an analysis of policies related to youth employment, Schwebel et al. (2019) found that most policies are made without the consultation of rural youth and tend to focus on improving skills as opposed to reducing constraints preventing entry into a given market. An effective SBAE system builds more than the capacity of the youth involved; it builds and develops the local value-chain system incrementally as productivity increases, which creates a more conducive environment for youth and expands opportunities for employment later

beyond the production side of agriculture. Davis et al. (2020) recommended interventions that ensure sustainability through market-based solutions, which is a core tenet of SBAE and the "learn and earn" ethos, evident in 4-H Ghana's slogan of "Learn, Earn, and Go Green" (Elliott et al., 2022; 4-H Ghana, 2015).

There also seems to be a need to link traditional TVET and other higher education programs with the primary or secondary school curriculum, which SBAE could help address and overcome (Cletzer et al., 2016; Vandenbosch, 2006). Effective programs seemed to be more holistic in nature and integrated into a broader strategy. They also offered continued support in services like financial coaching or access to credit. One of the more effective programs noted in the landscape analysis by Franzel et al. (2020) was the Youth Options Pathway Model being implemented in Rwanda, which compliments technical training and financial services with leadership development. The pathway model is very similar to the SBAE model, just a different delivery method. Linking existing higher education programs and goals at the lower levels or linking programming to broader strategies and more comprehensive services are ways to lengthen the arc of learning to support youth in their transition to adulthood that SBAE could strategically support and strengthen, depending on the context.

The final pivotal recommendation made by Davis et al. (2020) highlights the need for youth engagement through public-private partnerships. SBAE, from design to development to implementation, is an incredibly pluralistic approach dependent on consistent collaboration from a variety of stakeholders, spanning public, private, and nonprofit organizations and institutions. These examples will be further explored below.

Critical Partnerships of SBAE

The pluralistic nature of SBAE strengthens its development and delivery while fostering sustainable pathways for the longevity of the intervention and its multifaceted potential impacts. Successful SBAE requires participation and support from key public institutions, third-party actors in the private and public sectors, and youth farmer organizations. Examples of each and roles they can play in SBAE are outlined below. The strength of these institutions and partnerships is critical for scaling up and out and ensures multiple sources of funding and accelerates the diffusion and transformation process.

Public Institutions. Whereas most agricultural innovations are diffused through public or private extension overseen by a country's Ministry of Agriculture, SBAE requires more comprehensive institutional engagement between ministries of education and agriculture, as well as others as economies evolve. The Ministry of Agriculture (MOA) oversees and spearheads agricultural research and development and the dissemination of those innovations through the public extension system, which could include local and regional extension agents or research stations as well as technical and vocational education and training programs or agricultural universities who are training future educators and extension agents. The MOA is important for offering technical support to agriculture and science teachers and setting national agricultural priorities.

The Ministry of Education (MOE), on the other hand, is important for delivering the innovation and information through schools, teachers, and curriculum, and monitoring it through periodic assessment (McKnight, 2021a). The MOE provides key funding and oversight of the implementation process by shaping the curriculum, training teachers, retaining students, and

providing space for students to gather and learn. Schools also track attendance and can offer data identifying the impact of SBAE on overall student learning, performance, and attrition.

The pedagogy diffused through the MOE and how teachers are trained also directly affects the rate at which SBAE is adopted in schools and the kind of challenges students and teachers may face. For instance, many teachers teaching in government schools across sub-Saharan Africa currently were trained in teacher-centered approaches that emphasize methods like memorization and concepts like knowledge as fixed. These contrast with tenets of the SBAE model, which is founded in student-centered, inquiry-based, experiential approaches to learning. Being trained one way and being asked to teach another way can be difficult and require additional supplementary training and resources to redirect and support teachers on the journey to relearning how to teach in this context. Therefore, if an MOE is on board and is already shifting overarching views of pedagogy toward more student-centered learning, that could indirectly help foster an enabling environment for SBAE. Conversely, if an MOE has not yet made this shift, then SBAE could be an entry point for diffusing new teaching methodology as well. Regardless, SBAE could not be possible without the schools or the support of the MOE.

Additionally, ministries related to finance, trade, and commerce are important to SBAE as it achieves greater community outcomes in the transformation process and impacts local markets. These ministries will need to be brought on board to secure additional funding channels to create more market opportunities for smallholder farmers. The value chains that added production feed into are especially important and will need to grow and develop as production increases, or an intervention like SBAE could be preparing youth and building skills without running parallel interventions that promote delivery and transport methods for an increased food supply or job creation for skilled youth entering the workforce.

Public and Private Sectors. The private sector has a critical role to play in technology and innovation and also operates its own private extension systems as a result. Franzel et al. (2020) noted that private sector actors could play a stronger role in engaging youth through EAS via fee-based services and village agents. Skilled youth coming from the SBAE system would be qualified to fill these types of roles, as well, so seeing these agents and services operating in their community could add relevance to their work and give them something to aspire to in the future. Another important role of the private sector is through funding and investments, with primary funders of country 4-H programs in Africa and globally coming from organizations like the Bill and Melinda Gates Foundation, Cargill, DuPont, Nike Foundation, and others (National 4-H History Preservation Program, n.d.).

The public sector and nongovernmental organizations can play a critical role in meeting capacity needs required for implementing SBAE. Franzel et al. (2020) identified public sector actors as most effective for implementing comprehensive capacity building and skills training; their findings also recognized the role and positioning of public sector actors in building partnerships and providing pipeline programs for workforce development, such as internships for youth.

Youth Organizations. Youth organizations, and young farmer organizations specifically, serve as the backbone of the social network and leadership development driving SBAE. Young farmer organizations collate young people with interests in agriculture and organize opportunities for engagement that are locally driven. Examples of these types of organizations include 4-H, Young Farmers Clubs, Junior Farmer Field Schools, Youth Farmers Associations, and more. These organizations represent important youth networks for programming and development and can serve to increase access to skills, information, and opportunities as well as promote positive

perceptions of youth and their role in agriculture and development. They are also critical to actualize the leadership development components of the agricultural education model within SBAE systems and can serve to prime youth and adults alike to the idea of youth in agriculture.

As SBAE systems are adopted, adapted, and expanded, public-private partnerships will continue to play pivotal roles in traditional technical areas, like research and development, skills training, impact evaluation, and curriculum development. However, those partnerships could play vital roles connecting youth to economic opportunities as well. One area for future development applies to the at-home entrepreneur projects youth in SBAE undertake. As the number of students involved and related social knowledge-sharing networks increase, the kinds of projects and innovations undertaken may increase in scope or scale—and cost. Original budget projections by government actors may not always carve out enough room for this type of growth; however, nongovernmental organizations and private sector actors could more easily move and allocate funds for special projects and purposes like these. With enough support and engagement, they could even invest in incubators to help youth scale their projects into small businesses. This is an element of the Youth Options Pathway Model being implemented in Rwanda that could be added to the SBAE system (Franzel et al., 2020). As an auxiliary component of the SBAE network, it would lengthen the arc of the intervention’s impact from youth to adulthood, school to start-up, and curricular-supported to self-sustaining.

Alignment with Regional Priorities

SBAE aligns with regional priorities and their comprehensive focus on improving local livelihoods, developing youths’ skills and capabilities, promoting gender-inclusive programming, and spurring agricultural, economic, and structural transformation that meets short-term needs while mitigating long-term challenges.

Table 2: Regional Policies Including Youth

Policy	Challenges Faced by Youth	Youth Role and Participation in Agriculture	Youth Investment Focus Areas
African Youth Charter	Not mentioned	Not mentioned	<ul style="list-style-type: none"> ■ Guaranteed participation of young people in government and spheres of society ■ Provision of technical and financial support to build the institutional capacity of youth organisations ■ Provision of access to health care ■ Provision of access to information and services which will empower youth to become aware of their rights and responsibilities ■ Education and skills development ■ Poverty eradication and socioeconomic integration of youth ■ Sustainable livelihoods and youth employment
African Youth Decade Plan of Action	<ul style="list-style-type: none"> ■ Unemployment, underemployment ■ lack of skills, relevant education, access to capital, unmet need for health-related information and services 	Not mentioned	<ul style="list-style-type: none"> ■ Ensuring a rights-based approach to youth development through meaningful participation and representation ■ Consolidated investment targeting youth socioeconomic empowerment ■ Mainstreaming youth perspective in the efforts to achieve broad development goals and priorities ■ Investing in youth empowerment and development ■ Investing in meaningful participation and contribution of young people towards Africa's progress and sustenance of current gains. Advocating for the well-being of youth by having access to education, health facilities, employment and promoting the cause of the disadvantaged youth.
Agenda 2063	<ul style="list-style-type: none"> ■ Unemployment and underemployment ■ Access to education, training, skills and technology, health services, jobs and economic opportunities, 	Not mentioned	<ul style="list-style-type: none"> ■ Inclusive growth, job creation, increasing agricultural production; investments in science, technology, research and innovation; gender equality, youth empowerment and the provision of basic services including health, nutrition, education, shelter, water and sanitation ■ Engagement and empowerment of youth through the full implementation of the African Youth Charter ■ Youth issues mainstreamed in all development agendas. ■ Africa's youth shall be the driving force behind the continent's political, social, cultural and economic transformation.
CAADP	Not mentioned	Not mentioned	Not mentioned
Malabo Declaration	Not mentioned	Not mentioned	<ul style="list-style-type: none"> ■ To create job opportunities for at least 30% of the youth in agricultural value chains ■ To support and facilitate preferential entry and participation for women and youth in gainful and attractive agri-business opportunities.
SADC Regional Agricultural Policy	youth is poor, rural, has poor access to economic activities, education, land and capital.	Participation for most of the rural youth in farming is based on circumstances and limited economic opportunities	<ul style="list-style-type: none"> ■ Promoting land policy research and development considering gender, youth and vulnerable groups ■ Facilitate Member States in promoting agriculture as an attractive career choice for the youth ■ Facilitating the participation of informal traders, SMEs and marginalised groups such as women and youth. ■ Mainstream youth needs in regional and national policies and strategies dealing with access to land, farm support systems and services and rural finance.

(“Table 1,” Geza et al., 2021)

Table 3: SBAE-Related Aspirations & Goals within Agenda 2063

Aspiration	Related Goals
<p><u>Aspiration 1:</u> A Prosperous Africa, based on Inclusive Growth and Sustainable Development</p>	<ul style="list-style-type: none"> ● <u>Goal 1:</u> A High Standard of Living, Quality of Life and Well Being for All Citizens ● <u>Goal 2:</u> Well Educated Citizens and Skills revolution underpinned by Science, Technology and Innovation ● <u>Goal 3:</u> Healthy and well-nourished citizens ● <u>Goal 4:</u> Transformed Economies ● <u>Goal 5:</u> Modern Agriculture for increased productivity and production
<p><u>Aspiration 3:</u> An Africa of Good Governance, Democracy, Respect for Human Rights, Justice and the Rule of Law</p>	<ul style="list-style-type: none"> ● <u>Goal 12:</u> Capable institutions and transformative leadership in place [with a focus on] <ul style="list-style-type: none"> ○ Institutions and Leadership, and ○ Participatory Development
<p><u>Aspiration 4:</u> A Peaceful and Secure Africa</p>	<ul style="list-style-type: none"> ● <u>Goal 13:</u> Peace Security and Stability is preserved ● <u>Goal 14:</u> A Stable and Peaceful Africa
<p><u>Aspiration 6:</u> An Africa Whose Development is people driven, relying on the potential offered by African People, especially its Women and Youth, and caring for Children</p>	<ul style="list-style-type: none"> ● <u>Goal 17:</u> Full Gender Equality in All Spheres of Life ● <u>Goal 18:</u> Engaged and Empowered Youth and Children

**transcribed from the African Youth Charter's "Goals & Priority Areas," available at <https://au.int/agenda2063/goals>*

(African Union, 2015)

Conclusion

SBAE is a comprehensive, cost-effective, scalable, and transformative intervention strengthened by pluralism and aligned with regional priorities that contributes to the development of vocational and life skills through experiential learning and improves rural livelihoods by diffusing innovation through youth as early adopters. Truly comprehensive and collaborative, SBAE engages adults and youth alike by working with extension agents, parents, teachers, and practitioners alike to build the capacities of local youth that emphasize hard and soft skills applicable to school, business, community, and life.

Through pluralistic partnerships, design, and implementation, SBAE offers opportunities for public sector oversight and leadership along with private sector development and support through training and technical assistance. It also leverages existing youth networks to provide leadership opportunities and network development and knowledge sharing. Its participatory nature involves youth as decision makers and positions them as influencers in coordination with other local leaders, such as their agriculture teacher, 4-H advisor, and other youth and farmers. By leveraging existing extension, education, and youth networks, it also reduces costs. Funding can invest more in teacher training, local projects, and curriculum development. The number of partners involved also allows for sharing resources and pooling funding if implemented strategically.

The SBAE model is grounded in research and theories that provide structure but allow for contextualization, making it scalable, while emphasizing transformative change through diffusion of innovation and positive youth development. SBAE can focus on youths' needs, interests, and aspirations while delivering scientific, evidence-based solutions that increase productivity and income generation. Meanwhile, climate-sensitive and climate-smart innovations can lead to

improved environmental and ecological resilience. SBAE can also develop skills and capacity for immediate action that set youth up for long-term goals. It creates space for girls to participate in agriculture and gain leadership skills and experiences, and it positions and equips youth to be decision-makers and entrepreneurs. All of these developments result in improved food security, local livelihoods, and youth employment through increased income generation and economic opportunity resulting from higher agricultural productivity and school attendance rates, in turn leading to more peaceful and prosperous communities and a more stable region.

III. SBAE in Action:

A Brief Overview of SBAE in Liberia, Ghana, and Uganda

While the concept of SBAE has been around colloquially since the late 1800s, it has begun to gain momentum in sub-Saharan Africa due to the ballooning economic, environmental, and societal needs. The vision of SBAE across Africa is "to support food security, economic development and trade, and agricultural transformation through empowered and motivated school-aged youth" (Elliott et al., 2022, 2:54-3:23). Currently in sub-Saharan Africa, 16 countries have adopted various forms of SBAE in an effort to meet emerging food security and youth employment needs (*4-H Partnerships in Africa*, n.d.; WSU Extension, 2015). Since 2014, three countries in sub-Saharan Africa have adopted this specific model of SBAE: Liberia, Ghana, and Uganda.

While the core tenets of SBAE prioritizing participatory, youth-centered approaches to development through experiential learning are universal, the actual implementation and adaptation of SBAE can and should be contextual. This section looks more closely at how SBAE in general has evolved and how the SBAE model expanded by AgriCorps has been adopted and adapted based on its context. Using Liberia, Ghana, and Uganda as case studies, this section seeks to determine what kind of enabling environment is required for successful adoption of SBAE as an intervention and offers insights for future adopters.

The Evolution of SBAE

Institutionalizing Experiential Learning in Agricultural Education. The foundations of modern-day SBAE originated in the United States in the early 1900s with Professor Rufus Stimson, a Harvard-educated philosopher-turned-president of land grant Connecticut Agricultural College, present-day University of Connecticut. In this role, he sought to diffuse research coming

from the university to local farmers by engaging students through the public school system. An advocate for “learning and earning,” Stimson pioneered at-home student projects that emphasized the need for trained practitioners and local partnerships with schools as vehicles for delivering this knowledge (Elliott et al., 2022; McKnight, 2021a).

Stimson’s experimental model was significant for several reasons. First, it revealed a new way to gain buy-in of local farmers by using students as early adopters and the university extension system’s role in it. Second, it emphasized the importance and potential of experiential learning and applying knowledge to issues relevant to students and their families. Third, it introduced the scalable model of “learning and earning,” placing productive value on the outputs of students’ learning (McKnight, 2021a; Stimson, 1919). Collectively, these cemented the importance of agency and self-direction in engaged learning projects and inspired others to integrate this practice into their extension practices as well.

Eventually, the U.S. formally scaled the concept of home projects in the Smith-Hughes National Vocational Education Act of 1917, which required agriculture teachers to supervise these types of student-led projects. Scaling out to other land grant universities at the time created momentum that led to a new movement of youth in agriculture which came to be known as Future Farmers of America (FFA), a youth-centered leadership development organization still thriving in the U.S. today (McKnight, 2021a).

One reason scaling effectively catalyzed the FFA movement was because youth interest in agriculture already existed at the grassroots level and had been mobilizing organically since 1902. The Smith-Lever Act of 1914, which institutionalized the cooperative extension system within land grant universities, allocated special funds for youth programming which often took the form of “Farmer Institutes” and set the foundations for the evolution into 4-H (*4-H Programs at a*

Glance, n.d.; Wyoming 4-H, n.d.; Wessel and Wessel, 1982). Simultaneous to the policy movement toward SBAE were grassroots organizations like “corn growing clubs” and “canning clubs.” Corn clubs were advised by local extension agents and were originally geared toward boys and increasing productivity, with a focus on diffusing innovations from experimentation stations to local farmers (*4-H History*, n.d.; National 4-H History Preservation Program, n.d.; Uricchio et al., 2013). Canning, or tomato clubs, on the other hand were geared towards girls and focused on food preservation and home economics. Eventually, these clubs combined to become the building blocks of present-day 4-H, a national youth development organization funded by the national Cooperative Extension System and the U.S. Department of Agriculture (USDA) which stands for “Head, Heart, Hands, and Health” (*4-H Pledge*, n.d.).

Written under the auspices of USDA’s Cooperative Extension System, 4-H became a scalable and sustainable institution for youth across the country. Today, 4-H still promotes and engages young people in “informal, practical, learning-by-doing” education geared at helping them “acquire knowledge, develop life skills, and form attitudes that will enable them to become self-directing, productive members of society” (Wyoming 4-H, n.d.). According to the National 4-H Council, 4-H has become the largest out-of-school program for school-aged children and youth, with opportunities for children and youth 5 to 18 years of age in every state and county in the country. Partnering with the public universities, community volunteers, and local professionals, 4-H programs continue to provide “hands-on projects in areas like science, health, agriculture and civic engagement, in a positive environment where they receive guidance from adult mentors and are encouraged to take on proactive leadership roles” through in-school and after-school programs, including clubs, camps, and conferences both in-person and online (*4-H Programs at a Glance*, n.d.).

The Expansion of 4-H into Africa. The 4-H model has since been adopted and adapted around the world, first being seen in Africa through the Young Farmers of Kenya in 1949 and Ethiopia 4-T in 1956. In 2011, the National 4-H Council hosted the First International 4-H Executive Conference, which sought to create a consortium of international partners to stimulate renewed collaboration for the development of youth education programs to tackle global issues of food security. Of the nine founding country organizations involved in this initiative, representing regions around the world, two came from Africa: 4-H Tanzania and 4-H Ghana (National 4-H History Preservation Program, n.d.), demonstrating the growth and significance of 4-H in Africa in that time frame.

Today, at least 16 countries in Africa have some version of youth development organization specifically modeled after 4-H in the U.S. (*4-H Partnerships in Africa*, n.d.; WSU Extension, 2015). The concept of more formalized, country-led 4-H programs affiliated with the 4-H Global Network and National 4-H Council started in Cameroon in 2005 (Victorson, 2012) and has since spread. Currently, the following host independent, country-led 4-H organizations: Cameroon, Gambia, Ghana, Ethiopia, Kenya, Liberia, Malawi, Namibia, Nigeria, Senegal, South Africa, Tanzania, Tunisia, Uganda, and Zambia (*4-H Partnerships in Africa*, n.d.), while Burundi hosts several localized 4-H programs at the school level through a partnership with Washington State University Extension (WSU Extension, 2015). Country programs in Tanzania, Ghana, and Kenya have established themselves as Hubs of Excellence, with added resource and capacity building taking place through their programs (Victorson, 2013).

Other forms of youth development and agricultural education organizations have adopted 4-H in Africa as well, including through 4-K clubs, which are geared toward primary students. As Janis Brinn (2020) explains, 4-K clubs originated in Kenya, with the four K's standing for the

following guiding principles in Swahili: “Kenya, Kuungana (to unite), Kufanya (to do) and Kusaidia (to help).” Since its inception, 4-K clubs have spread and are now present in 13 countries across Africa: Cameroon, Ethiopia, Gambia, Ghana, Kenya, Liberia, Namibia, Nigeria, Tanzania, Tunisia, Uganda, South Africa, and Zambia (Brinn, 2020). These clubs are geared at younger children, who can choose to continue with Young Farmers organizations as they get older (Brinn, 2013).

Scaling SBAE in Sub-Saharan Africa

Programming to strengthen the delivery of these programs first kickstarted in Botswana in 1967 with the Youth Development Program (YDP), which was partially funded by the present-day National 4-H Council to build global partnerships and support for the adoption and implementation of SBAE. The YDP sought to meet demands for long-term capacity building by assigning agriculture professionals from the U.S. to work with country staff for 18 months to help with training, recruiting, development of curriculum and other education materials, and assessment (National 4-H History Preservation Program, n.d.). Over the decades, a number of partnerships have sought to deliver similar support, albeit through different methods of delivery. 4-H partnerships and programming in Senegal, Burundi, and Liberia demonstrate some of the most recent and varying methods of strengthening capacity and delivery for SBAE.

In Senegal, USAID’s Education and Research in Agriculture project teamed up with Virginia Tech to establish a 4-H program as part of its Feed the Future strategy, piloting the first three clubs in 2015 (USAID, 2015). The project, which promotes 4-H through extracurricular activities for primary and secondary students, has since grown to 30 clubs, engaging more than 500 youth and 100 adult leaders (Guisse, 2015; Virginia Tech, 2018). The project partnered with Peace Corps Senegal to connect local adult volunteer leaders with Peace Corps volunteers to help

facilitate 4-H clubs after school (USAID, 2015; Guisse, 2015). This pilot program laid the foundations for the Feed the Future Senegal: Youth in Agriculture project, which was initiated in 2018 and seeks to strengthen, scale, and institutionalize the current 4-H program and prepare it to become a national, self-sustaining program for positive youth development and economic empowerment (Virginia Tech, 2018).

Around the same time, another method was deployed by Washing State University (WSU) Extension in Burundi. Through its sister schools program, WSU Extension partnered with THARS, a Burundian organization standing for Trauma Healing and Reconciliation Services, to identify nine local schools and begin building garden-specific 4-H programs with them (WSU Extension, 2015; WSU Extension, n.d.). In this model, THARS and WSU 4-H work to train teachers on positive youth development and plant sciences to create school gardens in elementary schools (THARS, 2019). This method differs in that the local partner is providing most of the hands-on training and support for each sister school, while WSU Extension provides support for training of trainers with THARS, as well as tools and seeds for gardening and the science curriculum to be used at each school (WSU Extension, 2015). The other main differences are its focus on primary students and its scope, which strictly focuses on school gardens as an entry point to cultivating excitement for learning as a long-term pathway to peace and reconciliation.

Also around this time, AgriCorps was seeking a solution that stretched beyond school gardens to meet food security needs. It partnered with the existing 4-H program in Liberia to develop and test its own extended model for SBAE (for more, see “II: The Case for School-Based Agricultural Education) (AgriCorps, 2022c). This evolved into one of the first concentrated efforts to bring an integrated agricultural curriculum into government-run schools that focused specifically on post-primary students and embodied the 4-H agricultural education model in school

while still providing extracurricular activities for positive youth development through 4-H programming outside of school.

Adapting curriculum materials from Peace Corps Liberia, AgriCorps also borrowed the Peace Corps model of placing agricultural education volunteers from the U.S. for year-long terms at local schools to work alongside youth and agriculture and science teachers to support implementation of the curriculum and facilitate at-home entrepreneurship projects outside of school (A. Peterson, personal communications, July 2, 2022; AgriCorps, 2022d). This model and the delivery method for it has gained traction and momentum in the past few years and has since been adapted and implemented in Liberia, Ghana, and Uganda.

The International Agricultural Education Fellowship Program. The volunteer placement fellowship first utilized to pilot the AgriCorps model of SBAE inspired the formal International Agricultural Education Fellowship Program (IAEFP) in 2018, which is now being implemented in Ghana and Uganda by other partners. The fellowship program places college-educated, early-career professionals in agriculture and related fields with partner schools in developing countries to teach classes, advise 4-H clubs, and support local extension partners with the implementation of SBAE. Thus far, cohorts have ranged from 2-10 fellows each school year (AgriCorps, 2022d; CRS, 2022).

The fellowship program was originally funded and implemented through AgriCorps directly under the Corps Fellows program (AgriCorps, 2022b); however, in 2016 a U.S. congressional delegation traveled to Ghana, where they witnessed a 4-H event that involved students from schools working with fellows to implement SBAE. The experience set into motion new partnerships among the USDA, AgriCorps, and the Norman E. Borlaug Institute for International Agriculture and Development at Texas A&M University to further invest in this

model of SBAE. These new partnerships resulted in formally integrating the fellowship program into the 2018 Farm Bill as the newly renamed IAEFP (Elliott et al., 2022; Helmer, 2021). The program now receives funding through the USDA's Foreign Agricultural Service (FAS), an overview of which can be seen in Table 4 (FAS, 2022a).

Now, different implementation organizations can compete for this grant each year. In 2020, the first year the funding was available, Texas A&M's Borlaug Institute and Catholic Relief Services (CRS) each received \$500,000 awards to implement SBAE through the IAEFP in Ghana and Uganda respectively for the following school years (FAS, 2022b). The Borlaug Institute officially took over the program from AgriCorps in 2020, sending nine fellows to Ghana to serve in junior and senior high school classrooms (Elliott et al., 2022), while CRS experienced delays due to the COVID-19 pandemic and country situation in Uganda, welcoming its first cohort of fellows in 2022 (P. Subba, personal communication, Oct 27, 2021.)

The incorporation of the IAEFP into law solidifies SBAE and global partnerships to promote youth development through agriculture as a priority for the U.S., complimenting regional priorities in places like sub-Saharan Africa. It also institutionalizes the role of third-party actors in implementing these types of interventions at scale. Not only does it embed pluralism into the implementation process, but it also opens the door for future investments and redirecting efforts into long-term development goals as opposed to short-term emergency relief. Scaling SBAE has involved a variety of partners and evolved slightly differently in Liberia, Ghana, and Uganda, though after closer inspection, certain similarities emerge.

Table 4: The International Agricultural Education Fellowship Program (IAEFP)

Program Overview
<p>Established in 2018, the International Agricultural Education Fellowship Program provides fellowships to eligible U.S. citizens to assist developing countries in establishing school-based agricultural education and youth extension programs.</p> <p>The program aims to:</p> <ul style="list-style-type: none">● Develop globally minded United States agriculturists with experience living abroad;● Help meet the food and fiber needs of the domestic population of eligible countries; and● Strengthen and enhance trade linkages between eligible countries and the United States agricultural industry. <p>Candidates must hold a minimum of a bachelor’s degree in an agriculture-related field and must understand U.S. school-based agricultural education and youth extension programs.</p>

**transcribed from the USDA’s Foreign Agricultural Service at <https://fas.usda.gov/programs/international-agricultural-education-fellowship-program>*

(FAS, 2022a)

In-Focus: Liberia. Following more than a decade of civil war, 4-H Liberia re-established itself in 2006 as a nonprofit organization, operating mostly on a volunteer basis (Brinn & Sheriff, 2018). Umaru Sheriff, the National Executive Director of 4-H Liberia, was a university student studying accounting and searching for viable models to engage young people in development when he and some friends came across a site about 4-H in the U.S. and began the process of getting a branch going in Liberia. Starting with three school clubs, the program expanded to more than 80 clubs and 4,000 members in just under 10 years, reaching 6 of Liberia’s 15 counties (Corteva Agriscience, 2018). By emphasizing gender equality, entrepreneurship skills, and leadership development through club activities and school gardens, efforts focus on developing youth potential as well as rebranding agriculture as both a business and a career. The organization

currently partners with the Ministry of Food and Agriculture and Ministry of Education, who have formed a Joint Department Program with representatives from each ministry to oversee agricultural education (MOE, 2010), as well as a number of other nongovernmental organizations (AgriCorps, 2022c).

In 2014, Trent McKnight started AgriCorps, a nonprofit organization linking young American agricultural education volunteers with schools in Liberia to promote youth development through agriculture. AgriCorps piloted its approach in Liberia first, sending volunteers to local schools for a few to several months at a time during this period. Volunteers, who were part of the Corps Fellows program, served during a term of the school year, lived in the communities in which they serve, and provided classroom instruction, youth mentorship, and advisory or extension services for the local 4-H club (AgriCorps, 2022a). Following successful pilot placements, the program formally partnered with 4-H Liberia and expanded to welcome its first full cohorts of fellows the following year (AgriCorps, 2022c).

A number of activities fit into the AgriCorps model of SBAE. In addition to the in-school curriculum and school demonstration farms, students also participated in Leadership, Education, Agriculture, and Development (LEAD) workshops, and the National 4-H Liberia Youth Agriculture Fair (McCabe, 2021; Brinn & Sheriff, 2018). Activities have encompassed everything from plant reproduction and alternative irrigation to pest-resistant hybrid seeds and leadership development skills like goal setting and public speaking (McCabe, 2021; AgriCorps, 2015). The “learning and earning” model has spurred income generation and decision making by youth, which they have reallocated for tuition fees, building repairs at the schools, and even community-wide festivities (Elliott et al., 2022; McKnight, 2021).

In 2020, the organization made a strategic pivot to pause the fellowship program and focus its energy and resources on research and development. Partnering with Northwestern University's Global Poverty Research Lab and Innovations for Poverty Action, AgriCorps is helping coordinate a three-year randomized-controlled trial in 200 schools across Liberia. The venture seeks to build evidence and insights on the impacts of SBAE on youth, adults, and the communities in which they live (A. Peterson, personal communications, July 2, 2022; Elliott et al., 2022; Helmer, 2021; AgriCorps, 2020; FID, n.d.). These findings will help inform decisions moving forward and offer insights for other countries seeking to implement similar programs.

In the meantime, AgriCorps still partners with 4-H Liberia, who continues to oversee the implementation of SBAE in schools across the country. The National 4-H Liberia Youth Agriculture Fair, first initiated in 2017, also continues to serve as a gathering point for youth, partners, and innovation alike (Brinn & Sheriff, 2018). Trainings for educators, youth, and extension agents also continue and have focused most recently on techniques for planting roots and tubers, particularly cassava, with funding support from USAID and CRS (AgriCorps, 2022e).

In-Focus: Ghana. 4-H Ghana started in 2000 and has around 200 clubs across five of the country's 16 regions: Northern, Eastern, Volta, Greater Accra, and Ashanti (AgriCorps, 2022c; 4-H Ghana, 2015). 4-H Ghana reported a reach of more than 48,000 youth through its efforts from 2000 to 2015, with children and youth between the ages of 10 and 25 participating in school or community 4-H Clubs with a focus on school demonstration farms as methods for fostering entrepreneurship and gender equality (4-H Ghana, 2015). 4-H Ghana has worked with AgriCorps since 2014 and the Borlaug Institute since 2020 to place fellows in schools with clubs to teach agricultural science classes and to demonstrate teaching methods using positive youth development and student-centered learning approaches. It also partners with Peace Corps Ghana

to integrate 4-H activities into community development projects or to help run local clubs (4-H Ghana, 2015).

Structurally, the Ghana Education Service (GES), an agency under the auspices of the Ministry of Education, and the Ministry of Food and Agriculture (MOFA) oversee the 4-H program's activities at a national level across the five regions, while district boards within each region consisting of GES, MOFA, and other community representatives oversee club activities within the district and report up to 4-H Ghana Headquarters. Each community or school club consists of children or youth aged 8 to 20 years old from the local junior or senior high school, tertiary school, or community with an adult advisor, who is usually a teacher at the school or an invested community member—or in some cases a Peace Corps Volunteer. Each club's activities are overseen by a local management board that consists of the advisor, a head teacher, a member of the Parent-Teacher Association, a leading farmer, and any other interested or important community members (4-H Ghana, 2015, p. 8). The oversight structure seeks to involve a number of local, regional, and national stakeholders to ensure collaboration for multi-disciplinary projects inherent in the SBAE model, such as the school demonstration farms. The school farms are a huge component of the Ghana SBAE landscape and require land allocation, market access, and business development, as well as reinvestment of earnings back into the farm and school.

In Ghana, the 4-H system operates as a marketing cooperative which aligns with literature identifying the need not only to increase production but also to create market opportunities for the increased supply (AgriCorps, 2022c). The income generation resulting from these mechanisms has positively benefited schools and communities in a number of ways. One way schools have used earnings in Ghana has been through tuition coverage for a certain number of students (Elliott et al., 2022; Spence, personal communication, October 22, 2021; McKnight, 2021). Covering the

annual school fees allows students to continue their education uninterrupted, as many drop out temporarily or permanently to work and earn money in order to save enough to pay for tuition and return later (A. Peterson, personal communication, July 2, 2022).

Another unique application of earnings generated from the school farms in Ghana has been to fund school feeding programs. In 2015, six schools with 4-H had school feeding programs; some used produce from the school garden or farm, while others relied on the income generated to subsidize the program. Oftentimes, parents or teachers volunteered to help prepare food, such as boiling cassava. Schools with feeding programs resulting from SBAE programming showed increased enrollment and improved attendance (4-H Ghana, 2015). This use of income perfectly demonstrates Lerner et al.'s (2013) findings tied to 4-H involvement and positively contributing to the community.

One current endeavor of SBAE in Ghana is to improve coordination with university research and extension programs (4-H Ghana, 2015). Linking those programs with the secondary school programming could do more than fill a gap in extension services. It could open opportunities for career exploration, cross-cultural learning experiences, research-centered monitoring and assessment, and impact evaluations that could strengthen outreach and programming. Increased partnerships could also create new funding opportunities for independent experimentation by supporting student projects. By closing the distance between youth, teachers, extension agents, and researchers, youth and teachers involved in SBAE can get closer to the innovation and perhaps participate more in the development side of innovation or experimentation side as opposed to focusing only on diffusion.

In-Focus: Uganda. With an exceptionally high youth population and school dropout rates, Uganda's education system was struggling to equip students with the practical skills and

experiences needed to secure viable livelihoods should the system of prohibitive school fees and high-stakes exams fail them. From these concerns arose the self-prescribed “coalition of the willing,” a group of teachers and parents determined to bridge the connection between agriculture, education, and livelihoods who organized the very first School Farm Camp at Gayaza High School in 2014 (Kibirige & Crutchfield, 2022, p. 10). The camp invited leaders in agricultural science and extension to give demonstrations and guided practice in everything from animal husbandry to plant propagation and intensive gardening. The camp was so successful that it has become an annual event and expanded to include business and marketing strategies, as well as teacher training on how to integrate agriculture into more than just science, like writing and math (Kibirige & Crutchfield, 2022).

Not long after the first farm camp, George Ntibarikure, a founding member of the coalition, traveled to the U.S. to participate in the Farmers-to-Farmers (F2F) program through CRS. He had hoped to gain insights on how to expand their programming and increase peer-to-peer learning opportunities. Through F2F he worked with former 4-H and FFA alumni and employees and learned more about systematic approaches to SBAE and youth development organizations. This experience later resulted in the creation of Uganda’s first Young Farmers Clubs in primary and secondary schools. By 2016, leaders of the coalition and Ntibarikure were working to adapt the U.S. SBAE model in Uganda’s schools and integrate agriculture into all levels of school curriculum; in addition, they sought to bridge in-school content with the annual farm camp and local Young Farmers Clubs to provide out-of-school experiential learning and leadership development opportunities (Kibirige & Crutchfield, 2022, p. 10-11).

Many local clubs have since rebranded into Youth Future Farmers of Africa (YoFFA) and seek to engage the SBAE model in and out of school with an added component of community

service. YoFFA chapters are typically overseen by a team, similar to the club management boards implemented in the 4-H Ghana structure, but these tend to be a bit smaller in size, including the school's administrator, a key teacher, and an agricultural teacher when possible (Kibirige & Crutchfield, 2022). The momentum created by the first School Farm Camp also spurred the creation of a larger coalition, the Young Farmers Federation of Uganda (UNYFA), whose members consist of YoFFA chapters as well as other young farmers groups and school clubs at the district and local levels. Before the COVID-19 pandemic, UNYFA's membership totaled 24,000 individuals aged 12-39 (UNYFA, 2020).

Another unique component of the developing SBAE environment in Uganda is its professional development network for teachers involved, the Teachers and Educators for Future Farmers of Africa (TEFFA), which was formed in 2018. This formalized peer group evolved from observations and recommendations made by a National FFA delegation from the U.S. who visited in 2016. Now, each year at the annual School Farm Camp and another agribusiness camp sponsored by a local university, TEFFA elected leaders and board members offer parallel sessions for agriculture teachers and club advisors (Kibirige & Crutchfield, 2022, p. 12). This is an effective addition to the SBAE ecosystem as it provides connection to peer support and educational and financial resources; however, it is also professionalizing the role of agricultural educators to their non-agricultural peers and government officials. While SBAE can create more positive perceptions of agriculture as a business and career path for youth, TEFFA activities can create more positive associations with agricultural education as a career path for young professionals and adults.

In 2018, the government grew more involved and undertook efforts to institutionalize SBAE, partnering with external nongovernmental actors to operationalize a more standard SBAE curriculum for Uganda. To develop the national agricultural curriculum, the Ministry of Education

and Sports contracted Vivayic, Inc., a consulting, strategy, and design firm specializing in creating learning tools and materials. Vivayic had previously been contracted by AgriCorps and 4-H Ghana to develop their teacher training manuals (which were later referenced in Burundi sister schools as well). It was currently partnering with Field of Hope to support teacher training development and create a curriculum guide for them which promoted project-based learning and student-centered teaching strategies (T. Redwine, personal communication, Nov 12, 2021).

Field of Hope is a Christian nonprofit organization that has worked in agricultural education and extension in Uganda since 2010 (Field of Hope, 2020). Its work encompasses youth agricultural education, smallholder farmer advancement, and leadership development and closely mirrors the SBAE model being implemented in Liberia and Ghana. Field of Hope also subsidizes a fellowship program which places up to nine university-level volunteer fellows in schools for 10- to 12-weeks at a time to help facilitate and implement SBAE through instruction, demonstration farms, and extension. One unique feature of Field of Hope's SBAE support is its Inspiring Students in Agriculture fund, which is a grant providing additional support for the adaptation and expansion of SBAE through school gardens, student entrepreneurship projects, field trips, and teacher training based on local interest and need (Field of Hope, 2022). Field of Hope also assisted TEFFA during the onset of the COVID-19 pandemic by making professional development opportunities and teacher training available through distance learning platforms and connecting TEFFA members to educators from all over the world (Kibirige & Crutchfield, 2022).

The government rolled out its new curriculum in 2020, targeting senior high school students by carving out opportunities to take agriculture as an elective. The new curriculum aligns with the SBAE model of incorporating classroom instruction, supervised experiential learning, and leadership development, and it also provides students with the opportunity to earn internationally

recognized certifications upon completion (T. Redwine, personal communication, Nov 12, 2021; Kibirige & Crutchfield, 2022). Catholic Relief Services is currently supporting implementation of the new secondary curriculum through the USDA-funded IAEFP, working closely with Field of Hope in Uganda and the Borlaug Institute as it implements the program in Ghana (CRS, 2022; P. Subba, personal communication, Oct 27, 2021).

Summary of Scaling SBAE. Each country's journey adopting and adapting SBAE in government schools at the post-primary level highlights key similarities and a few key differences. They each emphasize the importance of youth being involved in the decision-making process for how to spend earned income from SBAE-related activities such as the school demonstration farm and the diversity of applying those funds. Whether youth are reinvesting in the productivity of the school farm and accessing additional markets, or they are using the funds to support scholarship funds to provide tuition waivers for classmates or supporting school feeding programs that benefit all students, youth are demonstrating how their income and decisions can positively impact and benefit their communities.

The adoption and adaptation of SBAE in these three countries also highlights the importance of collaboration between ministries of agriculture and education and the role of local and international organizations. Local leaders are important in paving pathways for new ways to organize, professionally or educationally. External actors such as nongovernmental organizations also prove important for implementing SBAE through capacity building through training or resource development and knowledge sharing through cultural and professional exchange programs. Similarly, private actors can play key roles in supporting funding youth development organizations like 4-H and their activities, while public and private research institutions can be pivotal partners in extension services.

The implementation of SBAE in Uganda provides some new adaptations that could prove useful in other contexts as well, namely the fund managed by Field of Hope to support locally led innovation and investments through entrepreneurship and education. The other notable takeaway from Uganda is the creation of a professional development network for agricultural education professionals involved in SBAE. Each of these elements target different yet important parts of what makes SBAE successful at scale and could help connect ideas, people, and resources in the future.

Predictive Indicators for Successful Adoption of SBAE

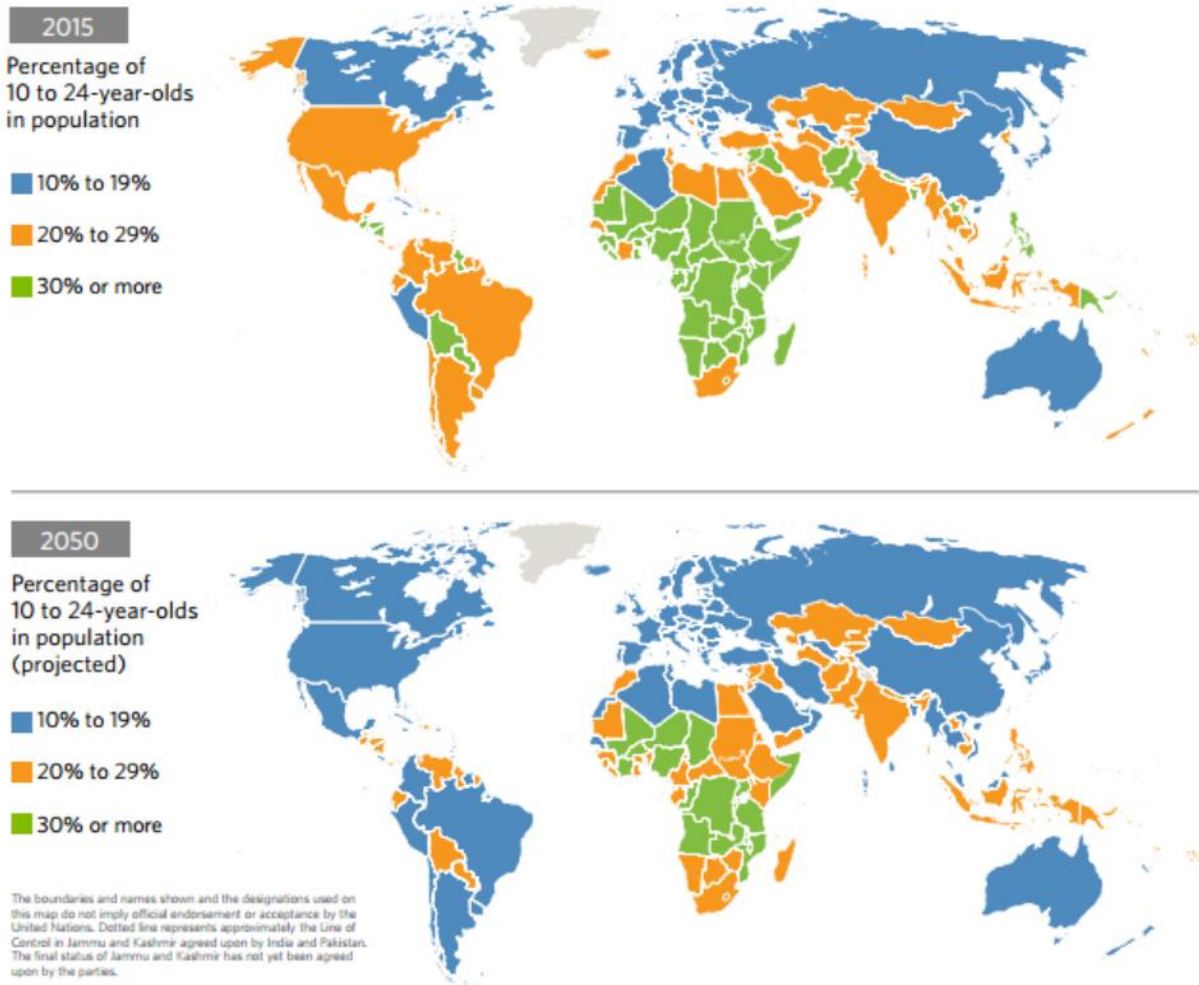
Indicators. While the cases of Liberia, Ghana, and Uganda will continue to offer insights on implementation strategies, they also offer collective insight for other countries considering adopting and adapting SBAE as an intervention to meet emerging food security and economic needs. The following indicators have been informed by the literature discussed above and recurring characteristics apparent in each of the implementation countries thus far. These indicators include (i) the projected percentage of youth in a country's overall population paired with prevalence of food insecurity, (ii) a nation's rate of off-farm employment, and (iii) the existence and extent of youth farmer organizations or clubs. While future work could involve creating a codex or matrix from these indicators to pinpoint the probability of success of SBAE in a specific context, this section simply proposes these indicators as predictors of success as leaders consider SBAE for their country.

The first key predictive indicator, *projected percentage of youth in overall population*, determines whether a country is experiencing a youth bulge and to what extent. The challenge of unemployed and underemployed youth, which is common in countries with these demographic characteristics, enhances the rationale for SBAE. As an intervention, SBAE can support in

equipping youth with skills for future employment and civic life while also contributing to processes of agricultural, economic, and structural transformation. When looking at this indicator, two measurements could be important in establishing an arc of the demographic shift's trajectory: percentage of youth in a country's population in 2015 and the predicted percentage of youth in the population in 2050. These dates align with predicted forecasts of food insecurity and highlight the rate at which youth may be entering the workforce. Seeing the arc may also help policymakers determine which contexts are facing the most urgent need for an intervention of this kind. For example, in 2015 youth between the ages of 10 and 24 accounted for more than 30% of the population in almost every country in sub-Saharan Africa, while in 2050, those trends are expected to shift (Figure 2; UN, 2014). Countries who still have high youth populations will still have need for interventions targeting youth while they are young and building skills and experiences systematically.

To further prioritize which countries in the region experiencing youth bulges could benefit most from this intervention, implementers can consider stacking a second component on this key indicator to account for the *prevalence of food insecurity*. When stacked with the previous the percentage of youth in the overall population, this indicator helps predict which countries should take top priority for policymakers, as well as international donors, other governments, and nongovernmental organizations. Figure 3 overlays countries' prevalence of food insecurity over the percentage of youth in the population (Yeboah, 2018). While data in the map was collected in 2015 and 2017, it shows the following countries with the highest rates of food insecurity and youth populations exceeding 50% of the total population: Guinea-Bissau, Sierra Leone, Liberia, Chad, Central African Republic, Ethiopia, Uganda, Rwanda, Tanzania, Zambia, Namibia, Zimbabwe, and Madagascar (Yeboah, 2018, p. 19).

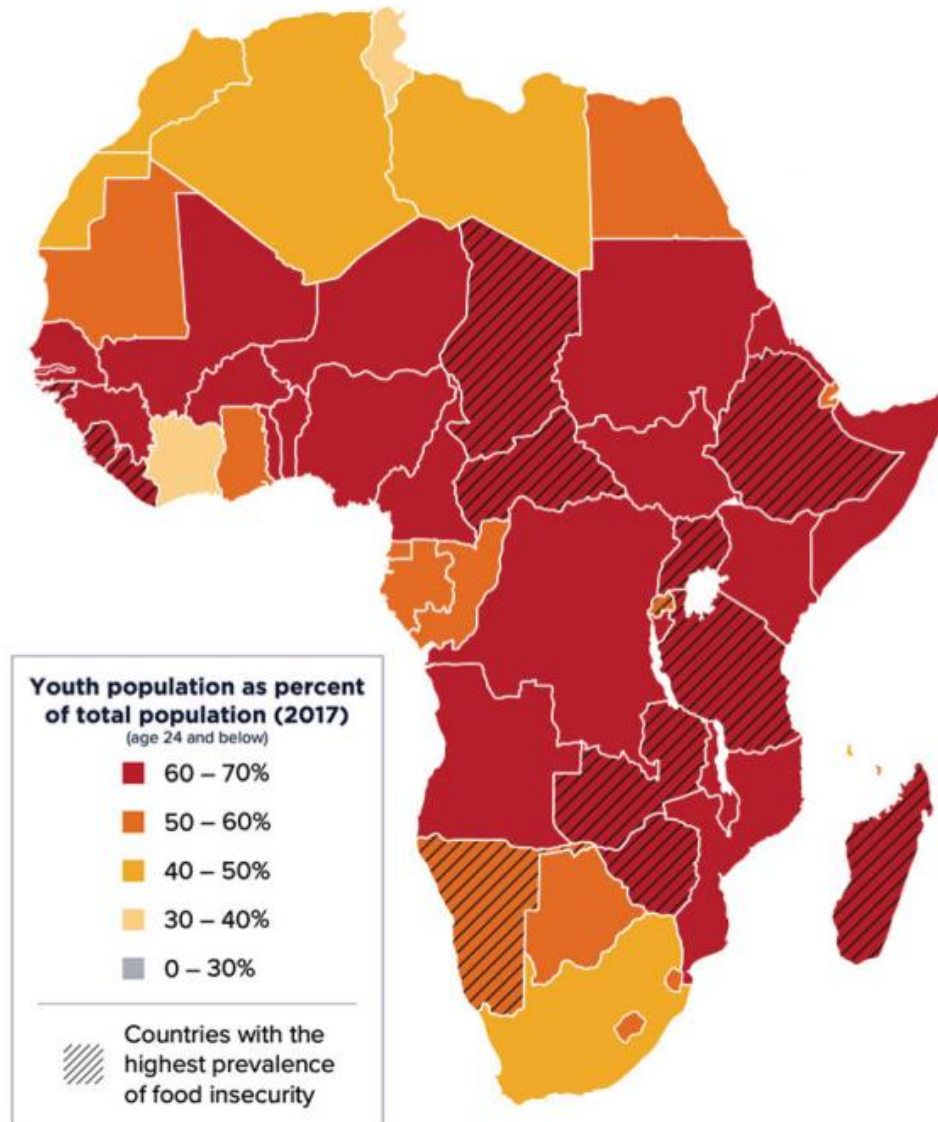
Figure 2: Percentage of Youth in Total Population around the World in 2015



*transcribed from the World Economic Forum at <https://www.weforum.org/agenda/2016/05/the-world-s-10-youngest-countries-are-all-in-africa>

(UN, 2014)

Figure 3: Prevalence of Food Insecurity and Youth Populations in Africa in 2017



**transcribed from the Chicago Council on Global Affairs' annual report at <https://www.thechicagocouncil.org/sites/default/files/2020-11/Youth%20for%20Growth%3B%20Transforming%20Economies%20through%20Agriculture%20PDF%20Report.pdf>*

(Yeboah, 2018, p. 18-19)

The final two indicators include the rate of off-farm employment and strength of existing youth farmer organizations and clubs. *The rate of off-farm employment* is important in depicting the exit rate from farming. If more and more of the population is leaving farming, it would signify growth in agricultural productivity and indicate that the country is moving through the transformation process. If a country has a high youth population and a high prevalence of food insecurity but a high exit rate from farming, that would indicate that many youth are likely beginning to concentrate in urban centers as part of the transformation process and are at a slightly farther point in development compared to other countries. However, if the exit rate from farming is lower, then it would indicate there is a higher need for investing in youth in these rural, agrarian communities to stimulate agricultural and economic growth.

The *strength of existing youth farmer organizations or clubs* can be measured in a few ways. It could be that 4-H exists in that country, such as the cases of Liberia and Ghana, or it could be that a similar youth organization exists to promote agriculture, such as the case of the coalition and then YoFFA in Uganda. The existence of these organizations, and the strength of them, is important for several reasons. These networks are important channels for communicating opportunities, sharing information, building consensus, pooling resources, and developing partnerships for SBAE. They also signify that an effort is being made organically and locally to engage youth, provide experiential learning opportunities, and invest in youth in agriculture specifically and that an intervention such as SBAE would have interested adults in the community, be they school teachers or club advisors, who are positioned to introduce SBAE and expand what they are already doing in a more systematic way. It also represents a population of youth who are positioned to be among the first adopters of SBAE and early adopters in their communities as a result. The strength of the network is equally important, and when weighing this indicator,

countries with independent, country-wide or country-led organizing should be given priority. For instance, if organized in a matrix, Burundi should have a weaker score for this indicator because WSU Extension is coming in and partnering with a non-agriculturally related organization to implement concepts of 4-H in only a few schools; thus, it is not yet an independent, country-led program. A country like Kenya or Tanzania, on the other hand, should score highly in this indicator because each has robust independent, country-led programs that span both children and youth.

Priority Countries. Using this set of predictive indicators⁴ in a rudimentary form, Table 5 highlights which countries in sub-Saharan Africa should receive priority when considering adoption and adaptation of SBAE as a nationwide policy approach. The table accounts for countries who have youth populations exceeding 50% of total population and who are experiencing a high prevalence of food insecurity according to data visualized by Yeboah (2018); it also accounts for the existence of organizations or clubs for youth in agriculture, though that data set may be limited as it came from past statistics from the National 4-H Council's Global 4-H Network. The following countries met every indicator: Ethiopia, Liberia, Namibia, Tanzania, Uganda, Zambia, suggesting that these countries have key factors for an enabling environment and so could benefit most immediately from an intervention like SBAE. Because Liberia and Uganda are currently implementing programs, Ethiopia, Namibia, Tanzania, and Zambia all appear as strong candidates to adopt SBAE next. Further analysis could differentiate more of the nuances between these four countries and what form of SBAE may be most appropriate or effective given their contexts.

⁴ At this time, Table 5 does not include the rate of off-farm employment, though ideally future research could differentiate further among countries using more data to understand and clarify the country's context and needs.

Table 5: Priority Countries for SBAE in Sub-Saharan Africa

Country	Youth Bulge (>50% total population)	Prevalence of Food Insecurity	Existence of Youth Farmer Organizations
Cameroon			X
Central African Republic	X	X	
Chad	X	X	
Ethiopia	X	X	X
Gambia			X
Ghana			X
Guinea-Bissau	X	X	
Kenya			X
Liberia	X	X	X
Madagascar	X	X	
Namibia	X	X	X
Nigeria			X
Rwanda	X	X	
Sierra Leone	X	X	
South Africa			X
Tanzania	X	X	X
Tunisia			X
Uganda	X	X	X
Zambia	X	X	X
Zimbabwe	X	X	

Other enabling factors to consider which would enable adoption and adaptation of SBAE, but which would not be necessary to its success, could include the existence of farmer exchange programs, such as CRS's Farmer-to-Farmer program which kickstarted the expansion and formalization of youth farmer organizations in Uganda. This program proved vital for sharing knowledge and cultivating partnerships and support networks for leaders of the coalition as they sought to formalize and grow their programming, and much of the insights gained and recommendations received from U.S. counterparts who were part of the exchange have resulted in thoughtful and innovative additions to the SBAE environment, setting an example for future adopters.

Another enabling factor to consider is what types of education and training is being done through the Ministry of Education or other nongovernmental organizations in the country and whether those trainings, though parallel to SBAE training, could complement and strengthen the community of learning for educators. For instance, if the ministry is rolling out a new biology or English curriculum that integrates participatory learning and student-centered approaches, then that pedagogy aligns with much of the SBAE model. Having teachers from other disciplines who are buying into the overarching pedagogy of SBAE not only provides a supportive environment for teachers who may be involved in SBAE, but it also provides a supportive environment for students.

While these indicators and enabling factors are important considerations when seeking whether to adopt SBAE as an intervention, they do not constitute a complete or exhaustive list. However, they are critical and offer a simple way of gauging SBAE's fit given a country's demographics and context. Perhaps future work could take these indicators and enabling factors and create a more precise or user-friendly codex, matrix, or formula in which to plug country data

into and determine the predicted success rate of the intervention given the country's information. For now, they offer a simple way to think through the intervention and what must be happening at a country level before SBAE is even introduced to ensure its likelihood for success.

Considerations & Critiques

Another important consideration for incorporating SBAE into existing systems of education and extension is the strength, leadership, and interest of key institutions, especially the Ministry of Education and the Ministry of Food and Agriculture. These institutions can work together to oversee SBAE activities such as through establishing a joint committee or by designating certain agencies as leads and creating ways for them to coordinate and make decisions. The social networks created through the mobilization of youth organizations are integral, but the approval and buy-in of government institutions is critical. SBAE relies not only on the existing public education system but also on the students and teachers who are the heart and soul of the schools themselves; a ministry of education that prioritizes SBAE will communicate the importance of such an intervention to all its teachers, while a ministry of agriculture can provide the program and its participants with connections to extension agents, new innovation and technology, and research and vocational institutions. Both are critical for creating a self-sustaining policy and learning environment where SBAE, and the youth and teachers involved, can thrive.

Two important considerations on the education side of the intervention pertain to pedagogy and curriculum. First, curriculum design and development thus far has been done by external firms, including both private and nonprofit organizations. As a result, policymakers and youth development advocates should prepare to carve out both time and funds in the budget that allow for the curriculum development process. This should include developing the content and materials for teachers, advisors, and students and working with a diverse group of stakeholders to test and

refine it. While it is possible that one day a standard baseline curriculum could be developed to serve as a model for future SBAE adopters, agriculture and the connotations and socioeconomic perceptions of each crop and who grows it can be so region- and country-specific that most countries will likely prefer to develop something tailored fully to their needs, history, and interests, in which case budgeting accordingly will be an important step in the process, as well as setting aside enough time for this step which could be anywhere from one or more years.

The timeline should also consider the roll out of a new curriculum and whether or not the new curriculum would be replacing an existing one or be something entirely new. Because of the extracurricular nature of SBAE's design and the way it has been adopted so far, most countries looking to adopt it would likely opt for a phased roll out, where all participating schools are prepared, trained, and given the curriculum but where the first year or two focuses on a specific grade, such as Grade 9, and then the following year the Grade 10 curriculum would be rolled out and implemented, scaffolding on the previous year. One challenge of this kind of roll out could be attrition; due to a variety of factors, it is not uncommon for students to have gaps in their education where they leave school for a period of time and return (A. Peterson, personal communication, July 2, 2022). However, the experiential nature of SBAE also opens it up to a greater amount of flexibility and personalization, which would help in meeting students where they are at in terms of their interests, experiences, and goals.

Ghana and Liberia have used SBAE and the IAEFP as a way for establishing youth agricultural clubs at schools that do not yet have them, which could be a consideration. However, in other countries, curriculum roll out could target schools with existing youth farmers clubs and an advisor already, regardless of whether the club is affiliated with the school or community, 4-H or other. Club advisors, as well as school science or agricultural teachers, should be included in

training events. In some cases, the club advisor and agricultural or science teacher are one in the same; however, in situations where they are not, it is important for both youth mentors to be trained in positive youth development and student-centered approaches to learning. This may require both ministries partnering to fund SBAE training workshops or securing outside funding or collaborations with civil society organizations, nongovernmental organizations, or private businesses.

The SBAE model and any accompanying curriculum would also likely challenge cultural norms and expectations, so additional time should be considered when training teachers and club advisors. The student-centered approaches that are foundational to the agricultural education model could challenge the more traditional teacher-centered approaches oftentimes used in sub-Saharan Africa. For teachers trained in the traditional ways of teaching, readjusting to a new curriculum based in a different and sometimes opposing pedagogical perspective requires time, practice, and patience. One way to support teachers in this transition is to provide continued resources and support, which is one reason the Peace Corps and IAEFP approaches of pairing teachers with someone who can model and contextualize these approaches can be a helpful strategy. Eventually, once a strong enough dynamic is established, it may be possible for agriculture or science teachers leading the classroom instruction component of SBAE to evolve from a student-centered to a co-inquiry approach, where students are more than the decision-makers; they are the questioners and evaluators as well.

One criticism of the model could be that it is too linear. While Elliott et al. (2022) have expressed that the model is not linear in that activities can happen simultaneously at various stages, the foundations of the diffusion of innovation are linear in nature. The identification and selection process for which innovation gets introduced to extension agents, club advisors, or agriculture

teachers is a top-down process with students implementing a predetermined innovation more than experimenting among a variety of innovations and deciding which to adopt. When discussing this process with former AgriCorps Chief of Party for Liberia, Austin Peterson (2022) explained the process as being generally consultative with Northwestern University and 4-H Liberia and that when making selections, he sought to identify and share innovations that cost-effectively increased yield while simultaneously reducing labor and inputs. This approach is effective for innovations like a drought-resistant seed for a staple crop already being grown for instance. While this is not experimentation for new knowledge creation, it is guided experimentation for experiential learning that allows youth the opportunity to observe and try something new in a safe setting where success is almost guaranteed. This may be the result of the program being new enough that an innovation that does not work or does not demonstrate visibly remarkable results could risk the program's credibility or threaten the local perception of SBAE or the potential of youth participating in it.

However, to make the intervention truly transformative for youth development, eventually youth should be more than diffusers. They could also contribute to the creation of knowledge and truly experiment with a package of possible innovations and then evaluate them to determine which is most appropriate for them and their crop or farm. Just as teachers will require continued support and training to transition from teacher- to student-centered approaches, so too will students need time to adjust to their new roles as decision-makers and entrepreneurs. In that regard, a top-down approach to innovation diffusion is not ideal long-term; however, it is most feasible, actionable, and supportive at this early stage of the program's development. Current efforts could lay a strong foundation for a future of SBAE where youth are engineers, evaluators, and entrepreneurs with the critical thinking skills to apply to any position in any field as their communities, country, and economy grow and change over time.

Conclusion

Sub-Saharan Africa faces increasing pressure to address challenges related to food security and youth employment. SBAE offers a means to expand extension services and spur agricultural productivity through innovation and collaboration to help meet rising food security needs. SBAE also offers an approach to build youths' potential by providing experiential learning and leadership development opportunities that empower youth as decision-makers and entrepreneurs and position youth as confident, caring, and contributing members of their communities. Strong institutions, strong partnerships, and strong teachers are critical to implementing SBAE that transforms communities and systems, and Liberia, Ghana, and Uganda are demonstrating new ways to engage youth through the public education system and build capacity in agriculture and life skills that positively support the youth and their classmates, as well as the school and community.

The way SBAE has evolved and been adopted and adapted over time suggests that it will continue to evolve. However, the steadfast components of experiential learning and positive youth development will continue to ground the approach, while the hard and soft skills youth cultivate through participating in SBAE programming will continue to transcend employment and food production. If investing in agriculture is the key to economic and structural transformation, investing in youth is key to societal transformation. Identifying a country's projected youth population demographics, prevalence of food insecurity, rate of off-farm employment, and strength of existing youth farmer organizations and networks can help policymakers and practitioners consider where to invest first and how. Perhaps Ethiopia, Namibia, Tanzania, or Zambia will be the next country to incorporate youth through SBAE and offer new insights and opportunities for empowering youth, combatting scarcity, and leveraging innovation and technology.

References

4-H Ghana (2015). *4-H Ghana overview* [PowerPoint Presentation]. InnovATE.

<https://innovate.cired.vt.edu/wp-content/uploads/2015/09/3-Boateng-4-H-Ghana-Overview-Ruforum.pdf>

Adekoya, A. F., Ayuba, I. K., & Sokunbi, G. M. (2018). Employment in agriculture and youth unemployment in West Africa. *Institute for Governance and Development*, 5(1597-1740), 122-126. https://www.researchgate.net/profile/Ibrahim-Ayuba-4/publication/334304484_Employment_in_Agriculture_and_Youth_Unemployment_in_the_West_Africa_A_PSCE_approach/links/5d2355ffa6fdcc2462cc4c4a/Employment-in-Agriculture-and-Youth-Unemployment-in-the-West-Africa-A-PSCE-approach.pdf

Africa Development Bank (AfDB) (2016). *Jobs for Youth in Africa: Catalyzing youth opportunity across Africa*. African Development Bank Group.

https://www.afdb.org/fileadmin/uploads/afdb/Images/high_5s/Job_youth_Africa_Job_youth_Africa.pdf

African Union (2006). *The African Youth Charter*. The African Union Commission. Banjul, the Gambia. https://au.int/sites/default/files/treaties/7789-treaty-0033_-_african_youth_charter_e.pdf

African Union (2015). *Agenda 2063: The Africa We Want*. African Union Commission, Ethiopia. https://au.int/sites/default/files/documents/36204-doc-agenda2063_popular_version_en.pdf

African Union (2015). *Goals & Priority Areas for Agenda 2063*. Agenda 2063: The Africa We Want. African Union Commission. <https://au.int/agenda2063/goals>

- AgriCorps (2015). *Asesewa 4-H leadership camp*. <https://agricorps.org/2015/05/asesewa-4-h-leadership-camp/>
- AgriCorps (2020, Sept 16). *Job posting: Chief of Party in Liberia*.
https://agricorps.org/2020/09/job_posting/
- AgriCorps (2021, Aug 20). *Theodora Kumi--School-Based Agricultural Education & Ghana* [Video]. https://www.youtube.com/watch?v=mZRrEX_2zEw&t=9s
- AgriCorps (2022a). *Blog*. <https://agricorps.org/blog/>
- AgriCorps (2022b). *What Corps Fellows Do*. <https://agricorps.org/join/what-do-corps-fellows-do/>
- AgriCorps (2022c). *Where*. <https://agricorps.org/where/>
- AgriCorps (2022d). *Who*. <https://agricorps.org/who/>
- AgriCorps (2022e, May 2). *AgriCorps and 4-H Liberia activity video report 2022* [Video].
<https://www.youtube.com/watch?v=hYu2JH1Feac>
- Allen, A., Howard, J., Kondo, M., Jamison, A., Jayne, T., Snyder, J., Tschirley, D., & Yeboah, K.F. (2016). *Agrifood Youth Employment and Engagement Study*. Michigan State University. 150 pages. East Lansing, Michigan.
https://www.isp.msu.edu/files/4814/7249/7008/AgYees_Report_FINAL_web.pdf
- Assaad, R., & Levison, D. (2013). *Employment for youth: A growing challenge for the global economy*. Working Paper No. 2013-07. Commissioned for the High-Level Panel on Post-2015 UN MDG Development Agenda Employment and Economic Growth. University of Minnesota.
- Ayinde, J.O., Olatunji, S.O., & Ajala, A.O. (2018). *Assessment of rural youth adoption of cassava production technologies in southwestern Nigeria*. *Scientific Papers-Series*

Management Economic Engineering in Agriculture and Rural Development, 18(3), 21-26.

Baah-Boateng, W. (2016). The youth unemployment challenge in Africa: What are the drivers? *The Economic and Labour Relations Review*, 1–19.

BenYishay, A. & Mobarak, A.M. (2018). Social learning and incentives for experimentation and communication. *Review of Economic Studies*, 86(3), 976-1009.

DOI:10.1093/restud/rdy039

Betcherman, G. & Khan, T. (2015). Youth employment in sub-Saharan Africa: Taking stock of the evidence and knowledge gaps. International Development Research Centre. Canada.
<https://idrc.ca/sites/default/files/2021-06/youth%20employment%20in%20sub-saharan%20africa.pdf>

Betcherman, G. & Khan, T. (2018). Jobs for Africa's expanding youth cohort: A stocktaking of employment prospects and policy interventions. *IZA Journal of Development and Migration*, 8(13). <https://doi.org/10.1186/s40176-018-0121-y>.

Brinn, J. & Sheriff, G.U. (2018, June 6). *4-H around the world: Liberia- Part 1*. Michigan State University Extension. <https://www.canr.msu.edu/news/4-h-around-the-world-liberia-part-1>

Brinn, J. (2013, Jan 8). *4H in Africa: Tanzania, Ghana, Kenya, Ethiopia and South Africa*. Michigan State University Extension.
https://www.canr.msu.edu/news/4h_in_africa_tanzania_ghana_kenya_ethiopia_and_south_africa

Brinn, J. (2020, May 15). *4-H around the world: Africa*. Michigan State University Extension: 4-H Global & Cultural Education.

https://www.canr.msu.edu/news/4_h_around_the_world_africa

Catholic Relief Services (CRS) (2022). *CRS Farmer-to-Farmer: International Agricultural Education Fellows Program*. <https://farmertofarmer.crs.org/international-agricultural-education-fellows-program/>

Cletzer, D. A., Rudd, R., Westfall-Rudd, D.M., & Drape, T. (2016). Agricultural education and training in Sub-Saharan Africa: A three-step approach to AET institution building. *International Journal of Education*, 8(2), 73–87.

Corteva Agriscience (2018). *Umaru Sheriff brings agricultural and leadership training to the young Liberians who need it most*. <https://www.corteva.com/who-we-are/outlook/4-h-liberia-teching-change-agriculture-by-training-future-farmers.html>

Davis, K., Luzobe, B., Franzel, S., Rurangwa, R., & Uwitonze, N. (2020, July 10). Including Youth in Agriculture through Extension and Advisory Services. AgriLinks. <https://www.agrilinks.org/post/including-youth-agriculture-through-extension-and-advisory-services>

Dewey, J. (1938). *Experience and Education*. The Kappa Delta Pi Lecture Series. Simon & Schuster, New York. [Experience and Education by John Dewey](#)

Elliott, J., Spence, J., & Dado, M. (2022, May 18). *School-based ag ed (SBAE): A comprehensive transformative food security solution for Africa* [Presentation]. Norman Borlaug Institute for International Agriculture and Development. National AIAEE Conference, Virtual. *Association for International Agricultural and Extension Education*. <https://www.youtube.com/watch?v=doYq2eFrcQ0&t=7s>

FAO, IFAD, UNICEF, WFP, & WHO (2021). The State of Food Security and Nutrition in the World 2021: Transforming food systems for food security, improved nutrition and affordable healthy diets for all. Rome, FAO.

<https://www.fao.org/documents/card/en/c/cb4474en>

Field of Hope (2020, May 11). *Field of Hope: Who we are* [Video].

<https://www.youtube.com/watch?v=7bAcpZ0GWio&t=71s>

Field of Hope (2022). *Youth agricultural education*. <https://www.fieldofhope.org/youth-agricultural-education/>

Folawewo, A. O., & Adeboje, O. M. (2017). Macroeconomic Determinants of Unemployment: Empirical Evidence from Economic Community of West African States. *African Development Review*, 29(2): 197– 210.

Foreign Agricultural Service (FAS) (2022a). *International Agricultural Education Fellowship Program*. U.S. Department of Agriculture (USDA).

<https://fas.usda.gov/programs/international-agricultural-education-fellowship-program>

Foreign Agricultural Service (FAS) (2022b). *IAEFP funding allocations*. USDA.

<https://fas.usda.gov/programs/international-agricultural-education-fellowship-program/iaefp-funding-allocations>

Franzel, S., Lowicki-Zucca, J., Miiro, R., & Uwitonze, N. (2020, June 26). "Demand-driven extension and advisory services – catalysing opportunities for youth in agriculture." *Rural 21. The International Journal for Rural Development*, 54(2), pp. 23-25.

https://www.rural21.com/fileadmin/downloads/2020/en-02/Rural21_2_2020.pdf

Fund for *Innovation* in Development (FID) (n.d.). Building a sustainable system of agricultural extension around schools. FID. <https://fundinnovation.dev/en/projets/building-a-sustainable-system-of-agricultural-extension-around-schools/>

Geza, W., Ngidi, M., Ojo, T., Adetoro, A.A., Slowtow, R., & Mabhaudhi, T. (2021). Youth participation in agriculture: A scoping review. *Sustainability*, 13(16).
<https://doi.org/10.3390/su13169120>

Guisse, B.K. (2015). *Senegal 4-H: Linking university experts with grassroots youth leaders* [PowerPoint Presentation]. Feed the Future Senegal Youth in Agriculture.
<https://innovate.cired.vt.edu/wp-content/uploads/2015/09/1-Guisse-4-H-Senegal-RUFORUM.pdf>

Helmer, J. (2021, Sept 11). *FFA alum takes ag ed abroad*. National FFA Organization.
<https://www.ffa.org/the-feed/ffa-alum-takes-ag-ed-abroad/>

Helmer, J. (2021, Sept 11). *FFA alum takes ag ed abroad*. National FFA Organization.
<https://www.ffa.org/the-feed/ffa-alum-takes-ag-ed-abroad/>

Hoddinott, J., Alderman, H., Behrman, J.R., Haddad, L. & Horton, S. (2013), Economic rationale for stunting reduction. *Matern Child Nutr*, 9: 69-82. <https://doi.org/10.1111/mcn.12080>

Hughis, E. (2018, April 30). *Akwadum 4-H LEAD workshop*. AgriCorps.
<https://agricorps.org/2018/04/akwadum-4-h-lead-workshop/>

IFAD. (2019). *Creating Opportunities for Rural Youth: 2019 Rural Development Report*. Rome: International Fund for Agricultural Development.
https://www.ifad.org/documents/38714170/41190221/RDR2019_Overview_e_W.pdf/699560f2-d02e-16b8-4281-596d4c9be25a

- Kibirige, B. & Crutchfield, N. (2022, Feb). *YoFFA & TEFFA: The duo promoting Uganda's agricultural education*. The Agricultural Education Magazine, 94(4), 10-12.
https://www.naae.org/profdevelopment/magazine/archive_issues/Volume94/2022%2001%20--%20January%20February.pdf#page=23
- Kolb, D.A. (1984) *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice–Hall, Inc. [\(PDF\) Experiential Learning: Experience As The Source Of Learning And Development](#)
- Lerner, R., Lerner, J.V., & Colleagues. (2013). *The Positive Development of Youth: Comprehensive Findings from the 4-H Study of Positive Youth Development*. Tufts University: Institute for Applied Research in Youth Development, Massachusetts.
<https://4-h.org/wp-content/uploads/2016/02/4-H-Study-of-Positive-Youth-Development-Full-Report.pdf>
- Losch, B., Freguin-Gresh, S., & White, E. T. (2012). *Structural transformation and rural change revisited: Challenges for late developing countries in a globalizing world*. Agence Française de Développement and the World Bank: Washington, DC: World Bank Publications. <https://doi.org/10.1596/978-0-8213-9512-7>
- McCabe, C. (2021, July 1). *The global youth are the future of agriculture*. AgriCorps.
<https://agricorps.org/2021/07/the-global-youth-are-the-future-of-agriculture/>
- McKnight, T. (2021a). *Empower Youth, Transform Agriculture: An introductory guide to school-based agricultural education in Sub-Saharan Africa*. The Movement for School-Based Agricultural Education and AgriCorps, Inc. http://sbae.org/wp-content/uploads/2021/02/Empower-Youth-Transform-Agriculture_0102.pdf

McKnight, Trent (2021b, April 16). *You're Doing It Wrong, Dad!* [Video]. TEDxCWRU on YouTube, (6:13-8:47). <https://www.youtube.com/watch?v=p2pPO29DaYs>

Ministry of Education (MOE): Division of Agriculture & Environmental Education. (2010, March). *Policy Guideline for School Garden and Statutory Responsibilities/Functions of the Agriculture & Environmental Education Unit*. Monrovia, Liberia: Ministry of Education.

Nakasone, E. & Torero, M. (2016). *Agricultural Extension through Information Technologies in Schools: Do the Cobbler's Parents go Barefoot?* East Lansing, MI: Michigan State University.

National 4-H Council (n.d.). *4-H Partnerships in Africa*. https://4-h.org/wp-content/uploads/2016/02/4-H-Partnerships-in-Africa_Progress-Report.pdf

National 4-H Council (n.d.). *4-H History*. <https://4-h.org/about/history/#!menu-builder>

National 4-H Council (n.d.). *4-H Pledge*. <https://4-h.org/about/what-is-4-h/4-h-pledge/>

National 4-H Council (n.d.). *4-H Programs at a Glance*. <https://4-h.org/parents/programs-at-a-glance/>

National 4-H History Preservation Program (n.d.). *International 4-H History Continuum*. https://4-hhistorypreservation.com/History/International_Programs/

OECD/FAO. (2022). *OECD-FAO Agricultural Outlook 2022-2031*. OECD Publishing, Paris. <https://doi.org/10.1787/f1b0b29c-en>. <https://www.oecd-ilibrary.org/docserver/a9646eec-en.pdf?expires=1657236549&id=id&accname=guest&checksum=2345C51F1420C74D406C14394FA72D15>

Olokundun A. M., Falola, B. H., & Ibidunni, A. S. (2014). *Agro Business as a Remedy for Youth Unemployment towards the Achievement of Sustainable Development in Nigeria:*

Comparative Perspectives from the Kwara State Agro Business Economy. *Journal of Economics and Sustainable Development*, 5(3): 46-57.

Population Reference Bureau (2012, Nov 26). "Fact Sheet: Attaining the Demographic Dividend." PRB. Washington, DC. <https://www.prb.org/resources/fact-sheet-attaining-the-demographic-dividend/#:~:text=The%20demographic%20dividend%20is%20the,to%20the%20working%20age%20population.>

Rah, J., Akhter, N., Semba, R. et al. (2010) Low dietary diversity is a predictor of child stunting in rural Bangladesh. *European Journal of Clinical Nutrition*, 64, 1393–1398. <https://doi.org/10.1038/ejcn.2010.171>

Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press. <https://teddykw2.files.wordpress.com/2012/07/everett-m-rogers-diffusion-of-innovations.pdf>

Schwebel, D., Estruch, E., Wobst, P., & Grandelis, I. (2019). Policies for youth employment in Sub-Saharan Africa. In V. Mueller and J. Thurlow (eds.), *Youth and jobs in rural Africa: Beyond stylized facts* (pp. 47-74). International Food Policy Research Institute. Oxford University Press. DOI: 10.1093/oso/9780198848059.003.0003

Stafford-Brizard, B. (2016). *Building blocks for learning: A framework for comprehensive student development*. Turnaround for Children. <https://turnaroundusa.org/wp-content/uploads/2016/03/Turnaround-for-Children-Building-Blocks-for-Learningx-2.pdf>

Stimson, R. (1919). *Vocational agricultural education by home projects*. The MacMillan Company, New York.

Sultana, P., Rahman, M.M. & Akter, J. (2019). Correlates of stunting among under-five children in Bangladesh: a multilevel approach. *BMC Nutrition*, 5(41).

<https://doi.org/10.1186/s40795-019-0304-9>

Tavenner, D. (2019). *Prepared: What kids need for a fulfilled life*. Currency, New York.

The Movement for School-Based Agricultural Education (2020). *SBAE*. <https://sbae.org/>

Trauma Healing and Reconciliation Services (THARS) (2019). *Pathways to peace: Cultivating learning with school gardens in elementary schools*. <http://www.thars.org/services-2/>

U.S. Agency for International Development (USAID) (2015). *4-H Senegal positive youth development* [Fact Sheet]. USAID and Virginia Tech.

https://cired.vt.edu/content/dam/cired_vt_edu/Youth%20in%20Agriculture%20-%204-H%20Fact%20Sheet.pdf

United Nations (1981). International Youth Year: Participation, Development, Peace. United Nations General Assembly, 36th session, item 76, pp.15. [https://documents-dds-](https://documents-dds-ny.un.org/doc/UNDOC/GEN/N81/165/83/PDF/N8116583.pdf?OpenElement)

[ny.un.org/doc/UNDOC/GEN/N81/165/83/PDF/N8116583.pdf?OpenElement](https://documents-dds-ny.un.org/doc/UNDOC/GEN/N81/165/83/PDF/N8116583.pdf?OpenElement);

<https://www.un.org/en/global-issues/youth>.

United Nations Economic Commission for Africa (UNECA) (2011). *Africa Youth Report 2011: Addressing the youth education and employment nexus in the new global economy*. Addis

Ababa, Ethiopia: UNECA.

<https://repository.uneca.org/ds2/stream/?#/documents/6c222e28-e6a4-549e-a412-7af919ea2e5d/page/5>

United Nations (UN) (2014). "Young in the World: Changing Proportions in 1980, 2015, and 2050" [Map]. From Myers, J. (2016, May 9). "The world's 10 youngest populations are

all in Africa." World Economic Forum. <https://www.weforum.org/agenda/2016/05/the-world-s-10-youngest-countries-are-all-in-africa>

Uricchio, C., Moore, G. & Coley, M. (2013). Corn Clubs: Building the Foundation for Agricultural and Extension Education. *Journal of Agricultural Education*, 54(4), 224–237.

Vandenbosch, T. (2006, August 30). Post-Primary Agricultural Education and Training in Sub-Saharan Africa: Adapting Supply to Changing Demand. World Agroforestry Center, Nairobi.

Victorson, N. (2012, Dec 31). *4-H develops youth around the world: Part 1*. Michigan State University Extension.

https://www.canr.msu.edu/news/4_h_develops_youth_around_the_world_part_1

Victorson, N. (2013, Mar 28). *4-H provides positive youth development opportunities around the world: Part 2*. Michigan State University Extension. https://www.canr.msu.edu/news/4-h_provides_positive_youth_development_opportunities_around_the_world_part

Virginia Tech (2018). *Feed the Future Senegal youth in agriculture*. Virginia Tech Center for International Research, Education, and Development. <https://cired.vt.edu/programs/feed-the-future-senegal-youth-in-agriculture.html>

Washington State University (WSU) Extension (2015, Jun 19). *WSU Burundi 4-H sister school program* [Video]. <https://www.youtube.com/watch?v=HLXGeFtNhuA>

Washington State University (WSU) Extension (n.d.). *Burundi 4-H sister school program*.

Washington State University Extension: 4-H Youth Development Program.

<https://extension.wsu.edu/4h/youth/global-4-h/burundi/>

Wessel, T. & Wessel, M. (1982). *4-H: An American Idea 1900-1980, A History of 4-H*. Chevy Chase, MD: National 4-H Council.

Wyoming 4-H (n.d.). *What is 4-H?*. University of Wyoming. <https://www.uwyo.edu/4-h/about4-h/what-is-4h.html>

Yami, M., Shiferaw, F., Abdoulaye, T., Alene, A.D., Bamba, Z., & Manyong, V. (2019). African rural youth engagement in agribusiness: Achievements, limitations and lessons. *Sustainability*, 11(185), 1-15. DOI:

10.3390/su11010185.https://www.researchgate.net/publication/330039918_African_Rural_Youth_Engagement_in_Agribusiness_Achievements_Limitations_and_Lessons

Yeboah, F.K. (2018, March). Youth for Growth: Transforming Economies through Agriculture. The Chicago Council on Global Affairs.

<https://www.thechicagocouncil.org/sites/default/files/2020-11/Youth%20for%20Growth%3B%20Transforming%20Economies%20through%20Agriculture%20PDF%20Report.pdf>

Young Farmers Federation of Uganda (UNYFA) (2020). *About us*. UNYFA.

<https://unyfa.org/about-us/>