standards in other markets or for categories of production not covered in the national standard. It is often hard for a government agency, which works according to set administrative regulations, to provide such services.

Especially because government certification for the domestic market usually has no oversight, the credibility and competence of the government agency providing certification is a crucial factor. Even if not strictly demanded by the market, obtaining IFOAM Accreditation is one of the most effective ways for a government certification program to verify and demonstrate competence.

In case the government wants to provide technical support for certification, e.g. for the setting-up of Internal Control Systems, in a system which is intended for international recognition, this should be provided by a different agency/unit from the one doing public organic certification. This is in line with the international principles of separation of advice and certification functions. If the public certification system is only intended for the domestic market, there can be more flexibility: governments may develop, in close discussions with private organic stakeholders, whatever system they feel would provide the credibility needed in their own national context.

d. Support for organic vocational training and academic programs

Political justification

Organic agriculture is knowledge intensive. In the past few decades, in many parts of the world, agricultural education at various levels (in schools, universities, extension) has focused on conventional methods with high use of agro-chemical inputs, high yielding varieties, new plant breeding techniques, optimization of animal weight gain without consideration for animal welfare, etc. A lot of the knowledge dispensed through these agricultural education channels is not relevant to organic farming, or opposes it. To accompany the growth of the organic sector in a country it is crucial to develop organic agriculture education parallel to conventional agronomy and animal husbandry. In many cases, organic knowledge will also benefit people who might work in the conventional sector, in particular when it comes to improving the sustainability and resilience of conventional agriculture as they may pick up some useful ideas and concepts from organic agriculture. Therefore, it is an efficient use of public funds to include organic agriculture or agro-ecological approaches as a voluntary or compulsory component of agricultural vocational training and academic programs.

Suitable contexts

Similarly to organic research and extension, the development of organic vocational training and academic programs is suitable to all contexts and policy objectives, with the exception of very early stages of organic development where there isn't even yet enough knowledge in the country to set-up such professional education programs. At such early stages, people who want to specialize in organic agriculture would typically go abroad for studies. After some domestic universities have accumulated experience working on organic agriculture research and projects, and there are experienced organic professionals in the country, specific organic courses can be set-up and demonstration sites can be established.

Possible modalities of implementation

The ideal scenario is to combine mainstreaming of organic agriculture through compulsory courses in all agricultural education programs with offering specialized organic agriculture diplomas and degrees. That way, all agriculture students will achieve a basic level of understanding of organic agriculture, while some students can specialize further in organic agriculture.

The creation of special organic agriculture departments within existing agricultural universities is a best practice to ensure a stable pool of organic experts, who can work both on organic education and on organic research. This is common practice in EU countries and in a few other countries (e.g. Tunisia). Certain governments have gone a step further and established fully organic agriculture universities (e.g. recently Gujarat state in India).

A dedicated university or university department offering a specialized MSc in Organic Agriculture (or agro-ecology or similar terms) such as at the university of Kassel, Witzenhausen/Germany, the university of Berkley, USA or the Azad University, Karaj, Iran, is a real asset for the country, but it is also very important to offer organic specializations in lower-level education programs, such as diplomas and even school programs in areas where many school students will end up working in agriculture. Austria, for example, offers excellent organic vocational education with many 3-year vocational school programs specializing in organic available around the country.

When a whole degree/diploma in organic agriculture is not possible, a good starting point is to offer at least some optional specialization in organic agriculture in regular agriculture degrees (e.g. Belgium started offering organic farming options in agriculture diplomas in the late 80s).

One interesting format is the cooperation among various universities to offer a degree program in organic agriculture: this format is well developed in the EU with at least two such European programs[71]. In these programs, students complete their organic/agroecology degree in multiple universities and are awarded a double degree

[71] Those are the EUR-Organic (the European Master in Organic Agriculture and Food Systems involving five universities), and the ISARA-NMBU-WUR MSc program on organic agriculture and agroecology.

from two of the participating universities. This enables pulling resources together so that universities can offer an organic specialization even if they do not have the sufficient resources to provide it by themselves.

Governments may also support organic vocational training in the form of grants and subsidies to specialized organic vocational training programs that may be run by NGOs. One example is CRABE in Belgium, a local development association involved in organic agriculture development since 1980. It started offering vocational training in organic agriculture in 1984. Those vocational training activities continue up to now, within the framework of a program to combat unemployment (co-financed by Belgium public institutions and by the European Social Funds). Training in organic agriculture is a full-time one-year education program that is free of charge (and with unemployment & education benefits from the Belgium government) for young people, unemployed people, agricultural workers and people wanting to start organic farming.

On-the-job training for people who are already agricultural professionals is another format, especially relevant for staff of extension services. Such training can be organized and/or financed by the government. This was done in Austria in the late 1990s, where the Ministry of Agriculture started offering both a certificate for advisors in organic agriculture and further in-service training on organic farming and related topics such as animal welfare.

Public institutions can also support time-limited projects that include cooperation between organic training institutions to produce common educational systems and materials. There have been several such cooperation projects funded by the EU[72].

Similar projects can also be funded as development-cooperation projects. A case is the project "*Development of Institutional Capacity in Organic Agriculture*" funded by the England Africa Partnership (EAP) program of the UK Department for Education and Skills. The project partners were OAPTIN (the Organic Agriculture Project in Tertiary Institutions in Nigeria) and Coventry University in the UK. OAPTIN is a network launched in 2005 by a consortium of Nigerian universities aiming to improve the contribution of education institutions to organic agriculture in Nigeria. The project developed an organic curriculum and teaching materials suitable for Nigerian Tertiary Institutions, and provided capacity building for university staff. This project was then replicated more widely in West Africa under an EU co-operation project, "Institutional Capacity Building for Organic Agriculture in West Africa". Under this project, a three-week "Concepts of Organic Agriculture" workshop acquainted university lecturers with the basic principles of organic agriculture.

Another development cooperation project in Nigeria, the *"Work, Earn and Learn Programme for Developing Entrepreneurship in Organic Agriculture among Graduates in Nigeria*", provided hands-on experience through work and provided teaching on new

[72] One is the EcoNewFarmers project between 2014 and 2016. It included seven partners from seven EU countries produced a curriculum for a mobile learning course on ecological farming, and a database of institutions and trainers focus in ecological farming. Another such EU-funded project is the Euro-EducATES project, initiated in 2015. It aims to develop and disseminate common and innovative European educational tools on agro-ecology for agricultural teachers and trainers.

skills and attitudes for gaining access to markets. It included 4 weeks of intensive courses, followed by 3 weeks of internship in the private sector, visits to successful organic businesses overseas, mentoring to develop a business plan and support for business start-ups, marketing etc. Following the course, 69% of trainees opted to start their own small-scale businesses in organic agriculture.

Country examples

European countries are increasingly supporting the integration of organic education in public institutions. There are study courses and specialized degrees in organic farming at various state universities and universities of applied sciences across the EU. The most reputed are Wageningen University in the Netherlands, the University of Hohenheim in Germany, the Organic Agriculture Faculty of Witzenhausen attached to the University of Kassel (Germany), the Aarhus University in Denmark, all of which offer MSc qualifications in Organic Agriculture, and the Norwegian University of Life Science, which offers a MSc in Agroecology. Additionally, there are a number of European organic/agroecology double degree programs set up through a cooperation of various European public and private universities. Usually, (the few) countries in the EU that do not offer a special organic agriculture degree have at least some education programs offering a specialization option in organic agriculture.

Moreover, financial support is also often given by national governments to develop or improve teaching materials on organic farming for secondary schools, for example in Austria, Estonia, Germany and Spain.

Austria has well-developed organic agriculture education opportunities for more than 25 years, including higher education agricultural training, but also many vocational school programs. Since 1994 it has included training in organic farming in the curriculum for secondary agricultural colleges across the country. Nearly all the agricultural universities offer options to study organic agriculture.

In **Switzerland** almost all agricultural schools have offered a course on organic agriculture since 1996. See more information in the Best Practice text box below.

In **Serbia**, following the implementation of the National Action Plan for Organic Production Development of 2011, organic agriculture was introduced in primary education. There is also a one-year Masters Course in Agriculture at the University of Novi Sad, and there are discussions to introduce organic agriculture in high school curricula.

In **Bulgaria** the national Agricultural University in Plovdiv has started organic activities in 1993, establishing the first organic pilot farm and providing organic training. The university has been a pioneer and major contributor to the development of organic farming in the country, with a group of academic professors creating the first Association for Organic Agriculture, which farmers have subsequently joined.

The rest of the world is somewhat lagging behind Europe in terms of integration of organic agriculture in public education programs, but several countries have started the process in the past 10 years.

In the **USA**, in 2009, Washington State University became the first university to offer students a major in organic agriculture. Today, there are at least eight land grant universities that provide students the option for an organic major, minor, or certificate. In **Canada**, a number of universities and colleges also offer organic programs.

In **Australia**, Charles Sturt University offers a Bachelor in Ecological Agricultural Systems and a Master and Doctor in Sustainable Agriculture, all of which can be studied extramurally. Other universities in the country have organic units within their Master of Agriculture programs, and options for organic research at PhD level. There are also a number of organic education opportunities in **New Zealand**, whether at the certificate level or in the form of a specialization at a higher education level.

In **India**, almost all agricultural universities offer some education in organic farming, and some offer a full course. Himachal Pradesh Agricultural University in north India and the 4 agricultural universities in Karnataka (south India) have set up departments of organic farming. In 2016 the State of Gujarat announced it would set up India's first university exclusively dedicated to organic farming and research. Initial funds (EUR 1.4 million) have been allocated in the state yearly budget. In the State of Sikkim an organic farming chapter is standard part of elementary school curriculum.

In **Thailand**, the state university of Maejo has declared itself the first Organic Agriculture University in Thailand. This was included in the university's 15-year plan approved in 2012. The university is converting its land to organic agriculture and is opening an organic food center on the campus where students and staff can eat and buy organic products supplied by local organic farmers. Organic agriculture is being included as a compulsory part for all agricultural students (even though students can still learn conventional agriculture methods as well).

In the **Philippines**, the Government established the Cordilera Organic Agriculture Development Center (COARDC) at Benguet State University. The program started with 10 students in 2010 who graduated in 2012, becoming the first batch of certified organic agriculturists in the province. In the school year 2013-2014, there were 41 students enrolled in the program. Other universities have also started to include an organic curriculum. Since 2012, there is also an on-line distance learning certificate course on organic agriculture offered by the University of the Philippines Open University (UPOU).

In Samoa, the School of Agriculture and Food Technology of the University of the South Pacific (which is supported by 12 island nations of the **Pacific Community**) offers a unit on organic agriculture within the course on sustainable agriculture.

The government of **China**, in its 5-year plan 2016-2020, is planning to invest around EUR 187 million in new farmers training. The training will be for farmer and farm

managers with a preference for young graduates from college interested in agriculture. The program has a focus on organic, ecological and sustainable agriculture, with the expectation to get one million qualified farmers with international market access by 2020.

In Latin America, **Cuba** has played a leading role in the development of organic content for many of its academic and technical education courses. The CEAS (Center for Sustainable Agriculture Studies) of the Agricultural University of Havana established MSc and PhD programs in Agroecology in the 1990s, and has offered a distance-learning course since 1997. Many other universities and intermediary institutions, such as the Network of Agricultural Polytechnical Institutes, now incorporate organic agriculture in their curricula.

In **Costa Rica** specific degrees are available in organic farming, ranging from short-term courses to Master's with organic agriculture specialization. The EARTH University, a private agricultural university established with the support of the Costa Rican government, has a rather innovative academic approach and teaches organic, as well as biodynamic agriculture.

In **Brazil**, there are many possibilities to study agroecology in a BSc degree or in technical courses. At least 15 universities and educational institutions offer such options. The NGO ELO has also offered a course on biodynamic agriculture since 1986, which has recognition from the Ministry of education as Post Graduate level of education and for agriculture extension.

Brazil also hosts the first Latin American School of Agroecology (Escuela Latinoamericana de Agroecología - ELAA), which is the result of an initiative of the international NGO Via Campesina, with support from the state government of Parana (Brasil), the Federal University of the State, and the **Venezuelan** government. ELAA is under the control of the Ministry of Education of Venezuela but the curriculum and pedagogy are decided upon by Via Campesina Brasil and Via Campesina International. Similar schools have been created in Venezuela, Paraguay, and Colombia all still with support from the Venezuelan government.

In **Mexico**, 4 universities offer engineering degrees in agroecology. The most renowned is the public university of UACh (Universidad Autónoma Chapingo), which has pioneered the teaching of agro-ecology in the region and influences other agricultural colleges beyond the country.

In **Colombia**, in the nineties, the public education system started including organic agriculture and agroecology in different academic programs ranging from technical levels to postgraduate levels. Several universities offer specialization in organic agriculture or agroecology.

In **Peru**, the ministry of education and the ministry of agriculture support the FORMAGRO project, initiated in 2016 and implemented by SUCO, a Canadian development cooperation agency, to develop and implement agroecology educational programs in technical agriculture education institutions.

In Africa, **Tunisia** is clearly leading in terms of inclusion of organic agriculture in public education curricula, for more than a decade. For more information, see the Best Practice text box below.

In **Nigeria**, the Federal University of Agriculture, Abeokuta (FUNAAB) has started to integrate organic agriculture into their BSc of Agriculture and the organic agriculture group of the university offers a biennial certificated International Summer School in Organic Agriculture.

In **Senegal**, the Ministry of Agriculture has received FAO support of EUR 70,000 for a three-year program in organic agriculture at the Kaydar Center to train young people and help them start as organic farmers. The local municipality also provides one ha of land to these new farmers.

The **African Union** organized, in 2012, regional training workshops on organic standards and certification systems, organic production, marketing and extension support. The workshops were for participants from AU member states, in the context of its Ecological Organic Agriculture Initiative funded by the EU, Switzerland and Sweden. In addition, numerous African institutes and NGOs have been training organic farmers and extension workers for many decades. In **Kenya**, the Kenyan Institute of Organic Farming has conducted trainings since 1986. Other long-term training institutions are Gako in **Rwanda** and Kasizi Agriculture Training Center in **Zambia**.

In **Armenia** capacity building activities in organic agriculture are included in the EU-funded "Organic Agriculture Support Initiative" project started in 2015 and implemented by the Austrian Development Agency (the project also intends to integrate organic into academic curricula).

Best practice example(s)

Best Practice Example 1: Organic education in Switzerland

Despite being a small country with a small population, Switzerland was an early adopter of organic programs in agricultural education. Almost all agricultural schools have offered a course on organic agriculture since 1996. By 2009, several specific "organic agriculture" technical educational programs existed in the German-speaking part of the country, while directors of agricultural schools in the French-speaking part made an official commitment to develop similar programs in their schools.

Nowadays a 2-day organic farming course is mandatory for every agricultural student/apprentice, and optional organic specializations are always available. Twelve agricultural schools throughout the country offer organic agriculture training courses. There is also a specialized organic agriculture vocational school for (future) organic famers called "Bio-Schule Schwand".

The ZHAW University of Zürich offers a specialization in organic agriculture as part of the Environmental Engineering degree. This was initiated in 2010 in partnership with FiBL and Agroscope, the 2 leading organizations in organic research. Additionally, the University HAFL

Zollikofen offers a supplementary qualification in organic agriculture as part of the Agronomy BSc.

Further developments are still ongoing: in 2016, Bio Suisse and FiBL were working on the development of a new concept for agricultural education adapted to organic agriculture in Switzerland.

Best Practice Example 2: Organic education in Tunisia

Tunisia is the leading country in Africa when it comes to organic production and exports. For more than a decade, the Tunisian government has promoted organic agriculture development through a comprehensive set of measures, including the inclusion of organic options in agricultural education programs.

In Tunisia, there are compulsory OA courses at all higher agronomic institutes of learning. MSc degree programs in Sustainable and Organic Agriculture have been developed and offered in some of the higher institutions of learning in the country. These programs serve the dual purpose of training students in Organic Agriculture and as a way of researching organic production systems.

A diploma program in OA was developed to provide professional trainings for stakeholders involved in the country's organic sector. It is jointly conducted by the Agricultural Investment Promotion Agency and AVFA, the Agriculture Training and Extension Agency. The later is a public administration affiliated to the Ministry of Agriculture and in charge of developing and monitoring agricultural education curriculums. It supervises the 39 agricultural professional education centers spread across the national territory.

Pitfalls and challenges

Policy makers can take decisions that agricultural universities should switch to a more pro-organic curriculum. However, such top-down decisions will face resistance from the lecturers and staff of universities, most of whom have taught plant protection science, biotechnology and agronomy in the conventional way, and therefore may feel threatened by a shift in education priorities. In the case of the Kerala State in India, for example, the teachers' association at the Kerala Agricultural University, the flagship institution for agricultural education in the State, was one of the most fervent opponents to the Kerala 2010 organic policy, even though there were many teachers at the university who supported organic agriculture. Change will take time, and at the level of agricultural education, it may take up a generation of agronomists to get a real broad acceptance of more pro-organic curriculum.

The challenge of providing vocational training is always: is it going to really meet the needs of the farmers? This can be addressed by conducting a needs assessment of future trainees.

Another challenge, particularly with large-scale vocational training programs, is the availability of a sufficient number of qualified organic trainers. Often, before such large-scale training program is initiated, one needs to implement a national Train the Trainers program. The challenge is similar for inclusion of organic courses in academic

programs: in countries where organic agriculture is a new field of interest, there will not be enough qualified teachers to teach this subject.

e. Conversion and maintenance area payments for organic production

Political justification

The failure of the market to adequately recognize the delivery of public goods and the externalities of agricultural production is widely documented. In a number of countries conversion and maintenance area payments for organic farming are used and they partly address this market failure. These subsidies are given in the form of a fixed amount per ha to organic farmers or farmers in conversion to organic. The main policy logic behind such subsidies is to compensate organic farmers for the positive externalities (environmental and societal benefits) that they produce, or the negative externalities that they do not produce, through their choice of farming. Since these environmental and societal benefits (see Chapter II for more details) are "externalities", they are not fully compensated for by the premium price that the organic consumer is willing to pay for organic products. Hence, to encourage a wider adoption of organic agriculture amongst farmers, and to attempt to "internalize" externalities, some countries give subsidies to organic farmers in the form of multi-annual contracts. Subsidies are also given during the conversion period, and often these are even higher since, during this period, the farmer bears the additional costs of organic production but without the benefit of the premium prices for their products.

In early development stages of an organic sector, area payments can also provide the incentive necessary to bring a high number of farmers to convert to organic agriculture, at a time when market demand is not necessarily developed enough to pull so many farmers into conversion. This then provides economies of scale to build the rest of the supply chain on a wider basis of production supply. It can therefore create a temporary situation of supply-demand imbalance, which, if addressed by other measures to support organic processing and marketing, leads to a next-level supply-demand equilibrium for the organic sector.

Another advantage of area payments is that they can be used to modulate the development of certain types of production, and therefore encourage diversification in the organic sector, whether this comes from a risk-mitigation strategy, market expansion strategy, import-replacement strategy, or other reasons to encourage particular types of crops. For example, area payments for leguminous crops can be put higher than for other field crops, if the lack of protein feed has been identified as a bottleneck for the development of a domestic organic livestock sector.

Area payments for specific environmentally-friendly production methods such as organic agriculture fall within the "green box" category in the WTO Agreement on Agriculture, meaning that they are an acceptable type of agricultural subsidy for governments to maintain.