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Vocational Education and Training for Farmers and Other Actors in the Agri-Food Value Chain in Africa

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Vocational Education and Training for Farmers and Other Actors in the Agri-Food Value Chain in Africa



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Vocational Education and Training for Farmers and Other Actors in the Agri-Food Value Chain in Africa

Oliver K. Kirui and Marta Kozicka

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Abstract

The study analyzes the current state of Agricultural Technical and Vocational Education and Training (ATVET) in Africa and presents its challenges and opportunities. A review of the ATVET in selected Sub-Saharan Africa countries shows that there are far too few training opportunities for young people and that often, the training offered does not match the needs of the private sector and of local administrations. ATVET trainings focus primarily on production skills and on producers themselves with too little practical training. ATVET needs to be adapted to the context of increasingly commercial and technical 21st century agricultural systems. We use the German dual ATVET system as a case study for best practices. The study concludes that an effective reform of ATVET in Africa would require policies and initiatives that tackle the general challenges as well as taking advantage of country-specific opportunities.

Keywords: Agricultural technical and vocational education and training (ATVET), agri-food system, dual system, vocational schools, value chains, Africa.

List of abbreviations

AfDB	African Development Bank
ATVET	Agricultural Technical and Vocational Education and Training
AVFA	“Agence de le Vulgarisation et de la Formation Agricoles” Agricultural Training and Extension Agency
BIBB	“Bundesinstitut für Berufsbildung” German Federal Institute for Vocational Education and Training
BMZ	German Federal Ministry for Economic Cooperation and Development “Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung”
BRICS	Brazil, Russia, India, China and South Africa
CAADP	the Comprehensive Africa Agriculture Development Program
CETA	Colleges of Technical Agricultural Education “Collèges d’Enseignement Technique Agricole”
CmiA	Cotton Made in Africa
COMPACI	Competitive African Cotton Initiative
DEF	Diploma for Basic Education (9 th grade) “Diplôme d’Etudes Fondamentales”
DEUG	Diploma of General University Studies
DEULA	“Bundesverband der Deutschen Lehranstalten für Agrartechnik” German Association of Educational Institutions for Agricultural Engineering
DLG	“Deutsche Landwirtschaftsgesellschaft” German Agricultural Society
EFSC	Training Schools for Cooperation Specialists of Cameroon
EFSDC	Training Schools for Community Development Specialists of Cameroon
EFSEAR	School of Training of Specialists in Rural Equipment and Facilities of Cameroon
GIZ	“Deutsche Gesellschaft für Internationale Zusammenarbeit” German Agency for International Cooperation
IFPMS	Institute of Vocational Training Malick Sidibé
IPR/IFRA	Rural Polytechnic Institute of Training and Applied Research
LAMS	Agricultural College Medji of Sékou
MDGs	Millennium Development Goals
MINADER	Ministry of Agriculture and Rural Development of Cameroon
MINJEUN	Ministry of Youth of Cameroon
MINEPIA	Ministry of Livestock, Fisheries and Animal Industries of Cameroon
MOARD	Ministry of Agriculture and Rural Development of Ethiopia
NCCE	National Commission for Colleges of Education
NEPAD	New Economic Partnership for Africa’s Development
NGO	Non-Governmental Organization
NPCA	NEPAD Planning and Coordination Unit
OECD	Organization for Economic Co-operation and Development
ROR	Rates of Return
SAFI	School of Agriculture for Family Independence
SDGs	Sustainable Development Goals
TVET	Technical and Vocational Education and Training
VET	Vocational Education and Training
WASAA	Women in Agribusiness in Sub-Saharan Africa Alliance

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1 Introduction

Formal vocational training is needed to turn farmers and other actors in the agriculture and food system into skilled entrepreneurs who run their farms or businesses as economic and productive sustainable enterprises. This will be essential for farms and companies in the agro-processing sector to sustainably increase the level of productivity and income as well as their competitiveness on domestic and international markets.

The Organization for Economic Co-operation and Development (OECD) identifies that over 50 million young people in Africa are engaged in insecure employment, and that youth unemployment stands at 50 percent (2016). To keep pace with the growing working age population, Africa requires some 20 million new jobs each year (IMF 2016). Further, there are still far too few training opportunities for young people. Often, the available training does not match the needs of the private sector. Thus, there is a need to expand technical and vocational training opportunities and revamp the training institutions in Africa. The low social status of crafts and trades poses a problem, and technical and vocational education and training must be made available to all in order to improve productivity and make certain sectors more attractive. This is especially true for the agricultural sector, which is characterized by lack of modern production methods and low productivity, making it an unattractive sector to work in. There is also the need for new ways of developing strategies for small and medium-sized enterprises.

One of the focuses of the erstwhile United Nations Millennium Development Goals (MDGs) was on basic education, and especially on universal primary education. This left out the need for post-basic education and training, including agricultural technical vocational education and training (ATVET) (Fluitman 2005). This was in large part due to the fact that vocational education and training was absent in most government and donor-driven poverty reduction strategies in most developing countries, i.e. vocational education and training has been receiving less political attention. This is due to a lack of donor investment and lack of action by many governments, despite ATVET being among the key pillars of training for sustainable development (Pavlova 2014). There is a need, therefore, to adjust development efforts and build the human resources and capabilities of the poor. The more recent Sustainable Development Goals (SDGs), however, have specifically mentioned ATVET. Goal 8 of the SDGs (to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all), seeks to substantially reduce the proportion of youth not in employment, education or training by 2020 (UN 2015).

The link between poverty reduction and skills training and increased growth, productivity and innovation, is particularly strong in the informal sector (Fluitman 2002). ATVET thus plays a vital role in developing the skills that are needed to improve output, quality, variety and occupational safety, which in turn improve health outcomes, thereby increasing the incomes and livelihoods of the poor. ATVET also helps the trainees to strengthen knowledge about the informal sector, rural organizations and good governance. Access to training and relevant skills is important in many ways; it leads to increased productivity in agriculture-related sectors, links the poor rural population to profitable income generating activities, and attracts young people to agricultural and rural futures. Effective ATVET systems that build linkages between education, technical training, labor market entry, and lifelong learning are necessary for sustainable productivity growth and for generating better paying jobs in rural areas and beyond.

The approach pursued by countries in Sub-Saharan Africa to providing ATVET may falsely be considered to be obsolete in the context of increasingly technical 21st century agricultural systems (Johanson 2007; Brooks et al. 2013). In the majority of African countries, vocational training has not been considered a means for long-term capacity development. In its place, short-term and topic-specific training was the main instrument to improve farmers' knowledge and agricultural practices. However, experience shows that short-term training alone does not sufficiently qualify young farmers and other professionals in the agri-food sector, and the rural sector as a whole. Thus, there is need to combine

all the different capacity-building tools into a flexible, over-arching concept of capacity development and to embed this system into the agricultural and food sector as well as into the educational and health sector. This system includes colleges and universities, as well as the interaction between dual and tertiary educational systems.

The African Union has identified agriculture and rural development as key priority areas for which technical and vocational training and skills development are crucial for economic and social development (African Union 2007). Without these new skills, the indigenous or cottage industries, and the traditional and the informal skill acquisition systems do not adequately spur development. The African Union, therefore, recommended that the “member States develop and implement policies and strategies that would provide (re)training opportunities so as to ensure that half of Africa’s workforce will obtain new or improved skills” (ILO 2007). ATVET is increasingly being supported through vocational colleges and university-based certification programs, as well as through private-sector institutions and job-based training programs (Jacobs and Hawley 2008; Rivera and Alex 2008).

Under the leadership of Federal Ministry for Economic Cooperation and Development (BMZ), the German Government has identified vocational training as one of the educational objectives that promotes the concept of “life-long learning” and supports the partner countries by implementing this concept. The BMZ supports the “Promotion of Technical Vocational Education and Training for the Agricultural Sector in Africa” along with the Pan-African and national institutions (CAADP ATVET). This program is incorporated within the frame of the New Economic Partnership for Africa’s Development (NEPAD) and implements some of the elements of life-long learning in pilot countries all over Africa: Kenya, Ghana, Benin, Burkina Faso, Malawi and Togo.

In 2017, both Germany and the European Union have set the goal of redefining their partnership with Africa by elaborating a new development strategy called the “Marshall Plan.” This culminated at the G20 summit in Hamburg, Germany. Germany made the African continent a focus of its presidency of the G20. One key outcome of the summit – relating to ATVET – is the launch of the “G20 Initiative for Rural Youth Employment” in an effort to address the major challenge of employment for young women and men in rural areas, with a particular focus on Africa. Among other things, this initiative seeks to provide employment-oriented skills development programs for at least 5 million young people over the next five years, especially in rural areas (G20 2017a; G20 2017b). The “Marshall Plan” is premised on the need to find new solutions to new challenges on political, economic, social and cultural fronts. Thus, it is an expression of European and African states’ will to foster peace and development with emphasis on “fair trade, more private investment, more bottom-up economic development, more entrepreneurial spirit and, above all, more jobs and employment.” (BMZ 2016, p. 4).

The “Marshall Plan” is designed to be an over-arching and integrated strategy for the European Union and its member states and the states of the African Union to follow. It identifies areas of potential, as well as problems, and possible solutions. The Marshall Plan rests on three pillars: (i) economic activity, (ii) peace and security, and (iii) democracy and the rule of law. It contains more than a hundred ideas for reform and is centered round the key issues for development, such as, promoting economic activity, trade and employment (particularly for the youth), vocational training, financing, social protection, peace, security, stability, resilience, democracy, rule of law, human rights, political participation, and fight against corruption. The “Marshall Plan” requires African governments to invest and expand the technical and vocational education and training; introduce dual vocational training systems and establish vocational training schemes for crafts and trades; and focus more on the needs of local labor markets. Additionally, Germany should launch an alliance for jobs and vocational training for African’s youth in collaboration with the German private sector and international partners (such as the International Labor Organization, the African Development Bank, etc.), increase the number of scholarships available with the goal of mutual learning, and significantly intensify economic cooperation with Africa.

Africa is interested in learning best practices from the German dual educational system in the agri-food sector. It is therefore important not only for partners to adapt and transfer some elements of this system into their own national systems, but also develop and incorporate a comprehensive system into their national capacity development scheme for the agri-food sector. The German dual educational system in the agri-food sector consists of full and part-time vocational schools, apprenticeships and topic-specific trainings. It is important to identify the potential of linking the country's dual system to the public and private structures and to develop a framework for the actual implementation.

This study seeks to propose sustainable structures for a dual agriculture and food education system in Sub-Saharan African countries. This includes a process of on-going identification of new and future relevant issues. Facilitating the development of a practical, efficient and successful structure, which is country-specific, is the joint responsibility of all involved: the private sector and farms, vocational schools and other educational entities, and relevant public and private organizations. Furthermore, a sustainable and fair cost-sharing structure could significantly increase the rate of success. This paper presents the current state of ATVET in Africa, particularly in the 12 countries where PARI¹ operates. This discussion enables an analysis of the commonalities and differences between countries and points out the challenges that need to be addressed for a more effective ATVET system in Africa. The German dual system, considered one of the success stories of technical and vocational education and training in the world (Psacharopoulos 1987), is suggested as a model which can be adopted and adapted to the African context.

The remaining sections of the present study are organized as follows. Chapter 2 presents the necessary background and theoretical framework on Vocational Education and Training (VET) and its impact and outcomes. Chapter 3 addresses ATVET in Africa in detail – its current state, existing initiatives, individual country experiences, and its challenges and opportunities. Finally, conclusions and policy perspectives are presented in the chapter 4.

¹ Program of Accompanying Research for Agricultural Innovation from the Research Development Center (ZEF) in Bonn <http://research4agrinnovation.org/> , Accessed on 28 November 2017.

2 Overview of vocational education and training

2.1 Definitions and classifications

Agricultural Technical Vocational Education and Training (ATVET) can be defined as the educational process involving the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in agriculture, in addition to general education (Jones 2013).

ATVET is a subset of Technical Vocational Education and Training (TVET). TVET can be categorized as formal, non-formal and informal. The definitions of formal, non-formal and informal TVET vary across countries and institutions. The German development agency defines the various types of TVET as follows:

Formal TVET: provided by the state education system and leading to a recognized qualification. The learning processes are intentional and systematic.

Non-formal TVET: delivered by education and training providers, companies, social partnership organizations and public-benefit bodies outside of the state-initiated education and training system. The learning processes are intentional and systematic and may lead to a recognized qualification.

Informal learning: non-structured, non-intentional learning processes that take place at work or through other everyday activities. It does not typically lead to certification and recognition (GIZ 2015).

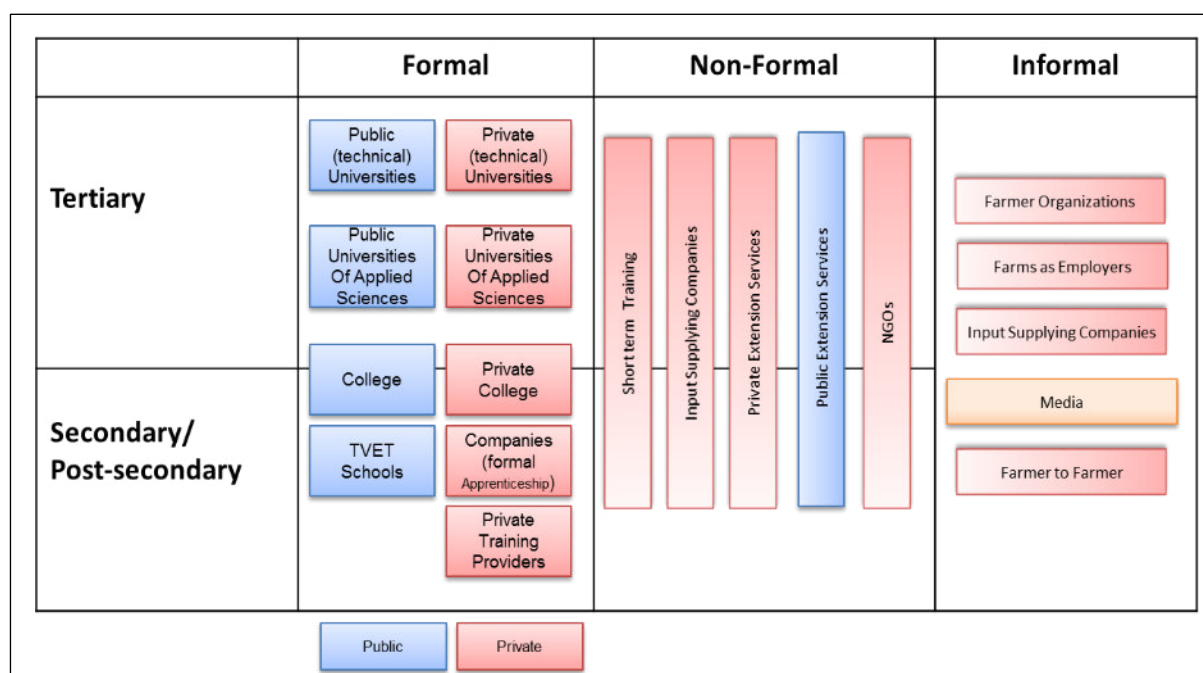
Actors involved in the VET system include state, students (apprentices), teachers or trainers (farmers, specialists), sponsors and agri-sector companies. TVET in Africa is delivered by both government and private providers, which include for-profit and non-profit institutions, non-governmental organizations (NGOs) and church-based institutions. In almost all countries, the provision of TVET by NGOs is on the increase, both in terms of the number of institutions and students. This trend is partially explained by the fact that the private sector provides training for the informal sector (which is an expanding job market all over Africa), while public institutions mainly provide training for the relatively stagnant industrial sector. Private providers also target “soft” business and service sector skills that do not require huge capital outlays to deliver, such as secretarial practice, cookery, and dressmaking. A limited amount of in-company or enterprise-based training also takes place in some countries. However, this type of training aims to hone some specific skills of company employees (Onderi et al. 2014).

Figure 1 presents all the actors involved and classifies them into formal, non-formal and informal training categories by level of education and distinguishing between private and public agents. The type of TVET provision generally falls into one of the following categories²:

- Public school-based vocational education and training
- Vocational training centers
- Private for-profit institutions
- NGOs

² An advanced farmer or a specialist can give the training from the (agro-processing) industry.

Figure 1: Actors in Technical Vocational Education and Training in Africa



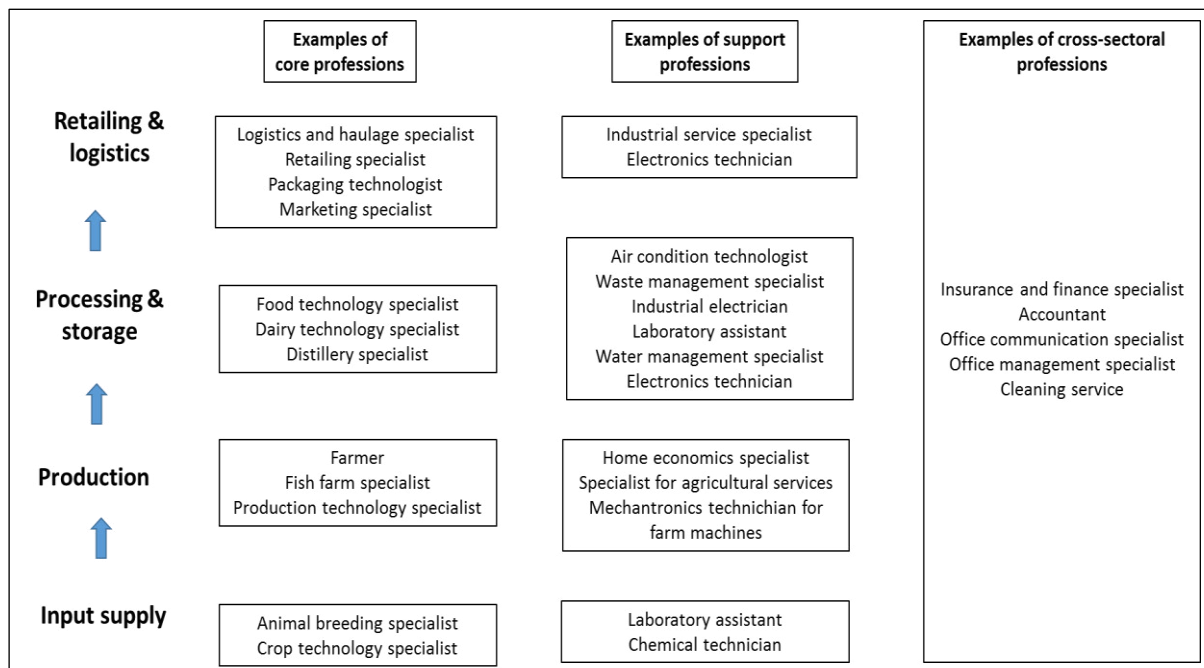
Source: Adapted from Walker and Hofstetter, 2016.

While most AVET systems focus primarily on the farm level and basic processing, this study proposes that a much broader set of skills is required to transform the agriculture sector in Africa. The relevant professions can be grouped into three categories:

1. **Core professions** include those professions that are directly related to the agricultural value chain. These may vary in degree of specialization because innovations and the introduction of new technologies may require highly specialized and skilled labor beyond the production level (e.g. processing and storage technology, logistics, retailing industry).
2. **Support professions** are required to ensure the functioning of the core professions at different stages of the agricultural value chain.
3. **Cross-sectoral professions** are not directly related to the agriculture sector, but are required to ensure the functioning of the value chain as a whole.

Some examples of professions along the value chain are shown in Figure 2.

Figure 2: VET professions along the value chain



Source: Authors' illustration.

2.2 Literature review

The theory underpinning the economic analysis of ATVET is based on the concept of human capital (Becker 1975) which treats human knowledge and skills as means of production – an asset that can potentially generate income (Mincer 1958). Human capital can be increased through investment, for example in education, training or health. ATVET is one of the most straightforward ways of investing in human capital because it generates productive skills which are traded in labor markets. Consequently, ATVET affects an individual by increasing their potential income.

Furthermore, ATVET has a potentially large impact beyond the individual level. For example, in the agri-food sector, higher productivity can lead to a higher supply of food, improved food quality, and lower prices due to larger production volumes, less waste, and more efficient use of resources (Kehl, et al. 2013). These outcomes, in turn, affect the food security of a country. Food security along with higher incomes in the agri-food sector may lead to better nutrition and even higher productivity in the long run. A well-developed curriculum for ATVET based on the current needs of the agri-food sector can provide a further boost to the whole economy.

Additionally, this boost to the rural economy and subsequent employment opportunities for rural youth may lead to lower rural-urban migration, an issue that has been linked to socio-demographic and environmental problems (Qin & Liao 2016). Increased income and, consequently, increased demand by the rural populations, along with a more productive workforce would positively contribute to economic growth (Besley & Cord 2006; Ravallion 2004). By building environmental awareness and capacity to apply new technologies, ATVET can substantially contribute to sustainable, 'green' growth. These impacts of ATVET on the individual, agri-food sector and economy-wide level are presented schematically in Figure 3.

Since TVET is an investment in human capital, costs and returns to this investment should be considered. Similarly to the distribution of benefits of TVET, costs can also be borne by different actors: individuals, company, NGOs or states. Costs can include trainees' and instructors' time or equipment, and opportunity costs – the value of the inputs in their best alternative use. Designing a cost-benefit

analysis framework, which considers all the complexities of system is a difficult task which has been widely studied, particularly through research funded by policymakers, e.g. Hoeckel (2008), Tsang (1997), Middleton (1991) or van Lith (1998).

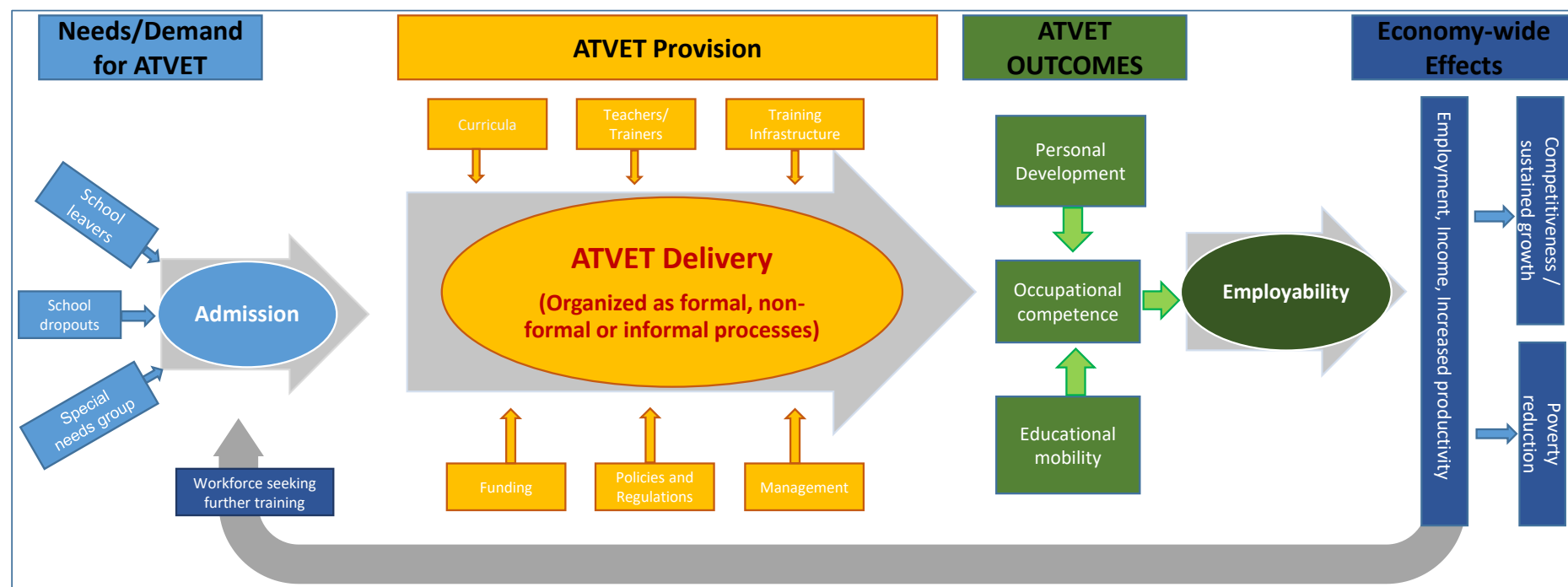
Several publications evaluate rates of return (ROR) to TVET, but unfortunately ATVET has not received the same kind of attention in the literature. A review of studies evaluating ROR to TVET on a global scale was conducted by Bennel (1996) with particular emphasis on comparing ROR to general education with that to TVET. His finding is contrary to the then orthodoxy, largely sustained by the World Bank, that general education has higher returns than TVET (Psacharopoulos 1987; Berthelemy & Bourguignon 1995). Studies indicate that most of the developing countries showed higher rates of return to TVET than to general secondary education. An important outlier was in Sub-Saharan Africa, where school-based vocational education was found to be inefficient and ineffective. Psacharopoulos, although critical of traditional TVET, proposes some approaches to make it an effective training tool (1987). The author insists that TVET must be de-linked from the formal schooling system, the latter of which should be limited to general skills; TVET should be offered by specialized vocational institutions or in the form of on- the-job training. He emphasizes the need to link TVET to employers and quotes the German dual system as a successful example. Additionally, he calls for an increase in private financing and ongoing evaluations of the trainings.

The African Development Bank opines that TVET can play a significant role in realizing the youth dividend, addressing youth unemployment, and, in concert with other macro-economic factors, boost national economic productivity (AfDB 2015). The African Development Bank has been at the forefront in promoting TVET in recent years in Sub-Saharan Africa. Similarly, Oketch (2014; Oketch 2015) analyses the role of TVET in youth skills development and employment in Africa using key economic and education highlights in Kenya, Ghana and Botswana. They also examine the policies and practices that characterize the TVET landscape across these Sub-Saharan African countries from a political economy approach. His findings suggest that TVET has played a marginal role in most Sub-Saharan African countries despite numerous policy actions to address youth unemployment and to promote economic growth through an expansion of TVET provisions. They further show that enrolment in vocational education as share of all enrolled in secondary education continues to be below 10% in most Sub-Saharan African countries.

Spielman et al. argue that agricultural education and training role is not limited to building human and scientific capital, but is also important in building the capacity of organizations and individuals to transmit and adapt new applications of existing information, new products and processes, and new organizational cultures and behaviors (2008). Consequently, it is important to emphasize that general education and ATVET are complements rather than close substitutes (McMahon et al. 1992). Nevertheless, the discussion which type of education is better for development is still ongoing (Oketch 2007). Recently, there has been a major shift in the mainstream perception of the role of ATVET in development. While the Millennium Development Goals limited their targeted educational levels to the primary education (MDG goal 2), the Sustainable Development Goals explicitly mention in the goal 4 “...equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university³”. Furthermore, the role of the vocational education and training on a job market has changed (Oketch 2007). Initially, it was to provide job-specific skills specific for entry into a career. Now, it is perceived more as a way to facilitate the acquisition of vocational-specific skills over a lifetime.

³ <https://sustainabledevelopment.un.org/sdg4>. Accessed on November 28, 2017

Figure 3: Impacts of ATVET on an individual, agri-food sector and the whole economy



Source: Adapted from Kehl, et al., 2013.

Relative advantages of different types of TVET, including school-based education, a dual system in which school-based education is combined with firm-based training, and informal training, are discussed by Eichhorst, Rodríguez-Planas, Schmidl, & Zimmermann (2012). The authors review evidence from all over the world and conclude that dual systems tends to be more effective than the school-based TVET. A well-designed dual system should both provide firm-specific technical skills, as well as general skills that are transferrable across employers within the occupation. The evidence suggests positive effects from informal training, however there remains too little evidence on its effectiveness. Informal training is especially important in the countries where formal TVET is not functioning properly. Nevertheless, it is important to emphasize that due to the lack of general skills and little availability of training in more modern occupations, employability after informal TVET is more limited.

In a more recent study on TVET in Africa, Oketch claims that part of the problem with African TVET was in the source of its funding (2007). The author finds that in the countries studied, namely Botswana, Egypt, Ghana, Senegal, Seychelles, Tunisia, and Zimbabwe, there were several malfunctions and waste in the cases where TVET was fully funded by public sector. He suggests that the private sector should be more involved, as private sector actors are often willing to invest in building the required human capital. For instance, a survey carried out on Indian firms (mostly from the manufacturing sector) showed that the private sector in India suffers from insufficient and inadequate supply of skilled labor (Mehrotra et al. 2014). The companies often complained about the lack of linkage between theory and practice. Many of the bigger firms run in-house training programs and importantly, they are often willing to cooperate with the government and other companies to invest in skill development programs. The authors further suggest that this creates space for implementing a TVET system based on a dual approach, similar to the German system.

The OECD assessed resource needs and mobilization within the sixteen OECD countries that offered vocational secondary education. Their findings revealed that their average per pupil expenditure was US\$ 970 more than the academic programs; Germany, Netherlands and Switzerland, in particular, spent US\$ 4, 567, US\$ 3, 393 and US\$ 8,726 more for each student enrolled in the vocational programs than in the academic ones (OECD 2014). It is noteworthy that Germany's education system is well resourced, receiving heavy funding from both the private and public sectors (Federal Ministry of Education and Research 2003). In contrast, many Sub-Saharan African countries are faced with face insufficient resources to implement vocation education and the actual implementation happens in phases (Kakupa 2017). Oketch and Lolwana (2017) posit that the political and economic conditions, as well as the policies for financing of education in many Sub-Saharan African countries do not allow for an expansive TVET system. However, there are significant reform activities are taking place in many countries (which include engaging the private sector, increasing allocation of education budget to TVET), many of which have been copied from international practices (Kedir & Geleta 2017; Kakupa 2017; Oketch & Lolwana 2017). Ngerechi (2003) suggests a cost-sharing model to ease the funding problem: the government should meet recurrent and development appropriations (salary cost of established staff, capital development and equipment), while parents or trainees should pay tuition fees (training fees and accommodation costs).

The BRICS⁴ study on best practices for skill development in BRICS countries emphasized the necessity of creating a skill development system in BRICS countries (BRICS 2015). All the success stories from the BRICS countries (National Skill Qualifications Framework in India, the "Dual Education" project in Russia, Sector Education and Training Authority in South Africa) emphasize the important role of private-public partnerships as well as close connection between technical education and skill learning, which brings us back to the topic of the dual approach. However, as emphasized by Euler (2013), the dual system is not equivalent to a quality vocational education. Additionally, the author claims that it is not easy to: "...export a vocational training system, or individual components, to other countries. Each country's social, cultural and economic conditions determine the methods and strategies to be

⁴ BRICS refers to Brazil, Russia, India, China and South Africa

used in this process” (ibid). He further proposes exporting the system in a modified way, by following the 11 essential elements of the German system he identifies. These elements include: alternating learning situations in accordance with the dual principle, partnership between the government and the business community, joint funding of the system, or social acceptance of vocational training. He outlines the steps in the process of adapting the system. This analysis makes it clear that the ATVET system is deeply rooted in social and economic spheres and that in order to design the adaptation of the dual system, a thorough analysis of the ‘importing’ country is needed. In addition, full engagement of the relevant stakeholders of the importing country and tight cooperation with exporting country are essential to success.

Eichhorst *et al.* (2013) also emphasize the crucial role of engagement of the government and the employers in building a dual TVET system (2012). These need to jointly develop institutional frameworks, curricula and certification processes. In addition, the authors of this study think that the success of the dual TVET system depends highly on the institutional and historical context, which can make adaptation in new environments difficult. Experiences in some Sub-Saharan African countries, such as Nigeria, Uganda and Zambia, have shown that the successful implementation of a vocational career pathway (modelled around the German dual vocational system, as detailed in Box 1 and Annex II) remains uncertain, partly due huge costs, limited infrastructure, limited linkages to private sector and critical teacher shortages (Oketch & Lolwana 2017; Kakupa 2017). Very few of these instructors can combine pedagogical competencies with technical qualifications and industry experience, since most of them are trained in the universities where such combinations are not offered (Oketch & Lolwana 2017).

The German VET system is widely known, notably for its dual aspect, and respected internationally and within the German society. It’s most important and unique selling point is the combination of practical and theoretical knowledge students acquire at the workplace and at a vocational school. The dual approach has received international attention, e.g. in the United States of America, the United Kingdom, and in Spain, and is discussed in the context of reducing youth unemployment rates (Solga *et al.* 2014). The success factors and strengths identified in studies of the German system are the following:

- **A broad qualification structure:** Youth with lower school qualifications have access to a high quality vocational and tertiary education, which improves their chances on the labor market (about 60% of the trainees are hired by their training company after completion of the vocational training)
- **Variety:** The German system offers a broad spectrum of professions and a great variety of educational promotion prospects
- **High stakeholder engagement:** The dual VET approach has a high degree of engagement and ownership by employers and other social partners
- **Bilateral financing:** The system combines public and private funding which makes it financially secure even in times of crisis
- **Supporting research institutions:** VET research capacities are well-developed and institutionalized (e.g. Federal Institute for VET, *BIBB*) (Solga *et al.* 2014; Hoeckel and Schwartz 2010).

Box 1 presents a general description of the German dual Vocational Education Training. Box 2 offers an overview of German VET in the agriculture sector. Though the German model is a good example of vocational training, it must not be misunderstood as a blue print for African countries. Countries would have to adapt and modify the system according to their national context. Detailed description of the German ATVET system are presented in Annex II (background information on organization and governance of education , incentives for different actors, costs and benefits of the dual system, and success factors, strengths and challenges going forward).

Box 1: The Dual Vocational Education Training in Germany

The German VET system is described as dual because the education proceeds at two places of learning: at the workplace at a training enterprise and a vocational school (*Berufsschule*). The general aim of this dual vocational training is for the trainee to obtain the skills, knowledge and qualifications required for a particular profession. Students gain practical professional experience by working at a training enterprise. The successful completion of a dual vocational training – which usually lasts between 2-3.5 years - leads to a professional degree (*anerkannter Berufsabschluss*), which qualifies for skilled work in one of the recognized occupations (*anerkannter Ausbildungsberuf*). According to the Vocational Training Act (*Berufsbildungsgesetz*) and the Handicrafts Code (*Handwerksordnung*), around 330 training occupations are recognized in Germany. The dual system of VET is formally open to anyone and requires no prerequisites for admission. However, many companies and training enterprises demand certain education qualifications.

The dual vocational training is based on a contract between a training enterprise and the trainee under private law. Trainees spend one to two days at the vocational school and 3-4 days a week at the training enterprise where they can put theory into practice. The training enterprises are obliged to provide the skills, knowledge and qualifications as defined in the training regulations (*Ausbildungsordnung*), which were established in order to set uniform national standards. Small companies that cannot provide comprehensive training may form training alliances with other firms. Vocational schools are required to follow the framework curricula (*Rahmenlehrplan*), which are drawn up for each recognized occupation. The overall responsibility for the VET lies with the Federal Ministry of Education and Research. Individual qualifications are endorsed by specialized ministries (e.g. Federal Ministry for Economic Affairs and Technology). The responsibilities for educational matters, which include all organizational matters (design of curricula, training and payment of teachers, legal supervision the Chambers) of VET schools, lie with the federal states.

To be able to offer vocational training, training enterprises must be able to provide the skills outlined in the training regulations through qualified training personnel. The qualification and certification of training companies is supervised by different authorities responsible for vocational training, usually the chambers of industry and commerce. Training companies pay their trainees an allowance in accordance with the collective bargaining agreement in the sector concerned. The salary increases with each year of training and is on average one third of the starting wage for a skilled worker. Vocational schools work together with the enterprises participating in vocational education and training in order to provide trainees with basic and specialized occupation-specific vocational training. However, general knowledge transfer is also part of the education at the vocational schools, namely German, social studies and economics, religion/ethics and sport.

After completing vocational education training and gaining practical experience in the specific profession, it is possible to obtain a *Meister* (Master craftsman) or technician diploma. The *Meister* is usually more oriented towards managing and crafting skills. The technician, on the other hand, is oriented towards technological skills (Aenis and Lixia 2016). These diplomas are the highest state-approved professional qualifications in crafts and other vocational professions and equivalent to the *Abitur*. Hence, Meister and technicians are able to obtain tertiary education at advanced colleges and universities. To get a *Meister* or technician diploma, further practical and theoretical training and specialized training courses are required for the final examination. This training takes up one to two years. A Meister or technician diploma is required to carry out on-the-job training of trainees.

Source: Authors' compilation.

Box 2: VET in German agriculture (“green sector”)

Practical on-farm training is at the core of vocational training in the agricultural sector. Trainees learn on a certified training farm. On-farm trainers are required to hold a *Meister* or technician certificate. University-trained farmers also have to hold the latter in order to be able to provide practical training. As current farms and agriculture-related companies become increasingly specialized, they cannot cover all teaching contents for their trainees. The so-called inter-company training therefore offers short-term training units on specialized farms or training centers (e.g. state-owned experimental centers or institutes). One example is the membership association DEULA (*Bundesverband der Deutschen Lehranstalten für Agrartechnik e.V.*, which is the German Association of Educational Institutions for agricultural engineering).

More than 90% of all family farmers, as well as approximately two-thirds of part-time farmers in Germany have received at least basic educational training. This demonstrates the high degree of farmer buy-in to this educational system. However, compared with industry and crafts, the agricultural sector plays a smaller role within the VET system; there are 13.500 new vocational education contracts per year in agriculture in Germany, compared to 150.000 in crafts and 350.000 in industry (Bundesministerium für Ernährung und Landwirtschaft 2015).

After two years of further work experience, persons who hold a farmer diploma can enroll in advanced vocational education at specialized agricultural schools. The dual system of VET in Germany offers two forms of advanced vocational further education: job-related and professional advanced education. In general, advanced vocational farming education teaches farm management skills, including for larger farms. Professional advanced training leads to a *Meister* (master craftsmen) or technician certificate, which provides the qualification to teach trainees on-farm. More than 40% of all main-income family farmers and more than 50% of private agricultural company leaders are *Meister* farmers or technicians. As stated by Aenis and Lixia, advanced further vocational education, such as the *Meister* or technician diploma is key to farm-level innovation, due to the emphasis on market-orientation and experience-sharing with the younger generation (2016). Job-related advanced education teaches specific expertise and professional skills, e.g. specialization in direct marketing, or expertise in green-keeping.

The qualifications process ends formally with an approved specialist diploma. The higher education pathway is particularly interesting for persons aiming to be qualified for the management of larger farms, agricultural administration, research, agribusiness, and agricultural extension services. Around two-thirds of company leaders and most extension advisors, as well as the majority of trainers of inter-company training units hold a university degree.

Curricula for VET in the agricultural sector are developed at the basic vocational and advanced (*Meister*/technician) level for each state-approved profession and for both on-farm/in-company and vocational schools. The specific curriculum for each profession is developed based on the framework curricula (*Rahmenlehrplan*), which includes a description of the field of learning, overall learning objectives and a timeframe estimating the class hours required to achieve the learning goals. To give an example, the framework curriculum for the basic vocational education of farmers includes the following (adapted from Aenis and Lixia 2016):

- *The farm and its relations*: functions, resources, internal and external relationships, law regulations, security aspects, environmental aspects, sustainable use of energy and materials
- *Working techniques and organization*: use of machines, production and marketing, business communication, evaluation of work flows
- *Plant production*: soils, soil fertility, crops production techniques, cultivation steps, harvesting procedures and techniques
- *Animal production*: efficient and sustainable husbandry, use of animals, ethics

In addition to basic and advanced vocational training, there are a number of short-term training courses across the agricultural field aiming to refresh the knowledge and skills of those already employed in the sector. The *Bildungsserver Agrar*, an information platform for agricultural education, lists about 1000 training courses and seminars for 2017 (Bundesministerium für Ernährung und Landwirtschaft 2016). These courses are offered by a great variety of providers and have to be paid by the trainees themselves, as this kind of training is market-based in Germany and not regulated by public authorities. The main actors providing short-term courses in the agricultural sector include the following (adapted from Aenis and Lixia 2016):

- State-run vocational education centers
- Inter-company training institutes (e.g. DEULA)
- Extension service providers: Agricultural ministries, Chambers of Agriculture, farmers' associations, e.g. *Deutscher Bauernverband* (German Farmer's Federation)
- Private professional organizations, e.g. German Agricultural Society (DLG)
- Private companies in the agro-industry

There are 14 state-approved vocational professions within the “green sector” in Germany, including, of course, professional farmer, but also home economics specialist (*Hauswirtschaftler/in*), dairy technology specialist (*Milchtechnologe*), distillery specialist (*Brenner/in*), and laboratory technician for dairy (*Milchwirtschaftlicher Laborant/in*) (see detailed description provided in Box 4 in Annex II).

Source: Authors' compilation

2.3 Challenges of ATVET in Sub-Saharan Africa

In order to bring about successful reform, it is important to analyze the current problems of existing ATVET systems and to identify the needs and aspirations of the youth. The African Union report on ATVET in Africa (African Union 2007) is one of many discussing the key issues of ATVET in Africa. These reveal complex socio-economic and institutional reasons for the malfunctioning of the TVET system in Africa. For example, TVET has a poor reputation and is perceived as a ‘dead-end’ for students who cannot continue into higher (university) education.

The educational output in most Least Developed Countries favor academic non-technical qualifications (Johanson and Adams, 2004). There are very limited ATVET programs that could open up labor market opportunities for the rural communities. Indeed, ATVET is considered a second-class career choice for those who have missed all other non-technical educational options (Ratnata 2013). TVET systems in most Least Developed Countries, including Sub-Saharan Africa, are inherently weak and are ill-equipped to achieve the SDGs. More importantly, ATVET in Sub-Saharan Africa is very fragmented and not integrated into an overall technical vocational education system. It is given low importance in many countries and it is insufficiently financed. ATVET was immensely affected when many developing country governments cut public spending during the structural adjustment period of the 1980s and 90s (Jones 2013). Furthermore, the provision of agricultural skills development and ATVET in sub-Saharan Africa has been essentially inadequate across the value chain.

Another stigma associated with ATVET relates to gender stereotyping, with some trainings being associated with the girls, who are considered less talented. The TVET system as a whole is perceived as inferior to the mainstream higher education system, and runs in parallel with separate institutions, programs and teachers. Moreover, poor linkage to the labor market and a lack of harmonization of TVET programs and qualifications are issues that need to be addressed. Gender should also be considered in the analysis and design of ATVET, since women often face gender-specific barriers. For example, it is very important to consider that in many developing countries, early marriage and child

bearing often significantly limit the possibilities of rural young women by severely restricting them in their mobility and limiting them to the domestic sphere. Furthermore, women are more often illiterate and generally have a lower level of education than men (Hartl 2009).

The role played by off-farm skills in rural areas has received significant attention (Robinson-Pant 2016) especially in more complex production systems, as has the issue of diminishing access to productive land due to climate change and land degradation (Kirui & Mirzabaev 2014; Nkonya et al. 2016) and the role of large-scale investment (von Braun 2009). The International Fund for Agricultural Development and the United Nations Educational, Scientific and Cultural Organization carried out a project entitled “Learning Knowledge and Skills for Agriculture and Rural Livelihoods” (2012–2014) in Cambodia, Egypt and Ethiopia (Robinson-Pant 2016), with the main goal of addressing the problems of high levels of youth unemployment in rural areas, rural poverty, and food security. The study points to the challenges of how to incorporate informal and non-formal learning processes into the concept of life-long learning and to the partnerships needed to make the skill training meaningful for development and rural transformation. The study further found that young people in the countries studied recognized the importance of education. However, they were constrained by the lack of financial resources and the need to work on the family farm. The youth showed a lot of interest in obtaining off-farm skills while perceiving learning as not only means to increase income but also as a process shaping their social identities and relationships.

In most Sub-Saharan African countries, a high number of illiterate youth and those with low levels of schooling live in rural areas and never receive adequate training. They are consequently poorly prepared for productive work (Bennell 1996; 2007). Additionally, the majority of these youth do not have the skills required for self-employment, which will further contribute to a development lag in many countries. In general, some core challenges facing TVET – and consequently ATVET – as identified by earlier studies, include poor quality, very high costs, unsuitable training to meet actual socio-economic conditions, a mismatch with young people’s aspirations, a disregard of the needs of the informal sector and the labor market (Atchoarena and Delluc 2001; Oketch 2007; Biavaschi et al. 2012).

According to a study by NEPAD (2013), the specific challenges faced by the ATVET systems in Africa are numerous:

- Unlike TVET systems, ATVET has only received marginal attention coupled with lower enrolment rates.
- ATVET has been criticized for having few linkages between private and public efforts and between TVET and agricultural universities and research.
- The fragmented and scattered technical and vocational training offered does not meet the needs of the fast growing agricultural and food sector.
- ATVET systems suffer from low capacity, inadequate and outdated training materials and equipment, and lack of skilled and qualified trainers in training institutions.
- Teachers and trainers lack practical, pedagogical and didactic skills, and lack technology knowledge and the competencies for curriculum development.
- There is a perception that vocational training is inferior to academic studies.
- In general, professional work in agriculture has a negative image compared to technical or office professions.

3 Agricultural Technical and Vocational Education Training in Africa

3.1 Post-Primary agricultural education and training in Africa

In most Sub-Saharan African countries, ATVET programs are formally school-based. In some countries like Kenya, ATVET training is incorporated into the school syllabus. In general, however, students either enter the vocational education track after 6-8 years at the end of primary school (as is the case in Burkina Faso in Kenya) or after 9-12 years of education or at the end of junior secondary school (as is the case in Ghana, Nigeria, Mali and Swaziland). The duration of school-based technical and vocational education is between three and six years, depending on the country and the model. Some countries, such as Ghana, Senegal, and Swaziland have incorporated basic vocational skills into the lower or junior secondary school curriculum in an attempt to expose young people to pre-employment skills. Oversight responsibility for TVET is generally shared between the ministries responsible for education or technical education and labor or employment, although some specialized vocational training programs (in agriculture, health, transport, etc.) fall under the supervision of the sector ministries.

Agriculture was introduced in general school curricula at secondary education level as a compulsory or optional subject in some Sub-Saharan African countries. However, in other countries such as Burkina Faso and Mozambique, agriculture is not taught as a separate subject at the secondary school. Some agriculture-related topics are integrated in the subjects of life and earth and natural sciences, respectively. In Ethiopia, the teaching of agriculture in secondary schools was phased out. This gave way to the launching of the ATVET program under the TVET wing of the country's education sector. In Ghana, Agricultural Science is a compulsory subject at the Junior Secondary School level (Ampiah et al. 2004) but is only offered as an elective subject in Senior Secondary Schools (Apori et al. 2003). In Kenya, agricultural science is offered as an optional subject both at Junior and at Senior Secondary Schools (Ngesa 2006). In Nigeria, agricultural science is an optional subject in Junior Secondary Schools and vocational elective at Senior Secondary School level (Adewale et al. 2004).

Agriculture was introduced at the secondary school level against the backdrop of negative attitudes towards farming by many secondary school students (Abalu 2001; Abulu and Wever, 2011). At this stage of learning, the study of agriculture is expected to provide students with an understanding of agricultural principles and practices. However, very few of these students end up as active agricultural producers. The curricula are populated with classroom lessons on theoretical lessons with very few practical applications. The lessons mainly center on the subject of agricultural production but with very few modules on topics such as agricultural entrepreneurship, alternative income-generating activities and agricultural processing.

There is a diversity of forms of agricultural education and training after the secondary level (i.e. technical and vocational education and training systems, non-formal and informal learning contexts, diploma colleges, universities, and on farm experiences). Students spend most of their time learning practical skills (Hoeckel and Schwartz 2010). Nevertheless, the curricula often inadequately address the needs of current and future labor markets. For example, one way of assessing the skills required by the labor market is to ask employers. Consultation may be organized at national level, regionally or by sector, and carried out either through bodies representing employers or through surveys. This input is then integrated into the training curriculum. Unfortunately, this does not take place in many countries in Sub-Saharan Africa. Furthermore, many developed countries (such as Germany, Australia, Ireland, Finland and Sweden) plan to respond to future labor market needs through skills forecasts. This also does not take place in Sub-Saharan African countries. (Neugart and Schömann 2002; CEDEFOP 2008). The linkages between learning and apprenticeship training are few to none (Vandenbosch 2006).

The structure and contents of agricultural training at this stage (post-secondary school level) vary across countries (see Annex II for detail descriptions). In Benin for example, there are four institutions of technical agricultural education: three Colleges of Technical Agricultural Education (CETA) and the Agricultural College Medji of Sékou (LAMS), attached to the Ministry of Technical Education and Vocational Training (Ogoudedji 2006). Teaching at the CETAs is 25 percent theoretical and 75 percent practical. Teaching at LAMS is 40 percent theoretical and 60 percent practical (ibid). The main areas of teaching are vegetable production, livestock production, environmental and nature conservation, processing, equipment, economy and management, and general education.

In Ethiopia, the Mid-Level Training component of the Agricultural Technical and Vocational Education (ATVET) program was implemented in 2001-2002. Its objective is to produce mid-level skilled, competent and motivated agricultural practitioners through the provision of pre- and in-service training. This training is carried out in 25 colleges distributed over the regional states. The training is composed of 30 percent theory and 70 percent practice. The main areas of teaching are animal husbandry, animal health, crop production, natural resources development and conservation, and cooperatives development.

Table 1 provides the detailed objectives of agricultural education at the post-primary level as well as other socio-economic objectives. A summary of the budget and staff dedicated to ATVET (and largely TVET) is also presented in Table 1.

The review of literature shows that the focus of ATVET in nearly all of the selected (PARI) countries and most of Sub-Saharan Africa is to train students on agriculture and its sub-disciplines as a subject in schools (secondary and in tertiary institutions). The courses taught focus mainly on agricultural production. Other important post-production aspects, such as processing, value addition, and packaging, are left out. Technical skills, such as animal breeding, dairy technology, distillery and wine making, fish farming, machine handling and repair and mechatronics, which would spur industries in the rural areas, are also missing. The teaching focuses heavily on theoretical learning rather than practical skills. Most of the practical skills are carried out in a 'model farm', and the students have little interaction with actual farmers and other value chain stakeholders. The studies also target new graduates from secondary school who have little experience with farm management and often will not consider farming as a profession. Detailed descriptions of the experience of each country is presented in Annex I). In contrast, the German ATVET system is described as dual system because the education proceeds at two places of learning: at the workplace at a training enterprise and a vocational school (see Box 1 and Box 2 and Annex II). The program is well received in Germany; more than 90% of all family farmers and about two-thirds of part-time farmers in Germany have received at least basic educational training in a well-thought-out curriculum (see detailed description in Box 2 and in Annex II).

Table 1: Agricultural education and training in selected African (PARI) countries

Country	Agricultural education objectives post-primary school	Socio-economic objectives of agricultural education	Theoretical vs practical teaching at ATVET schools/ Colleges	Budget and staff and number of ATVET colleges	Trainees	Private sector involvement
Benin	- Capacity for successful farming - Capacity for employment as a skilled technician. - Capacity for commercial farming - Capacity for middle management of agricultural services	- Improving the living conditions and livelihoods of farmers - Employment creation in rural areas - Improvement of agricultural productivity in rural areas - Support to agricultural extension systems.	25% theoretical 75% of practical	3% of the state education budget and less than 5% of secondary level staff 3 secondary level Colleges of Technical Education called CETA (Collèges d' Enseignement Technique Agricole) and other private and public high schools that provide ATVET training	- Farmers - Future farmers - Skilled farm workers - Rural development practitioners	Yes (e.g. Songhai Training Center)
Burkina Faso	N/A ⁵		N/A	29 agricultural training centers	- Farmers - Farm managers - Youth (Male & female)	N/A
Cameroon	N/A		N/A	9 Technical Schools of Agri. 6 Training schools 3 Regional Agri. colleges 35 farmer training centers, 24 Rural Training Centers 11 Young Farmers Training Centers.	Average of 500 young executives and rural development officers per year for a period of two years	
Ethiopia	<i>Note: Agricultural education is provided at the Agricultural Technical Vocational Centre</i>	- Increase the productivity and profitability of the agri. sector - Produce mid-level skilled frontline extension agents.	30% theoretical 70% of practical	27 ATVET colleges 8, 489 Farmer Training Centers	- Development agents who in turn train farmers > 2 million farmers trained by 2014	Yes
Ghana	Skills for paid and self-employment	N/A	N/A	N/A	Farmers and other value chain actors using Training of Trainees approach.	Yes

⁵N/A: Information Not Available (unknown)

Country	Agricultural education objectives post-primary school	Socio-economic objectives of agricultural education	Theoretical vs practical teaching at ATVET schools/ Colleges	Budget and staff and number of ATVET colleges	Trainees	Private sector involvement
Kenya	- Capacity to value farming as an occupation - Understand the role of agri. in the economy and national dev - Provide background for further studies in agri.	- Develop self-reliance in agri. - Enable schools to take an active part in national development through agri. activities.	N/A	N/A	<i>Farmers, Youth, agri. entrepreneurs</i>	Yes
Mali	N/A	- Agro-Pastoral Training - Agronomy, - Zoology - Forestry specialist	N/A	N/A	Value chain stakeholders (farmers, traders – retailers and wholesalers)	Yes
Malawi	- Equip learners with requisite knowledge, skills and attitudes for them to engage in agriculture as an occupation in their communities - Provide a foundation for those proceeding to tertiary levels of agricultural education and related fields	N/A	N/A	N/A	<i>Several stakeholders (farmers, extension service agents, technology developers, traders)</i>	Yes
Nigeria	- To cultivate and maintain students' interest in agriculture - To help students gain basic theoretical knowledge and practical skills - To help students integrate knowledge with skills - To prepare students for further studies in agriculture - To expose students to occupations in agriculture - To prepare students for opportunities in the field of agriculture	- To produce knowledgeable personnel in adequate number to be effective in technology transfer at farmer's level; - To equip the trainees to function efficiently in the ministries, research organizations; - To equip the trainees with adequate knowledge to understand various technologies so as to be able to adopt, utilize, demonstrate and transfer the technologies; - To prepare the trainees for farming as a career	N/A	Several institutes and universities.	- Farmer, - Extension agents - Researchers	Yes (<u>Leventis foundation agricultural training school</u>)

Country	Agricultural education objectives post-primary school	Socio-economic objectives of agricultural education	Theoretical vs practical teaching at ATVET schools/ Colleges	Budget and staff and number of ATVET colleges	Trainees	Private sector involvement
Togo	N/A	N/A	N/A	N/A	• Rice and Aquaculture value chain stakeholders • Farmer Business School that trains Entrepreneurs on their markets	Yes
Tunisia	N/A	• Initial edu (Competence Certificate, Certificate of Professional Competence, Diploma of Vocational Technician, and Advanced Technician diploma) • In-service training: Since 1998, the training of farmers, fishermen. Average of about 17,000 beneficiaries annual.	• 75% practical • 25% theoretical	• 39 training institutions in Agriculture and Fisheries	• Farmers, • Fishermen	Yes
Zambia	N/A	• ATVET in Zambia is organized in two levels: the continuing professional training and the life-long learning at grassroots level for farmers • Training areas: animal science, crop science, and agribusiness management, fisheries, agricultural engineering, and food and nutrition.	N/A	Several institutes at different levels	• Farmers • school dropouts, • extension agents	Yes

Source: Authors' compilation
N/A: Information Not Available

VET is making a comeback in Africa as a priority in education (McGrath 2011; McGrath 2012; Powell 2012; African Development Bank 2012; Takei 2016). Some of the initiatives that have been implemented to promote and revamp ATVET include upgrading teaching and learning infrastructure, improving institutional capacity, enhancing ATVET programs, and ensuring quality control in training provision (McGrath 2011; African Development Bank 2013; Takei 2016). In the agricultural sector, vocational training is important for equipping both the young and the old with the skills they need to increase productivity and to gain the necessary skills for the non-farm labor market (Takei 2016). We provide a few examples of successful initiatives regionally and within countries in the next section. Annex I also present the state of ATVET in the selected countries.

3.2 Promising Examples and Initiatives in ATVET

3.2.1 Africa-wide and regional Initiatives to improve ATVET

a. CAADP ATVET

The NEPAD Planning and Coordination Unit (NPCA) - the technical arm of the African Union coordinating the implementation of the Comprehensive Africa Agricultural Program (CAADP) - has stressed the importance of ATVET. With support of the GIZ, the German Agency for International Cooperation, on behalf of the BMZ, the German Federal Ministry for Economic Cooperation and Development, a new project called “Promotion of Technical Vocational Education and Training for the Agricultural Sector in Africa (CAADP ATVET project)” was launched by NPCA and the CAADP-Secretariat in 2012. The aim of CAADP ATVET is to develop and implement market-oriented qualification measures as well as coherent plans to incorporate agricultural technical vocational training components into the national education systems. The different actors and components of CAADP ATVET are presented in Figure 4.

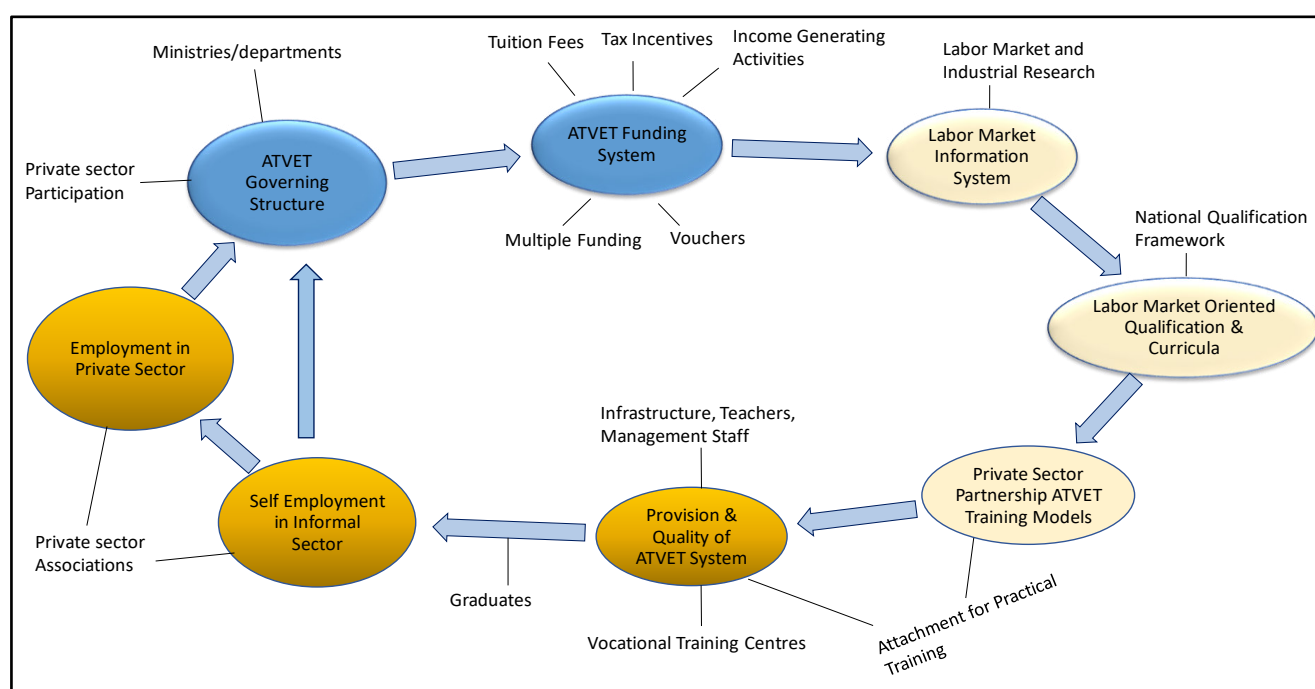
Through the NEPAD-CAADP ATVET project, most countries are undertaking ATVET system assessments to determine the needs, demands, and the most effective ways to boost human capacity development. The literature review points to a lack of rigorous evaluations of this African Union flagship initiative. There is therefore little in terms of empirical findings on the effectiveness of this initiative.

CAADP ATVET provides support in three areas:

- Knowledge management and survey of approaches, information and best practices for ATVET in Africa;
- Anchoring of ATVET in CAADP and African Union structures and in their promotion programs;
- Development and implementation of pilot qualification measures for farmers, youth and women, and service providers at the national level that can be disseminated as best practices to other countries through CAADP peer-learning mechanisms.

Besides the CAADP ATVET initiative, some international and local companies, donor agencies and private foundations have started to provide training with the aim to integrate African farmers into value chains. Some notable examples of such initiatives include the Competitive African Cotton Initiative (COMPACI), the School of Agriculture for Family Independence (SAFI), Women in Agribusiness in Sub-Saharan Africa Alliance (WASAA), African Cashew Initiative, and Africa Lead. We discuss a few of these initiatives below. There exists no rigorous academic evaluation of any of these initiatives either. Comprehensive and rigorous assessments would provide valuable lessons on the implications of vocational training in agriculture.

Figure 4: Systemic Components of ATVET Systems



Source: Adapted from Sarfo, 2013

b. Competitive African Cotton Initiative (COMPACI)⁶

COMPACI offers training/courses on business management for smallholder cotton farmers. The following trainings are carried out in all project countries with the aim to strengthen the capacity of smallholder farmers within the COMPACI program:

- Training in basic agricultural techniques
- Training in conservation agriculture techniques to increase soil fertility
- Training in integrated pest management
- Farmer business training
- Training of female farmers
- Training of pesticide use and handling
- Training of farmers and employees in the cotton gins according to CmiA criteria

The Farmer Business Schools aim to provide farmers with support in making decisions when it comes to managing their farms and empower them with a sense of business. These skills are also transferrable to the private sector. The first courses for smallholder farmers in Burkina Faso began in May 2012 in cooperation with the Faso Cotton Company. The aim was to get at least half of all COMPACI farmers to go to Farmer Business School by 2015.

The curriculum includes the following content:

- Correctly assessing crop fields to better determine the annual demand for inputs
- Identifying suitable foods to ensure children receive quality nutrition
- Income and expenditure planning for agricultural activities and for managing the family budget

⁶ <http://www.compaci.org/en/activities/farmer-business-schools>. Accessed on November 11, 2017.

- Benefits and risks of loans, the need for reserve funds as a prerequisite for loans and for building up capital, the advantages of cooperatives for purchasing equipment and the sale of production
- Estimating market and production risks

c. School of Agriculture for Family Independence (SAFI⁷)

SAFI is an agricultural school located in the Malawian village of Mtalimanja with the mission to help the people of Malawi learn better agricultural techniques to provide for themselves and their families. The Nu Skin Force for Good Foundation, in partnership with local non-profit organizations and civic groups, built the village in 2007 to house 30-40 farmers and their families. Husbands and wives receive education on fish farming, drip irrigation, sustainable farming, forest conservation, tree farming, animal husbandry, nutrition, among other subjects. The children attend primary school. Farmers and their families spend their second year of training back in their respective homes through an extension program, where the farmers implement their new skills. They also teach their children and other farmers in their communities, ensuring self-sufficiency through generations. Since 2009, more than 228 people have been educated at SAFI and the crops yields of alumni have increased by an average of 700 percent.

d. Women in Agribusiness in Sub-Saharan Africa Alliance (WASAA⁸)

WASAA is an alliance of women across the entire agricultural value chains in Sub-Saharan African countries. The focus is on wealth creation and economic independence for women and youth through strong and reliable partnership networks within the agricultural sector. WASAA works with smallholder farmers to address the barriers that limit their competitiveness. WASAA offer registered women farmers access to profitable markets using a technology-enabled market linkage model. Farmers register through a mobile platform at a fee. After registration, they can then engage with WASAA. The aim is to increase farm earnings and profitability. Timely updated messages are delivered to smallholder farmers with stepwise action points on how they can increase their yields. Farmers can send their questions through the platform to a help desk, where they will receive a response within 48 hours. Smallholder farmers registered on the mobile platform also receive training and information on how to improve the quality of their crops. Through their membership, farmers also have access to more profitable markets, because WASAA purchases produce (that meet the desired crop quality) from farmers using Fair Trade policies. WASAA then sells these produce in profitable (domestic and international) markets.

e. Cotton made in Africa (CmiA⁹)

CmiA's works to support participating smallholder farmers to continuously improve their skills in cotton cultivation and therefore create a sustainable foundation for cultivation through compliance with CmiA criteria. Farmers attend training courses organized with partner organizations in which they learn efficient and environmentally friendly cultivation techniques to increase their crop yields, and thus, their income. An important aspect of CmiA's sustainable farming techniques is maintaining soil fertility through crop rotation and creating compost pits to produce organic fertilizer. Other areas of training content are efficient use of rainwater and pesticides.

⁷ https://www.forceforgood.org/ffg/en/projects/school_of_agricultureforfamilyindependencesafi.html.

Accessed on November 11, 2017.

⁸ http://www.wasaa.net/?page_id=268. Accessed on November 11, 2017.

⁹ <http://www.cottonmadeinafrica.org/en/training/agricultural-training>. Accessed on November 11, 2017.

3.2.2 Country-level ATVET Initiatives

a. Alage ATVET College in Ethiopia

Ethiopia's ATVET sector is rather advanced compared to other developing countries'. Ethiopia developed an ambitious plan, the Agricultural Sector Policy and Investment Framework 2010 - 2020, led by the Ministry of Agriculture and Rural Development, and invested considerable resources to build up an ATVET system, which is primarily a public agricultural extension system (FAO 2014). A successful example of the ATVET College in Africa is the Ethiopian Alage ATVET College. Alage College was established in 2002 following governments' decision to promote the national technical vocational education and training. The knowledge and skills attained by the trainees, specifically in agricultural discipline, would fit into the country's transformation strategy. Alage ATVET College comprises 4200 ha of land and it possesses infrastructure and facilities necessary for practical agricultural training. The college has four departments, namely plant science, animal science, natural resources, and animal health. The objectives of the institution are:

- To train development agents (at the middle level college) in the field of animal science, animal health, plant science and natural resource
- To organize practical and demonstration sites
- To increase the income of the college

The college offers a number of short-term trainings such as:

- Improved animal feed and fodder production
- Cooperative development and accounting
- Alternative energy sources and small scale irrigation
- Meat hygiene and control
- Basic computer applications
- Outreach programs

b. Songhai Training Center in Benin

Songhai Training Center is the most renowned private ATVET institution in Benin. It was founded in 1985 to provide training to farmers, skilled farm workers and rural development practitioners. It has a dense collaboration with over 40 public and private organizations and universities. Songhai seeks to train young entrepreneurs who can then contribute to the sustainable development of their communities by creating jobs and thus prevent rural exodus; by ensuring food self-sufficiency of the region and contributing to the well-being of the people who will become more aware of the components of the products they consume; by training other young people willing to work in the field, and who thus contribute to the education of the youth of their village; and by providing services such as electricity and gas for all. The training is open to anyone who wishes to receive or to deepen his/her knowledge in the field of agricultural entrepreneurship. The duration and the cost vary depending on the program. A framework has also been created to monitor and support some trainees after program completion, particularly young women, who can benefit from micro-credit to culture and set up their farms.

Songhai Centre has expanded its activities not only in Benin but has been replicated in 14 other African countries. It encompasses practical and entrepreneurial curricula. A success factor is the cascading information transfer and teaching system that creates a large number of farmer resource persons; each trained graduate is encouraged to train another five farmers. "The implementation of the Songhai

model was a success also because its application is combined with the entrepreneurial capacity focused on personal leadership of its Director. The later provides training to ‘change the mind-sets’ towards entrepreneurship, and encourages the use of local resources, the combination of traditional and modern agricultural practices, technology adaptation and diversification of activities. The trainers are paid through a performance-based management model” (Vodouhe & Zoundji 2015).

c. The Faraja Latia Resource Center Ltd in Kenya

The Faraja Latia Resource Center runs an agribusiness apprenticeship in Kenya. The apprenticeship program runs for six months and is structured as a practical training, targeting the youth who have graduated from high school and post-secondary training institutions. The practical training is offered at Latia Model Farm and in a diverse mix of collaborating farms and agribusinesses in Kenya. 70 percent of the time is spent working in the model agribusiness enterprises and 30 percent in classrooms studying theoretical concepts. Upon completion, apprentices receive a nationally recognized Certificate of Competence. The Centre also provides short courses at Latia Model Farm or onsite at clients’ farms and agribusinesses. The courses cover topics in production, marketing, value addition, labor management, farm financial management, agribusiness investments planning and analysis, certification etc.

d. Leventis¹⁰ foundation ATVET training in Nigeria and Ghana

The Leventis Foundation was established in 1979 in Ghana and Nigeria with the goal of training young farmers in modern agricultural methods. This goal is in line with the governments’ emphasis on self-sufficiency in food production. To date, nine schools have been established in Nigeria and Ghana which specialize in innovative ways of training small scale farmers to improve productivity, efficiency and environmental sensitivity, taking advantage of the latest national and international research.

The trainees spend a year at the schools and thereafter, upon returning to their farms and communities, are advised and supported by the schools’ extension programs. They transfer their skills to other farmers in their area by way of example, while the schools organize short training courses and farmers’ field days for the surrounding communities. Training activities are similar in all Leventis Foundation agricultural training schools and are directed towards skill acquisition and capacity building in agriculture and agro-allied businesses by adopting an integrated approach. To achieve this aim, the training is structured to be 80 percent practical and 20 percent theoretical. There are four technical departments in the schools:

- Crop production and Agroforestry
- Animal production
- Rural Enterprise Development
- Agricultural Engineering

This is achieved through yearly recruitment of youths (18 to 35) to participate in training on modern general agriculture. Each of the schools have the capacities to admit 100 to 150 trainees (male and female) per year. All trainees receive board and lodging, school and work uniforms free of charge including monthly stipends. As of 2015, more than 7,000 youths participated in the one-year regular training from the foundation in Nigeria. The eligibility criteria include: be physically fit; ability to read and write in English; 18 to 35 years of age; and pass both written and oral entrance examination.

¹⁰ <http://leventisfoundation.org.ng>. Accessed on November 1, 2017.

The foundation also provides technical backstopping through:

- Provision of improved seeds
- Short courses to address farm problems and acquaint them with new and relevant information and technologies
- Linkage to input sources and output markets
- Farmers field days

e. ATVET experiences in Zambia

ATVET in Zambia is organized in two levels: the continuing professional training and the life-long learning at the grassroots level for farmers.

i. Continuing professional training

Several institutions offer post-secondary ATVET with diploma and certification qualifications in different branches of agriculture under the Ministry of Agriculture and Cooperatives. A number of them target industry-specific needs in order to meet the dynamic demands of the labor market. They include:

- The Natural Resources Development College, which offers 3-year diploma programs in agriculture (with majors in animal science, crop science, and agricultural business management), fisheries, agricultural education, agricultural engineering, water engineering, and food and nutrition. The college was established in 1967. The college also offers a 4-year diploma in horticulture in partnership with Zambia Export Growers Association.
- The Zambia Colleges of Agriculture in Monze and in Mpika provide training for key-front line agricultural extension agents through a 2-year certificate program.
- Commodity-based training institutions such as the Popota Tobacco College, the Zambia Horticultural Training Center, the Palabana Dairy Training Institute, the Cooperatives College, and the Kalulushi Farm College for school dropouts offer trainings for individuals wanting to venture in entrepreneurship or work in commercial farms.
- Katete Centre for Agricultural Marketing and the In-Service Training Trust, provide competitive short in-service agricultural training.

ii. Life-long learning at grassroots level for farmers

The national agricultural extension directorate under the Ministry of Agriculture and Cooperatives is responsible for extension and training services to farmers, especially in the rural areas. NGOs and other private organizations are also involved in the training of farmers. Extension staff and agents are stationed at the district Farmers' Training Centers, and the National Agricultural Information Services provides non-formal training through TV and radio programs (Alluri and Zachmann 2008).

4 Conclusions and policy recommendations

The importance of TVET in addressing present and future challenges for human capacity development in Africa is increasingly being recognized. TVET in particular must be tailored to meet the needs and demands in agriculture and contribute to growth and sustainable development. While the analysis of the current state of TVET in Africa shows that pan-African initiatives through the CAADP, as well as regional strategies and plans are already established, TVET in Africa is limited by many factors. They include but are not limited to: the marginal attention it receives and consequent weak integration into the general TVET system; the lack of a strong network involving all stakeholders from the agricultural sector (farmers, trainers, public and private actors); the lack of resources dedicated to TVET; and the negative perception of TVET professions and employment prospects upon completion of training.

When developing an TVET curriculum, the focus should be not only on key priority areas that can gainful employment to both youth and adults, but the development needs of rural areas should also be considered. This can be done by diversifying agricultural production or markets, further developing the manufacturing or services sectors, and promoting private sector development. This calls for a larger focus on the development of technical skill trainings in both agricultural and non-agricultural sectors in rural areas. Effective TVET must widen the coverage and refine the quality of the skills and competencies students obtain. This would improve the productivity of women and men and youth, stimulate income growth in the informal sector, and increase their human capital, thus improving their prospects of finding decent work in the formal sector. It is thus important that TVET take a more entrepreneurial approach – combining both technical and business skills – for poverty alleviation and economic development in rural and marginalized areas.

A review of TVET experiences at the individual country level shows a set of commonalities and differences between countries. There is a trend of increasing involvement by both the public and private sectors in TVET, despite national government institutions and ministries carrying out most of the responsibilities and managing the system. Many countries have already (or are in the process of) putting standards and curricula in place and are working toward integrating TVET in national and rural development plans and strategies. Through the NEPAD-CAADP TVET project, most countries in Sub-Saharan Africa are undertaking TVET system assessments to determine the needs of the trainees and the demands of businesses and industry, and the most effective ways to boost human capacity development. Most of the publicly run TVET centers have inadequate physical and human resources. Differences in TVET systems between countries are evident: Some countries are more advanced than others in the implementation of an effective TVET system (Ethiopia's is considered to have some of the best practices in Africa). Some of the older TVET schools, such as Alage in Ethiopia and Songhai Training Center in Benin, have dense network of collaborators rather than newly established centers.

It would be possible to develop TVET systems that take into consideration the input of both public and private players and that consider the present and future demands of society, and merge education, training, knowledge development and skill-enhancing techniques. Such systems must leverage new and innovative techniques to bolster agriculture in the TVET systems or create completely new ones. The system should also provide incentives to encourage the private sector to participate in the development of TVET skills and should further adapt to emerging trends in innovative training delivery systems. The TVET system should transform training into an entrepreneurial and professional system that will improve the skills of farmers and attract more youth into agriculture. More importantly, the new systems should borrow from and adopt models that have proved to be effective in other regions or countries, such as the German dual system. The success of the German dual system is attributed to its broad qualification structure, which offers high quality education and viable employment prospects for youth, coupled with a high degree of engagement of all stakeholders, a well-financed and balanced structure via the private and public sectors, and well-developed and institutionalized capacities. Therefore, policy reforms and national strategies that incorporate these features in national VET systems can prove beneficial for African nations.

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Annex I: Individual country experiences with ATVET in Africa

Benin

TVET in Benin represents 3% of the state education budget and less than 5% of secondary level staff. Benin's ATVET institutions have increased significantly in number since 2008. There are three secondary level Colleges of Technical Education, CETA, and other private and public high schools that provide ATVET training to students. The curriculum of CETA schools consist of 25% of theoretical courses and 75% of practical teaching. The ATVET schools mainly train future farmers, skilled farm workers and rural development practitioners. The country's most renowned private ATVET institution, the Songhaï Training Center, was founded in 1985. See section 3.2.2 for further details.

The NEPAD-CAADP project in Benin identified two value chains, namely rice and meat (poultry, pork and goat meat) as the most promising based on economic analyses and availability of employment opportunities. Teaching staff from three training institutions received competency-based training and corresponding occupational standards trainings in these two value chains. In addition, three market-oriented vocational training standards curricula were designed for initial formal and in-service training. In 2015, 61 students, of which 18 were female, were trained.

Although the country already had a general national policy of TVET through the Ministry of Labour and Public Employment, ATVET was not initially recognized and prioritized. After a review process, however, ATVET was included in the National Qualification Framework. The national stakeholders in agriculture, including the National Regulatory Institution, Ministries of Education and Agriculture, other training institutions, the private sector and practitioners, were involved in implementing ATVET. Through these efforts, short and long-term trainings have been created and initiated.¹¹

Burkina Faso

A study by the Ministry of Youth identified 29 agricultural training centers spread throughout the country in almost all regions, although there is some disparity within regions. For example, the Central West region has seven agricultural vocational training structures, followed by the Center region with four, and Central North and Hauts Bassins regions, each with three structures. The rest of the seven regions have one or two agricultural vocational training structures each. All agricultural vocational training centers are located in the provincial capitals. According to the classification of agricultural training centers, the study revealed four types of agricultural centers.

65.5 % of agricultural training structures are vocational training centers. This large proportion could be explained by the flexibility of the conditions of access to these training structures. Applicants for training at these centers are not required to have a diploma at the secondary or higher level and may come from an agricultural or any other background. Secondary technical schools providing agricultural training represent 17.2% of all ATVET institutions, followed by institutions of higher technical education (tertiary colleges) at 10.3%. Private professional colleges constitute about 6.9%. Furthermore, depending on the size of the center or the size of the demand for field training, some centers have expanded. Thus, 24.1% of the registered structures claim to have at least one annex as opposed to the majority, which have only headquarters (Ministère de la jeunesse, de la formation professionnelle et de l'emploi & PNUD n.d.).

Thanks to the promotion of ATVET with the support of the CAADP since 2014, 14 trainers and training center managers were trained, and entrepreneurship modules were developed. Over 200 youth, including 80 females, were trained on entrepreneurship, and the development of a business plan

¹¹ <http://www.nepad.org/nepad-on-the-continent?nid=846&programme=1>. Accessed on November 24, 2017.

based on the *Bauern-Unternehmerschulung* approach¹². In addition, leading structures such as the *Direction Générale du Foncier, de la Formation et de l'Organisation du Monde Rural* received support in their work in ATVET, and a paper advocating the integration ATVET into the national strategies of the National Program of the Rural Sector was prepared.¹³

Cameroon

Since 2005, specific ministries and sub-systems have spearheaded the reform of agricultural and rural training in Cameroon, which include: The Ministry of Agriculture and Rural Development (MINADER) and the Ministry of Livestock, Fisheries and Animal Industries (MINEPIA), the Ministry of Secondary Education, the Ministry of Employment and Vocational Training, the Ministry of Higher Education (FAR 2012).

MINADER agricultural training comprises nine Technical Schools of Agriculture, six training schools (see details below), 3 Regional Agricultural Colleges, 35 farmer training centers, 24 Rural Training Centers and 11 Young Farmers Training Centers.

The six schools are:

- 3 Training Schools for Community Development Specialists (EFSDC),
- 2 Training Schools for Cooperation Specialists (EFSC),
- The School of Training of Specialists in Rural Equipment and Facilities (EFSEAR).

The three regional agricultural colleges prepare students for the Higher Technician and Technician of Agriculture diplomas (ca. bachelor's degree). The nine technical schools of agriculture prepare students for the Diploma of Technical Agent of Agriculture. The three EFSDCs and the two EFSCs train technicians in the areas of community development and cooperative management. EFSEAR trains technical staff in rural facilities management. These establishments trained an average of 500 young executives and rural development officers per year for a period of two years.

Young Farmers' Support Program: This program based at MINADER aims to contribute to reinvigorate farmers and modernize farms. It aims to increase agricultural productivity through the development of young farmers' capacities and responsibilities. The latter can benefit from support with settling on their own land or on sites serviced by the state. Six sites (Wassandé, Nlobesse, Gnibou, Foossong Ellelem, Obis, Ikiliwindi, Ngyen-Mbo) were created in six regions. The recruitment of young people takes into account their age (18 to 35 years), educational level (minimum of the primary school certificate) and capacity to adapt. The impact of this program, which is still weak, shows that 260 projects by young people and groups of young people were implemented, 15% of them women, receiving funding of one million CFA francs per project.

In 2006, MINEPIA had 16 specialized centers as follows:

- 4 for cattle, two for small livestock and two for livestock,
- 4 for fishing, two for traditional and two for inland fisheries,
- 8 in aquaculture.

Training lasted from one to three months. MINEPIA also had three national zootechnical, veterinary and fisheries training centers that prepare higher technicians and technicians (veterinary nurse, livestock technician, fishery technician and aquaculture technician) and other professionals, such as assistant veterinary nurse, assistant livestock technician and assistant aquaculture technician.

¹² See <https://goo.gl/cHgDLm> for more details (Accessed on November 28, 2017).

¹³ [http://nepad.org/nepad-on-the-continent?nid=846&Country=Burkina Faso&cid=1974A](http://nepad.org/nepad-on-the-continent?nid=846&Country=Burkina+Faso&cid=1974A) Accessed on November 11, 2017.

Additionally, Cameroon has eight state universities, four of which have training programs related to the agricultural and rural sector: Dschang, Ngaoundéré, Maroua and Buéa. Of all these institutions, the University of Dschang has a prominent position because it houses the Faculty of Agronomy and Agricultural Sciences, the oldest and best structured for the training of senior managers of agriculture and rural development. The main degrees currently offered after the high school Baccalaureate of Sciences are:

- Higher technicians in agriculture (4 semesters);
- Production engineers or professional license (6 semesters);
- Design Engineer or Professional Master (10 semesters);
- Master of sciences (4 semesters);
- Ph.D. (6 semesters after the Master of Sciences).

Several initiatives to support the socio-professional integration of young people have been launched by MINJEUN. These include:

- The Multifunctional Centers for the Promotion of Youth;
- The Rural and Urban Youth Support Project;
- The National Civic Service of Participation in Development.

At the private level, Family Farm Schools and the Family and Rural Schools created in the 1990s, and Rural Family Houses exist to provide training to rural people for their social and professional integration.

Ethiopia

Ethiopia's ATVET is considered to have some of the best practices in Africa. Through the Agricultural Sector Policy and Investment Framework 2010-2020, led by the Ministry of Agriculture and Rural Development (MOARD), the country invested significant resources to build an ATVET system. Before ATVET was introduced, only universities offered training in agriculture. However, by 2000, the Ministry of Agriculture introduced ATVET in 27 colleges' curriculum. Currently, five federal and 20 regional colleges provide a three-year training program for development agents. The program admits students that have completed their general education (up to grade 10) in the national system for two years in school and a year-long apprenticeship. The curriculum is 30% theory and 70% practice.

Upon completion of their training, development agents are placed in farmer training centers to support farmers that do not have access to formal learning. The development agents are also assigned to promote modern agricultural practices in rural areas with close technical guidance and to encourage farmers to use location-specific modern agricultural inputs. Regional ATVET colleges are responsible for designing their own program based on training needs and the labor market. Furthermore, ATVET graduates must undertake competence assessments. However, the majority of development agents at the district level still lack the practical skills to effectively assist farmers. Data from 2010 show that 62,764 development agents were trained and 8,489 farmer training centers were created (Walker and Hofstetter 2016 citing Davis 2010). In 2012, 25,000 development agents trained 400,000 farmers and reached more than 2 million farmers in 2013 (Walker and Hofstetter 2016 citing FAO 2014).

The Ministry of Education is responsible for the design of the occupational standards and qualifications (2016).

A successful example in Ethiopia is Alage ATVET College. Alage college was established in 2002 following the governments' decision to promote the "national technical vocational education and training" program; the agricultural knowledge and skills obtained by the trainees would fit into the

country's transformation strategy. Alage ATVET College is situated on 4200 ha of land and it possesses infrastructure and facilities required for practical agricultural training. The college has four departments, namely plant science, animal science, natural resource and animal health. The objectives of the institution are:

- To train development agents at the middle scale level in the field of animal science, animal health, plant science and natural resource
- To organize practical and demonstration sites
- To Increase the income of the college

Ghana

Through its CAADP structures and processes, Ghana incorporated ATVET into its National Medium-term Agriculture Sector Investment Plan. Within this framework, six ATVET institutions were selected after a stocktaking exercise for areas of potential in human capacity and organizational development. Based on a need assessment, training for important skills required in the citrus and pineapple value chains were integrated into the new ATVET curricula. Private and public stakeholders were closely involved in the process, and training materials were developed with a competence-based training approach. These were introduced at three public and one private pilot institutions.

The training institutions are supposed to prepare their trainees to venture into agribusiness and agricultural enterprises along the value chain, from production, processing to marketing. The institutions' curricula however have to be recognized by the Ghanaian Council of Technical and Vocational Education and Training in order to align with the National Qualification Framework. Ghana has established a TVET National Qualification Framework by law, with the goal to obtain accreditation for ATVET at the selected institutions. About 382 trainees, including farmers, have received training in the revised curricula of the citrus and pineapple value chains, which includes training of the trainers in postharvest handling and the internal verification of competency-based training.¹⁴

Kenya

Kenya, with the help of GIZ's ATVET project, has been undertaking reforms of TVET in the agricultural sector and in close cooperation with major stakeholders, such as farmer associations, training providers, development partners, government institutions and the private sector. The ATVET training needs assessment considered horticulture, dairy and aquaculture value chains. Capacity building pilot training programs for trainers were conducted on topics such as contract farming, value chain development, good agricultural practices and aquaculture. The institutions involved in this pilot program include the Dairy Training Institute, the Bukura Agricultural College, and several polytechnics in the counties, the public Kenya School of Agriculture, Baraka Agricultural College, and the private Faraja Latia Resource Centre.

In 2015 alone, 416 trainers underwent training at various stations in the following fields: contract farming, 30 participants; value chain development, 60 participants; good agricultural practices, 40 participants; cage farming in aquaculture, 10 participants; Competency-Based Education and Training methodology, 276 participants. In total, 318 farmers¹⁵ were trained in the following fields: agripreneurship training by Faraja Latia, 80 participants; vegetable processing by Kenya School of Agriculture, 25 participants; fodder production and conservation and dairy milk quality control and

¹⁴ <http://www.nepad.org/content/agriculture-technical-vocational-education-and-training-atvet-ghana-0>.

Accessed on November 1, 2017.

¹⁵ The training was targeted at farmers.

processing by the Dairy Training Institute, 30 participants; dairy and horticulture modules in Kakamega County in Western Kenya, 100 youth; dairy production and processing skills in Bungoma County, 58 participants.¹⁶

Malawi

Malawi's NEPAD-CAADP ATVET process started in 2014. This began with a mapping of the status of the ATVET system and the identification of relevant actors and institutions to carry out the NEPAD-CAADP ATVET project. The stakeholders identified the following institutions to be relevant and effective for ATVET education provision:

- The Technical, Entrepreneurial and Vocational Education and Training Authority
- The National Council for Higher Education
- Public ATVET institutions
 - Malawi College of Fisheries
 - Community Colleges (Naminjiwa, Mponela, Mbandira Ngara)
 - Residential Training Centers (Lisasadzi, Thuchira)
- Private ATVET institutions:
 - Development from People to People Mikolongwe Vocational Training School
 - Stephanos Vocational Training Centre
 - St John's of God Institute of Vocational Training
- Private Sector and National Employer and Employee bodies such as
 - The Employers Consultative Association of Malawi
 - The Malawi Confederation of Chambers of Commerce and Industry.

The mapping also provided a starting point for two studies on the skills needed by the ATVET institutions and their organizational capacity to train farmers and other value chain actors. Through these studies, two value chains in horticulture (mango and pineapple) and one in aquaculture were selected. The process of curricula and occupational standards development has been initiated, and an orientation on competency-based education and training has been completed, with the aim of preparing participating institutions for effective implementation. There are also plans to integrate ATVET in Malawi's National Agricultural Investment Plan and Qualification Frameworks to ensure its systematic implementation.¹⁷

Mali

ATVET in Mali is organized as follows:

A. Secondary Agricultural Training Institutions

i) Public establishments

¹⁶ <http://www.nepad.org/content/agriculture-technical-vocational-education-and-training-atvet-kenya-0>. Accessed on November 1, 2017.

¹⁷ <http://www.nepad.org/content/agriculture-technical-vocational-education-and-training-atvet-malawi-0>. Accessed on November 21, 2017.

They include, among others, three Agricultural Learning Centers, the Sotuba Practical Livestock Training Center, the Tabakoro Practical Training Center in Forestry, and the Professional Training Institute Malick Sidibé. The Institute of Vocational Training Malick Sidibé (IFPMS), former Lycée Technique Agricole de Koutiala, is currently the only public school for secondary agricultural training under the supervision of the Ministry of Education. Launched in March 2004, IFPMS in Koutiala replaced the Lycée Agricole, which opened its doors in 1986. IFPMS Koutiala's mission is to provide initial training in technical and vocational fields. The vocational training institute receives, on a simple basis of academic orientation, the holders of the fundamental studies diploma, DEF, after 9th grade. Students between 16 and 17 years of age enter the “Brevet de Technicien” cycle and those over 17 years of age are referred to the “Certificat d’Aptitude Professionnelle” (Coulibaly 2006).

ii) Private Institutions include:

- The Agro-Pastoral Training Center of Bamako, created in 1986 and located in the district of Bamako
- The Agro-pastoral Center of Ségou created in 1999 and located in the town of Ségou
- The Center for Professional Training for the Promotion of Agriculture in the Sahel of Gao, established in 1999 and located in the city of Gao
- The Kita Polytechnic Rural Training Center, established in 2000 and located in the town of Kita.

These establishments provide four years of training to prepare the students who hold the DEF for the Agropastoral Technician's Certificate, called “Brevet de Technicien Agropastoral”. The Ministry of National Education, through the National Directorate of Technical and Vocational Education and the National Center for Education, determines the contents of the programs and defines the teaching methods (Ibid).

B. Higher education (tertiary) institutions

Public institutions include:

The Rural Polytechnic Institute of Training and Applied Research (IPR/IFRA) of Katibougou, devoted exclusively to agro-sylvo-pastoral training. IPR/IFRA's missions are: initial training of senior technicians in the fields of agriculture, livestock, water and forests and rural engineering; initial training of agricultural engineers, agro-economists, zootechnicians and water and forest engineers; the promotion of scientific and technological research; the continuing training of rural development managers and young graduates wishing to set up their own businesses in the rural sector; and the training of rural communities. In accordance with its missions, the IPR/IFRA offers three degrees: (1) the advanced technician program open to holders of the high school baccalaureate (biological and natural sciences series) or the diploma of an old regime technician of the IPR, (2) The engineering cycle (in agronomy, zootechnics and waters and forests), open to the holders of the Diploma of General University Studies (DEUG) or the Diploma of Technologies for a three-year training course, and (3) a Master's degree in Agricultural Extension, open to extension professionals holding the Diploma of Technician, for a four-year training.

The Higher Institute of Applied Training and Research, created in 1981, is a public institution attached to the University of Bamako and placed under the supervision of the Ministry of Education. It offers post-graduate training (Advanced Studies Degree, Advanced Specialized Studies and Doctorate Degree) in the fields of environment, soil sciences and plant protection. The duration of the training is 2 years for obtaining the advanced studies degree and the advanced specialized studies and doctorate degrees and 4-5 years for the doctorate for the holders of the degree of advanced studies (Coulibaly 2006).

Private schools: The Mandé Bukari University, a private institution of higher education, was founded in 1999. It offers university degrees, such as the DEUG, in natural sciences in 2 years after the baccalaureate, and agronomist, zootechnician and forestry technician degrees in 3 years after the DEUG. It also provides postgraduate training such as the degree of advanced studies in 2 years after

the master's degree and doctoral degrees in environment, rural sociology, rural economy and food technology in 3 years after the degree of advanced studies (Ibid).

C. Formal rural and continuous training

Rural Animation Centers: These centers were set up to train young farmers. They were born from the merger of the Civic Service and the seasonal schools. Placed under the supervision of the Ministry of Agriculture, there are 53 of them, including 12 Mixed Rural Animation Centers for young couples and 41 for single young men. Each center has 20 spaces, amounting to a total theoretical capacity of 1,300 spaces and provides two years of practical education, which includes literacy, agriculture in practice, livestock, and craft service. In mixed centers, wives (who accompany their husbands) also receive specific training in the conservation and processing of agricultural products, nutrition, hygiene and family planning.

In-service training of producers and supervisory and agricultural extension staff: The continuous training of producers and management staff on how to increase production and productivity is mainly provided by the government's central departments that are responsible for agriculture, fisheries, environment and sanitation, and by their decentralized structures at the regional and local level, as well as by rural development projects and programs. These structures usually operate through their agricultural extension network, most of which is structured at the operational level (basic sectors and zones, etc.). NGOs also play a major role; they are involved in the ongoing training of producers and field workers. Continuous training of producers is generally short-term so as not to keep the beneficiaries from their activities. Apprenticeships are provided to local producers on field-farms, livestock parks, bee-keeping areas, agro-forestry plantations, and other areas of agricultural production (Ibid).

Nigeria

A. Agricultural Education in Primary Schools

Agricultural science is taught in the curriculum to primary school students with the following objectives:

- Encourage children to develop a positive attitude and interest in agriculture and make them aware of agricultural issues;
- Expose the children to modern methods of agriculture;
- Help the pupils understand the importance of agriculture for the economy and their community;
- Develop their interest in creative activities;
- Enable them to understand their environment in a scientific way.

Agricultural education in primary school is mainly theoretical. The children learn about plants, insects and the environment surrounding their schools, but they do not gain a deeper understanding of agriculture (Agbulu and Wever 2011).

B. Agricultural education in Secondary School

Agriculture has been part of secondary school curriculum since 1967 in a 6-3-3-4 educational system (6 years in primary school, 3 years in junior secondary school, 3 years in senior secondary school, and 4 years in university). It was made a core subject at both junior and senior secondary school levels. With the reform of the system to 9-3-4 (9 years in primary school, 3 years in 9 secondary school, and 4 years in university) under the new universal basic education, agriculture is now an elective subject. The objectives of the subject are:

- To cultivate and maintain students' interest in agriculture;

- To help students gain basic theoretical knowledge and practical skills;
- To help students integrate knowledge with skills;
- To prepare students for further studies in agriculture;
- To expose students to occupation in agriculture;
- To prepare students for opportunities in the field of agriculture (Agbulu and Wever 2011, p. 30).

The emphasis on learning-by-doing in the objectives for teaching agriculture in secondary school is, however, challenged by the fact that funds and facilities (laboratory experiments, farm field activities) required for skill training are almost non-existent or hardly accessible. This makes agriculture a theoretical subject with little real application for students.

C. Agricultural Education in Colleges of Education

Colleges of education in Nigeria are institutions that provide training for students pursuing careers as teachers. Agricultural education programs offered at these colleges extend over a three-year full course with high academic and professional content. According to the National Commission for Colleges of Education's (NCCE) minimum standards (2002), these programs are designed to achieve the following objectives:

- To prepare teachers with the right attitudes towards vocational agriculture, as well as the necessary knowledge and professional competencies;
- To produce teachers who will be capable of motivating pupils to acquire interest in and aptitude for agriculture;
- To empower the teacher with the agricultural information required to teach students in a way that is relevant to their environmental context;
- To equip the teachers with adequate knowledge and ability to establish and manage a model school farm effectively;
- To provide a sound background to enhance further academic and professional progression of the teacher (Agbulu and Wever 2011, p. 33).

In order to provide quality agricultural education, the colleges of education require well-equipped facilities (laboratories for crop, soil, and animal studies; libraries; student farm plots; experimental plot; livestock; fish pond; etc.), as stressed by the NCCE's standards.

D. Agricultural Education in Colleges of Agriculture

Colleges of agriculture produce junior and senior technicians who will carry out training programs at the National Diploma and Higher National Diploma levels. Colleges of agriculture have the following objectives:

- To produce knowledgeable personnel in adequate numbers to be effective in technology transfer at the farmer level;
- To equip the trainees to function efficiently in the ministries, research institutions and similar organizations;
- To equip the trainees with adequate knowledge to understand various technologies so as to be able to adopt, utilize, demonstrate and transfer the technologies;
- To prepare the trainees for farming as a career (Agbulu and Wever 2011, p. 34).

The subjects taught include crop and animal husbandry, general agriculture, soil and water conservation, irrigation engineering, agronomy, agricultural mechanization, forestry, fisheries and wildlife, animal health, home economic/food technology and laboratory technology (Ibid).

E. Agricultural Education at Vocational/Farm Institute Level

Farm institutes, training centers and extension work stations provide training to agricultural instructors that will carry out government development programs at the grassroots level. The main skills they acquire include basic knowledge of agriculture and agricultural production (Ibid).

Togo

The CAADP ATVET project in Togo started in May 2014 and has achieved the following outcomes:

- Participants in a stakeholder analysis identified the rice and aquaculture value chains as the ones with the highest potential to employ youth.
- A training plan that meets labor market and job requirements and the development of specific competency-based curricula in the rice and aquaculture value chains was developed. In addition, the project plans on training trainers in order to enable them to master the new courses and train others.
- A list of formal and informal training centers was compiled, and two pilot centers (Infa de Tové and Centre International pour le Développement Agro-Sylvo-pastoral) were identified to test the new curriculum.
- A national ATVET strategy was developed with the participation of stakeholders.

As a result, 13 jobs were created along the rice value chain and 10 in the aquaculture value chain. Furthermore, about 150 students have been trained in the entrepreneurship courses, according to the “Competency-based Economies through Formation of Enterprises” approach. Approximately 206 rice producers have also been trained in the Farmer Business School. 30 women have been trained in rice boiling technology. The training focused on modules related to entrepreneurs and their markets, innovation and operation, and the development of the enterprise.¹⁸

Tunisia

In Tunisia, the Agricultural Extension and Training Agency (AVFA) is a public administrative institution under the authority of the Ministry of Agriculture. It oversees the implementation of programs related to economic and social development plans, mainly in the field of training and extension.

In the field of agricultural vocational training and fisheries, AVFA is responsible for the development and monitoring of programs and all activities related to initial and in-service training. The AVFA is also responsible for programs to upgrade training institutions in order to enable them to meet the needs of the labor market. AVFA oversees 39 training institutions that are spread all over Tunisia (at least one institution per governorate). They offer various courses in the field of agriculture and fisheries.

The public agricultural and fisheries vocational training system in Tunisia includes:

- A central body responsible for the implementation of the national policy on vocational training.
- A support body: the National pedagogical and in-service agricultural training institute in Sidi Thabet whose missions are:
 - Technical and pedagogical training of trainers and extension workers,
 - The development and updating of benchmarks and training programs,
 - Educational assistance to centers.

¹⁸ <http://www.nepad.org/nepad-on-the-continent?nid=846&programme=1> . Accessed on November 18, 2017.

- 39 training institutions spread over all governorates (at least one institution per governorate) to bring the training closer to the beneficiaries. These centers are comprised of:
 - 9 Sectoral Centers (of which 1 is in the field of fisheries). They constitute a reference for vocational training centers and businesses in the sector.
 - 30 Multipurpose Centers (including 7 in the field of fishing)

The 39 institutions have a total capacity of 2100 training positions with a staff of 282 permanent trainers.

The training system offers two types of training:

Initial education for four different levels (Competence Certificate, Certificate of Professional Competence, Diploma of Vocational Technician, and Advanced Technician Diploma):

- The training is 75% practical and 25% theoretical
- Training is provided either on a full-time basis in training school with an internship in a professional setting, or alternating between the school and agricultural enterprises or through apprenticeship in the workplace.
- The content of the programs and the organization of the training are defined in consultation with the representative professional organizations.
- The average number of trainees in the centers is about 1500 learners per year.

In-service training

A program aimed at improving the skills of farmers, fishermen (and their sons) was established in 1998. This has also allowed young people to set up their own businesses or to seek out new jobs.

- Field work was carried out to identify the skills needed by enterprises in agriculture and fisheries.
- The results of this work were used in the development of the programs, thus enabling the training offer to be organized accordingly.
- The programs are developed in close collaboration with the professional and administrative structures involved in the sector.
- Modules developed are implemented in the centers and/or in the farms.
- Training is conducted in the form of training sessions with technical demonstrations or results on the site of a pilot facility, or on a farm offering the most appropriate support.
- The duration of the training varies according to the target group from 8 to 15 weeks (4-5 days per week). The rest of the time, the farmers will continue their activities on their farms.

The average annual number of beneficiaries of continuing training is around 17,000. Some training activities are shared with other specialized actors (offices, sectoral inter-branch groups, technical centers, technical departments of the Ministry of Agriculture and higher education and research institutions, etc.).

In 1995, Tunisia joined a free trade area with the European Union and obtained financial and technical support from the French Development Agency, the World Bank and the European Union for its program for reforming training and employment. The main originality of this reform lies in the choice of partnership with the professional branches as a systematic framework for its implementation. Through this program, eight centers, including two in fisheries, received physical and technical

resources. In addition two agricultural training schools received support to achieve the ISO 9001 quality management system certification.¹⁹

Zambia

ATVET in Zambia is offered at different levels, including at the university (degree, diploma), secondary and primary schools as well as at grassroots level.

A. Agricultural education at primary and secondary schools

The curricula of primary and secondary schools contain modules in agricultural sciences. Primary schools teach agriculture as part of environmental science, and pupils, particularly in rural areas, tend to school gardens, which equips them with basic farming skills. Agriculture is offered as an optional subject in secondary schools. In this course, students participate in School Production Units. Students carry out projects on a given topic, and are generally taught by teachers holding at minimum a diploma in agriculture (Alluri and Zachmann 2008).

B. Agricultural education at the university

The School of Agricultural Sciences at the University of Zambia was founded in 1971 and offers a five-year B.Sc. degree with majors in agricultural economics and extension, animal science, crop science, land management and food science and technology. The School of Veterinary Medicine founded in 1983, extended the agricultural subjects options at the university to include a six-year undergraduate degree in Veterinary Medicine. Students initially enroll in the School of Natural Sciences and are directed in their second year to one of the two schools. The two schools also offer master's degrees in veterinary medicine and agricultural sciences with majors in agronomy and animal sciences. The first year is spent learning the program content and the last year is dedicated to research. The program in agronomy attracts students from the Southern African Development Community region. The School of Agricultural Sciences started offering in-service training in 1990 in order to help stakeholders in the agricultural sector (extension and research personnel, farm managers, land use planners, farmers, etc.) benefit from recent developments of the sector (Ibid).

C. Life-long learning at grassroots level for farmers

The national agricultural extension directorate under the Ministry of Agriculture and Cooperatives is responsible for extension and training services to farmers, especially in the rural areas. NGOs and other private organizations are also involved in the training of farmers. Extension staff and agents are stationed at the district farmers' training centers, and the National Agricultural Information Services provides informal training through TV and radio programs (Alluri and Zachmann 2008).

¹⁹ <http://www.eapcriptpaca.educagri.fr/tunisie-formation-professionnelle-agricole-c249.html>. Accessed on November 28, 2017.

Annex II: Agricultural Technical and Vocational Education Training in Germany

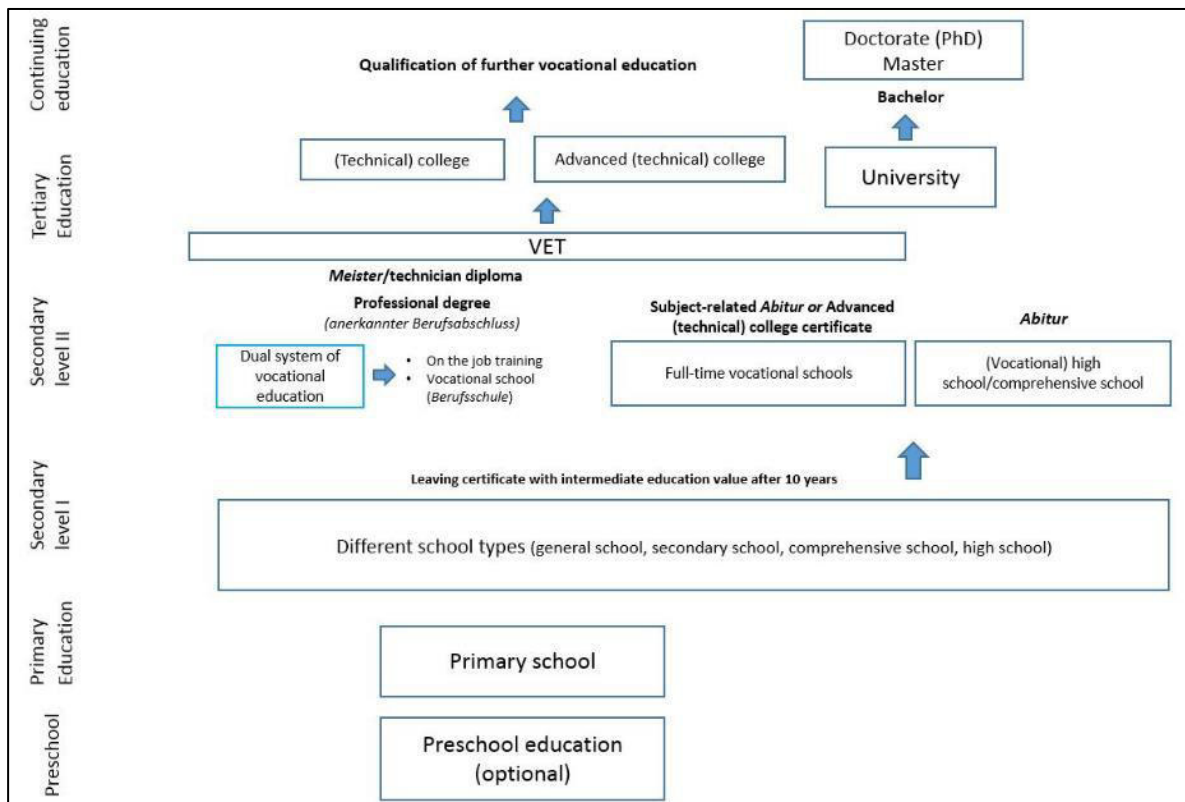
Background information on the organization and governance of education in Germany

The education system in the Federal Republic of Germany is determined by the federal structure of the state. Within the education system, the Federal States of Germany (*Länder*) have the right to legislate in the school sector, the higher education sector, adult education and continuing education (Lohmar and Eckhardt 2015). The regulations of education administration are laid down in the constitutions of the Federal States. The responsibilities of the Federal Government are defined by the Basic Law (*Grundgesetz*) and include different domains of education, science and research. Particular forms of cooperation between the Federal Government and the Federal States, called joint tasks (*Gemeinschaftsaufgaben*), are also laid down in the Basic Law (Lohmar and Eckhardt 2015). Furthermore, different fundamental principles are defined by the Basic Law (e.g. the freedom of art and scholarship, research and teaching). The Federation and the Federal States adopted a joint strategy for lifelong learning (*Strategie für Lebenslanges Lernen in der Bundesrepublik Deutschland*) in 2004. Lifelong learning is an inclusive approach, aiming to encourage learning for citizens of all ages and at all life stages. The strategy includes a variety of development focuses, such as inclusion of informal learning, adoption of new learning cultures, learning counselling, and fair access to education (Lohmar and Eckhardt 2015).

The education system in Germany is divided into early childhood education, primary education, secondary education (secondary level I and II), tertiary education, and continuing education. Compulsory education begins for all children at the age of six and involves nine to ten years of full-time schooling (depending on the Federal State). After four years of primary education, students can follow one of three different education pathways depending on their performance, skills and aims: high school (*Gymnasium*), secondary school (*Realschule*) or general school (*Hauptschule*). Students receive an evaluation for a certain school type by the primary school supervisory authority. Depending on the Federal State, the final decision is taken either by the parents or legal guardian of the child, or the school supervisory authority. Another type of school is the so-called *Gesamtschule*, a comprehensive school which can be attended by any student who has finished primary education. A school degree qualifying to enter higher secondary education (level II), can be obtained after the 9th grade at *Hauptschule* and after the 10th grade at *Realschule*, *Gesamtschule* and *Gymnasium*. Education degrees qualifying for a profession or university education can be obtained after the secondary education level II; attending the *Gymnasium* usually leads to a diploma called *Abitur* which qualifies students for university or for a dual academic and vocational education. Another way to obtain a degree qualifying for a profession or other certificates for tertiary education is to attend a vocational school or the dual system of vocation education (see chapter 4.2). Tertiary education encompasses different institutions of higher education such as universities, colleges of art and music, or technical colleges.

Regarding the education levels of trainees in the vocational training system, in 2012 39% of the trainees with newly concluded dual vocational training contracts had a leaving certificate with general education value (*Hauptschulabschluss*); 42% had a leaving certificate with intermediate education value (*Mittlerer Schulabschluss*) and 24% had obtained an advanced college certificate or a (*subject-related*) *Abitur* before starting a dual vocation education (Lohmar and Eckhardt 2015) Figure 5 presents an overview of the basic structure of the German educational system.

Figure 5: Basic structure of the German education system



Source: Authors' compilation

Higher secondary education: VET in Germany

At the secondary level II, the German education system offers different possibilities to obtain professional or advanced education degrees (see Figure 5). Typically, general school and secondary school graduates enroll in a vocational pathway at the age of 15 or 16. Students at high school generally aim to get their *Abitur* in order to be able to study at university. Full-time vocational schools within the German VET system also offer different ways to obtain a school-leaving certificate to qualify for higher education. At higher secondary schools, students can obtain a subject-related *Abitur*. It allows students to study at universities in specific subject fields. Vocational colleges and technical secondary schools lead to advanced (technical) college certification. From there, students may proceed to advanced colleges. These vocational education pathways lead to professional degrees only after students obtain a tertiary education certificate. On the other hand, the vocational education and training, which is offered by the dual system, leads to a professional degree (*anerkannter Berufsabschluss*) at the secondary education level.

The dual system of VET²⁰

The German VET system is described as dual because the education proceeds at two places of learning: at the workplace at a training enterprise and a vocational school (*Berufsschule*). The general aim of dual vocational training is to teach the trainee skills, knowledge and qualifications within a structured course of training at the vocational school to practice a certain profession. Detailed description of the German dual system in section 2.2 (Box 1). Box 3 presents the history of the dual system in Germany.

²⁰ Unless cited otherwise this chapter is based on/adapted from Lohmar & Eckhardt (2015)

Box 3: History of the German Dual Vocational Educational Training

Germany's dual vocational educational training has roots in Germany's medieval history, when craftsmen's guilds organized the educational process of becoming a journeyman (*Geselle*) and the additional Master (*Meister*) qualification. The vocational educational training remained exclusive to the crafts sector until the 19th century, at which time the system was adopted for occupations in trade. Important milestones are as follows:

1869: First trade regulated act (*Gewerbeordnung*), including compulsory education for minors to improve work-related skills

1897: Amendment of trade regulated act, including supervision of vocational crafts training by chambers of skilled crafts

1895-1914: Improvement of industry-related education in specialized training schools

1920: Introduction of vocational trainings for commercial occupations

1969: Ratification of Germany's "Vocational Training Act" to bundle different (regional) regulations in one federal act.

1969-1990: Modernization of 229 training regulations (of 375 training regulations)

2005: Amendment of the vocational training act (general modernization of vocational training act) Germany's dual VET-system has a long tradition and is constantly revised.

Source: Authors' compilation

VET in the "green sector"²¹

These qualifications end formally with an approved specialist diploma. The higher education pathway is particularly interesting for persons aiming to be qualified for the management of larger farms, agricultural administration, research, agribusiness, and agricultural extension services. Around two-thirds of company leaders and most extension advisors, as well as the majority of trainers of inter-company training units hold a university degree. See section 2.2 (Box 2) for detailed description. Besides the vocational profession of farmer, there are 13 further state-approved vocational professions within the "green sector" in Germany (see Box 4).

The responsibilities for VET in the agricultural sector lie with the State Ministries for Agriculture (in South and Eastern Germany), or the Chambers of Agriculture (in Northern Germany). The duties of these institutions include the selection and approval of training farms, certification of practical trainers, supervision of vocational training contracts, support of farmers and trainees, and the organization of the examinations.

Curricula for VET in the agricultural sector are developed at the basic vocational and advanced (*Meister/technician*) level for each state-approved profession and for both on-farm/in-company and vocational schools. The specific curricula for each profession are developed based on the framework curricula (*Rahmenlehrplan*) which include a description of the field of learning, overall learning objectives and a time frame estimating the class hours to achieve the learning goals. To give an example, the framework curriculum for the basic vocational education of farmers includes the following (adapted from Aenis and Lixia 2016):

- The farm and its relations: functions, resources, internal and external relationships, law regulations, security aspects, environmental aspects, sustainable use of energy and materials

²¹ Unless cited otherwise this chapter is based on/adapted from Aenis & Lixia (2016)

- Working techniques and organization: use of machines, production and marketing, business communication, evaluation of work flows
- Plant production: soils, soil fertility, crops production techniques, cultivation steps, harvesting procedures and techniques
- Animal production: efficient and sustainable husbandry, use of animals, ethical aspects

Box 4: State-approved vocational “green professions” in Germany

- Animal breeding specialist (*Tierwirt/in*)
- Crop technology specialist (*Pflanzentechnologe/in*)
- Dairy technology specialist (*Milchtechnologe*)
- Distillery specialist (*Brenner/in*)
- Farmer (*Landwirt*)
- Fish farm specialist (*Fischwirt/in*)
- Forest management specialist (*Forstwirt/in*)
- Home economics specialist (*Hauswirtschaftler/in*)
- Laboratory technician for dairy (*Milchwirtschaftlicher Laborant/in*)
- Ranger/hunter (*Revierjäger/in*)
- Specialist for agricultural services (*Fachkraft Agrarservice*)
- Specialist for horse breeding and keeping (*Pferdewirt/in*)
- Winegrower/winemaker (*Winzer/in*)

Source: Authors' compilation

In addition to basic and advanced vocational training, there are a number of short-term training courses across the agricultural field aiming to refresh knowledge and skills. The *Bildungsserver Agrar* – an information platform for agricultural education – lists about 1000 training courses and seminars for 2017 (Bundesministerium für Ernährung und Landwirtschaft 2016). These courses are offered by a great variety of providers and have to be paid for by the trainees themselves, as this kind of training is market-based in Germany and not regulated by public authorities. The main actors in providing short-term courses in the agricultural sector include (adapted from Aenis and Lixia 2016):

- State-run vocational education centers
- Inter-company training institutes (e.g. DEULA)
- Extension service providers: Agricultural ministries, Chambers of Agriculture, farmers' associations, e.g. “*Deutscher Bauernverband*” (German Farmer's Federation)
- Private professional organizations, e.g. German Agricultural Society (DLG)
- Private companies of the agro-industry

Incentives for different actors

The most important actors in the German VET system are the training enterprises and the trainees themselves. This section seeks to answer the following question: What are the main motives for training companies to offer vocational training, and why are young people interested in following a VET pathway?

According to the literature on the subject, the two main motives for training companies to offer VET are the investment (Merrilees 1983 cited in Jansen 2016) and the production motive (Lindley 1975; Jansen 2016). Some companies' main reason for offering training is to make use of the labor of their trainees. They profit from short-term advantages, as trainees are paid lower wages than skilled workers. However, empirical evidence shows that most training enterprises in Germany offer VET in order to secure a supply of skilled workers on the long run (investment motive) (Jansen 2016). There are three other motives mentioned in the literature: The screening motive (Stevens 1994 cited in Jansen 2016), meaning that companies observe trainees and choose the best for retention; the social responsibility motive, meaning that companies want to offer their trainees possibilities to integrate in the labor market (Beicht et al 2004 cited in Jansen 2016); and the reputation motive, meaning that firms gain a better image by offering vocational training, which eventually turns into monetary returns (Sadowski 1980 cited in Jansen 2016).

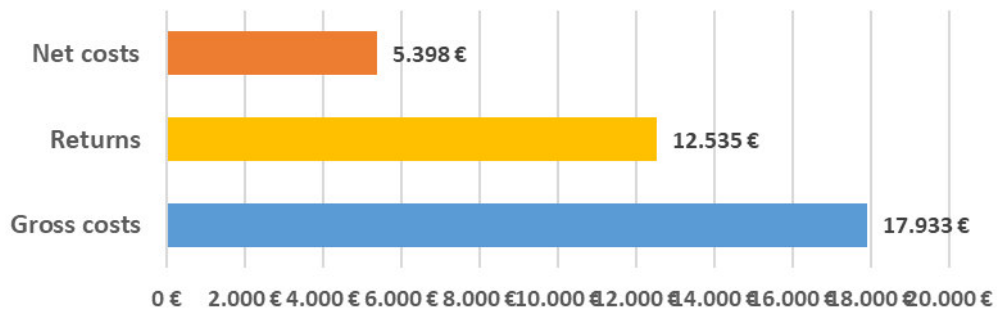
Costs and benefits of the dual system

The biggest share of the costs for the dual system of vocational training falls to the training enterprises, as they bear the costs of the in-company training. Responsibilities for funding vocational schools lie with the federal states and local authorities. Basic vocational training is generally free of costs for students. Advanced vocational education and training, however, must be paid by the students. In order to create equal opportunities between advanced vocational education and higher education, a number of state subsidies have been established, especially for the *Meister* and technician education pathways (Aenis and Lixia 2016). The latest representative report on the relative costs and benefits of the German vocational training system was for the 2012-2013 period, and was published by the BIBB (Federal Institute for Vocational Education and Training). The study states that vocational education is initially for the majority of training enterprises. In Germany, enterprises participate voluntarily in vocational training. Companies incur most of the costs in the course of vocational training, whereas benefits can arise at different points in time (Jansen et al. 2015). Yet, the costs are usually seen as an investment in the future, as personnel recruitment costs can be saved when hiring the trainees after they completed their training (Jansen et al. 2015). Training and hiring trainees also includes long-term advantages for the training companies: enterprises have the flexibility to provide training on the skills they most demand and on company-specific knowledge and can thereby reduce their dependency of the external labor market and the risk of a shortage of skilled workers (Jansen et al. 2015).

The BIBB cost-benefit calculations are based on a cost model underpinned by the work of the Edding Commission, which was set up to give advice on the costs and financing of vocational education and training (Jansen et al. 2015). Non-personnel and personnel costs that a company incurs for vocational training are categorized as gross costs. While trainees work productively at the company during the course of their training, they generate returns to the company. These returns are deducted from the gross costs. The obtained value is equal to the net costs of the vocational training. Results of the BIBB survey show that for the training year 2012-2013 the gross costs per trainee amounted to 17,933 € on average (see Figure 6). This is equivalent to about 52% of per capita Gross Domestic Product²². The training enterprise generates an average return of 12.535 € from the productive inputs of the trainee. Therefore, the net costs per trainee amount to 5.378 €. The largest share of the vocational training costs are made up of the personnel costs, which amount to about 11.000 € (62%) on average (see Figure 7). 23% of the gross costs are made up by the training personnel, 5% by premises and non-personnel costs (procurement costs for tools and equipment, in-company teaching) and 10% by other costs (including chamber fees, costs of teaching and learning materials, external courses, in-company training administration).

²² Gross Domestic Product per capita in Germany in 2012 was about €34,270 (<https://data.oecd.org/>). Accessed on November 28, 2017.

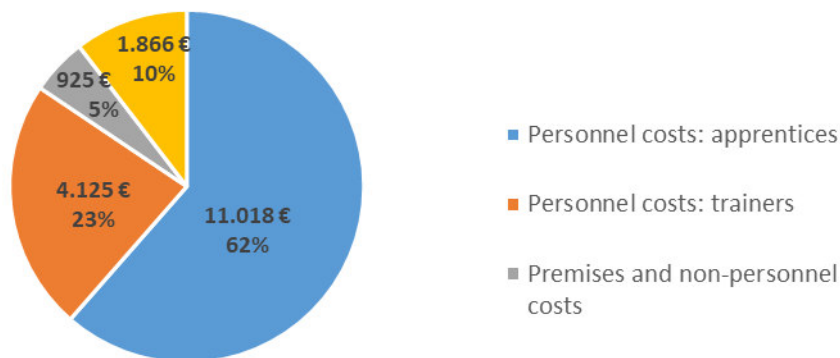
Figure 6: Gross costs, returns and net costs per apprentice per year (in Euros)



Source: adapted from Jansen et al. (2015)

Besides the training enterprise, the public sector and the trainees themselves contribute towards the financing of vocational training in Germany. As Jansen, Wenzelmann, and Müller (2016) point out, it is methodologically difficult to determine the exact costs of vocational training. For instance, information regarding the contribution of trainees towards the financing of vocational training is important (Jansen et al. 2016). However, estimations suggest that the contribution of trainees is considerable and has been thus far underestimated. As stated by the BIBB survey, returns can be generated in the workplace but also in training workshops (Jansen et al. 2015). Some training enterprises also receive grants by public sector support programs (e.g. run by the German federal states). Public spending is, however, focused on federal state-funded vocational schools (Jansen, Wenzelmann, and Müller 2016). Several programs support infrastructure (e.g. inter-company training centers, training for disadvantaged young people), or focus on economic policy and providing assistance to the sector of small and medium sized enterprises (Jansen, Wenzelmann, and Müller 2016).

Figure 7: Breakdown of gross costs per apprentice and year by cost categories (% and Euros)



Source: adapted from Jansen et al. (2015)



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